Installation, Operation & Maintenance

**WARNING**

QUALIFIED INSTALLER

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

**WARNING**

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

**WARNING**

FOR YOUR SAFETY

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

Attention should be paid to the following statements:

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

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

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

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

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**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.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

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

---

**CAUTION**

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Shut off main gas supply.
- Do not touch any electrical switch.
- Do not use any phone in the building.
- Leave the building immediately.
- 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.

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**WARNING**

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

FIRE, EXPLOSION OR CARBON MONOXIDE POISONING HAZARD

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

**WARNING**

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

**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.

**CAUTION**

Unit power supply wire should be only copper or aluminum.
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.

UNIT HANDLING

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

WATER PRESSURE

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

WARNING

UNIT HANDLING

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

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 of 3 phase units at startup by a qualified service technician. Fan motor rotation should be checked for proper operation. Alterations should only be made at the unit power connection.

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.

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

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

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

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

**WARNING**
Never attempt to open an access door or remove a panel while the unit is running. Pressure in the unit can cause excessive force against the panel.

**CAUTION**
PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) are vulnerable to attack by certain chemicals. Polyolester (POE) oils used with R-410A and other refrigerants, even in trace amounts, in a PVC or CPVC piping system will result in stress cracking of the piping and fittings and complete piping system failure.
1. Startup and service must be performed by a Factory Trained Service Technician.

2. The unit is for indoor use only. See General Information section for more unit information.

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

4. Install this furnace only in a location and position as specified in the Installation section of this manual.

5. Provide adequate combustion ventilation air to the furnace. If a vent duct extension is used, a class IV approved vent is required. See the General Venting section of this manual.

6. Combustion products must be discharged to the outdoors. Connect the furnace to an approved vent system. See the General Venting section of this manual.

7. Condensate is produced in the furnace and requires a condensate drain system. See the Condensate Drain Piping section of this manual.

8. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections.

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

10. 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 should be an L shaped duct.

11. 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.

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

13. 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.

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

15. Keep this manual and all literature safeguarded near or on the unit.
V3 Series Feature String Nomenclature

Model Options: Unit Feature Options

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**BASE MODEL**

**SERIES AND GENERATION**

V3 = Horizontal - Back Intake, Front Discharge

**UNIT SIZE**

A = Up to 1,200 cfm
B = Up to 2,000 cfm
C = Up to 4,000 cfm
D = Up to 6,000 cfm
E = Up to 10,000 cfm

**UNIT ORIENTATION**

R = Right Hand Connections
L = Left Hand Connections

**REVISION**

B = Second Revision

**VOLTAGE**

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

**CORROSION PROTECTION**

0 = None
A = Interior Corrosion Protection

**Model Option A: COOLING**

**A1: COOLING TYPE**

0 = No Cooling
1 = R-410A DX Cooling
2 = Chilled Water Cooling

**A2: COOLING ROWS**

0 = No Cooling
4 = 4 Row Coil
6 = 6 Row Coil
8 = 8 Row Coil

**A3: COOLING STAGES**

0 = No Cooling
1 = Single Circuit
2 = Two Circuits - Interlaced Coil
D = Double Serpentine
F = Single Serpentine
H = Half Serpentine
Q = Quarter Serpentine

**A4: COOLING FPI**

0 = No Cooling
A = 10 fpi
B = 8 fpi
C = 12 fpi
D = 14 fpi
### V3 Series Feature String Nomenclature

| GEN | SIZE | ORENT | MIREV | VLT | CORR | A1 | A2 | A3 | A4 | B1 | B2 | B3 | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | 2 | 3 | 4 | 5 | 5A | 5B | 5C | 6A | 6B | 6C | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14A | 14B |
|-----|------|-------|-------|-----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| V3  | B    | B     | 2     | 0   | 2    | 6  | H  | A  | E  | E  | A  | B  | C  | H  | 0 | E  | A  | F  | F  | B  | 0 | C  | 0   | A | 0 | 0 | 0 | 0 | 0 | B | 0 | 0 | 0 |
|     | 15   | 16   | 17   | 18  | 19  | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |

#### Model Option B: HEATING

**B1: HEATING TYPE**
- 0 = No Heating
- 1 = Hot Water
- 3 = Electric Heating
- 4 = Steam Distributing
- 5 = Electric Heat (UL 60335-2-40 Compliant)
- A = Open Combustion Natural Gas Heat
- B = Separated Combustion Natural Gas Heat
- C = Open Combustion LP Gas Heat
- D = Separated Combustion LP Gas Heat
- E = Open Combustion Natural Gas Heat - High Altitude
- F = Separated Combustion Natural Gas Heat - High Altitude
- G = Open Combustion LP Gas Heat - High Altitude
- H = Separated Combustion LP Gas Heat - High Altitude

**B2: HEATING DESIGNATION**
- 0 = No Heating
- 1 = 1 Row Coil
- 2 = 2 Row Coil
- 3 = 3 Row Coil
- 4 = 4 Row Coil
- 5 = 5 Stage
- 6 = 6 Stage
- A = Modulating 3:1 96% Efficient Counter-Flow
- B = 2 Stage 96% Efficient Counter-Flow
- C = 4 Stage 96% Efficient Counter-Flow
- D = Modular/SCR Electric
- E = Single Serpentine 12 fpi
- F = Half Serpentine 12 fpi
- G = Quarter Serpentine 12 fpi
- H = Single Serpentine 8 fpi
- I = Half Serpentine 8 fpi
- J = Quarter Serpentine 8 fpi
- K = Single Serpentine 10 fpi
- L = Half Serpentine 10 fpi
- M = Quarter Serpentine 10 fpi
- N = Single Serpentine 12 fpi
- O = Half Serpentine 12 fpi
- P = Quarter Serpentine 12 fpi
- Q = Single Serpentine 8 fpi
- R = Half Serpentine 8 fpi
- S = Quarter Serpentine 8 fpi
- T = Single Serpentine 10 fpi
- U = Half Serpentine 10 fpi
- V = Quarter Serpentine 10 fpi

#### Feature 1: SUPPLY FAN

**1A: SUPPLY AIR BLOWER CONFIGURATION**
- A = 1 Blower + 1 High Efficiency EC Motor
- B = 2 Blowers + 2 High Efficiency EC Motors

**1B: SUPPLY AIR BLOWER**
- A = 310 mm Direct Drive BC Plenum Fan
- B = 355 mm Direct Drive BC Plenum Fan
- C = 450 mm Direct Drive BC Plenum Fan
- D = 250 mm Direct Drive BC Plenum Fan

**1C: SUPPLY AIR BLOWER MOTOR**
- A = 500 W (0.67 hp)
- B = 1.0 kW (1.34 hp)
- C = 1.7 kW (2.28 hp)
- D = 3.0 kW (4.02 hp)
- E = 6.0 kW (8.00 hp)
- F = 800 W (1.07 hp)
### V3 Series Feature String Nomenclature

#### Model Options

<table>
<thead>
<tr>
<th>GEN</th>
<th>SIZE</th>
<th>ORIENT</th>
<th>MINREV</th>
<th>VLT</th>
<th>CORR</th>
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<th>12</th>
<th>13A</th>
<th>13B</th>
<th>14A</th>
<th>14B</th>
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#### 1D: SUPPLY BLOWER CONTROL/CONTROL VENDORS
- C = Field Installed Controls by Others
- D = Field Installed Controls by Others + Isolation Relays
- E = VCC-X Orion Controls System
- H = AAON Touchscreen Controller

#### Feature 2: REFRIGERATION OPTIONS
- 0 = Standard - None
- A = Single Circuit External Hot Gas Bypass
- B = Dual Circuit External Hot Gas Bypass
- C = Heat Pump
- D = Option B + H
- F = Options C + H
- H = Modulating Hot Gas Reheat
- P = Option H (Circuit 1) + Option A (Circuit 2)
- R = Option C + A
- S = Option C + B
- T = Option C + H + A
- U = Option C + H + B

#### Feature 3: SPECIAL CONTROLS
- 0 = Standard - None
- A = Constant Volume Controller - CV Cool + CV Heat
- C = VAV Controller - VAV Cool + CV Heat
- E = Make Up Air Controller - CV Cool + CV Heat

#### Feature 4: ADDITIONAL CONTROLS
- 0 = Standard - None
- A = Phase and Brownout Protection
- B = Return and Supply Air Firestat
- C = Return Air Smoke Detector
- D = Options A + B
- E = Options A + C
- F = Options B + C
- G = Options A + B + C
- H = Remote Safety Shutdown Terminals
- J = Energy Recovery Wheel Rotation Detection
- K = Options A + H
- L = Options A + J
- M = Options B + H
- N = Options B + J

#### Feature 4: ADDITIONAL CONTROLS Continued
- P = Options C + H
- Q = Options C + J
- R = Options H + J
- S = Options A + B + H
- T = Options A + B + J
- U = Options A + C + H
- V = Options A + C + J
- W = Options A + H + J
- Y = Options B + C + H
- Z = Options B + C + J
- I = Options B + H + J
- 2 = Options C + H + J
- 3 = Options A + B + C + H
- 4 = Options A + B + C + J
- 5 = Options A + B + H + J
- 6 = Options A + C + H + J
- 7 = Options B + C + H + J
- 8 = Options A + B + C + H + J

#### Feature 5: MIXING BOX

##### 5A: RETURN AIR DAMPER POSITION
- 0 = Standard - None
- F = Front
- L = Left Hand (Front OA Damper Required)
- R = Right Hand (Front OA Damper Required)
- T = Top (Front OA Damper Required)

##### 5B: OUTSIDE AIR DAMPER POSITION
- 0 = Standard - None
- F = Front
- L = Left Hand (Front RA Damper Required)
- R = Right Hand (Front RA Damper Required)
- T = Top (Front RA Damper Required)

##### 5C: MIXING BOX DAMPER CONTROL
- 0 = Standard - None
- A = 2 Position Actuators (24V)
- B = Fully Modulating Actuators (DDC)
- C = Fixed Position Damper
V3 Series Feature String Nomenclature

<table>
<thead>
<tr>
<th>Feature 6: FILTER BOX</th>
<th>Feature 8: COIL COATING</th>
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<tbody>
<tr>
<td>6A: PRE FILTER BOX</td>
<td></td>
</tr>
<tr>
<td>0 = Standard - None</td>
<td>A = E-coated Cooling and Heating Coils</td>
</tr>
<tr>
<td>A = 2&quot; Pleated - MERV 8</td>
<td>B = Copper Finned Coils + Stainless Steel Coil Casing</td>
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<tr>
<td>B = 4&quot; Pleated - MERV 8</td>
<td>D = Stainless Steel Coil Casing</td>
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<tr>
<td>C = 4&quot; Pleated - MERV 11</td>
<td>E = Options A + D</td>
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<tr>
<td>D = 4&quot; Pleated - MERV 13</td>
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<tr>
<td>E = 4&quot; Pleated - MERV 14</td>
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<tr>
<td>F = 2&quot; Pleated - MERV 8 + 4&quot; Pleated - MERV 8</td>
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<tr>
<td>G = 2&quot; Pleated - MERV 8 + 4&quot; Pleated - MERV 11</td>
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<tr>
<td>H = 2&quot; Pleated - MERV 8 + 4&quot; Pleated - MERV 13</td>
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<tr>
<td>J = 2&quot; Pleated - MERV 8 + 4&quot; Pleated - MERV 14</td>
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<th>Feature 7: FILTER OPTIONS</th>
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<td>A = Magnehelic Gauge</td>
</tr>
<tr>
<td>B = Clogged Filter Switch</td>
</tr>
<tr>
<td>C = Options A + B</td>
</tr>
<tr>
<td>D = Magnehelic Gauge – Unit Filter + ERW Filter</td>
</tr>
<tr>
<td>F = Clogged Filter Switch – Unit Filter + ERW Filter</td>
</tr>
<tr>
<td>G = Options D + F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature 9: EXPANSION VALVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = None</td>
</tr>
<tr>
<td>A = Thermal Expansion Valves</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature 10: EXPANSION VALVE CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = None</td>
</tr>
<tr>
<td>A = Standard Control</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature 11: EXTERNAL PAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = Standard - None</td>
</tr>
<tr>
<td>A = AAON Gray Paint</td>
</tr>
<tr>
<td>B = Special Paint</td>
</tr>
</tbody>
</table>
V3 Series Feature String Nomenclature

Model Options : Unit Feature Options

| GEN | SIZE | ORIENT | MIREV | VLT | CORR | A1 | A2 | A3 | A4 | B1 | B2 | B3 | A5 | B6 | C1 | C2 | C3 | C4 | 1A | 1B | 1C | 1D | 2 | 3 | 4 | 5A | 5B | 5C | 6A | 6B | 6C | 7 | 8 | 9 | 10 | 11 | 12 | 13A | 13B | 13C | 13D | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|-----|------|--------|-------|-----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| V3  | B    | R      | B     | 2   | 0   | 26 | H  | A  | E  | E  | A  | B  | C  | H  | 0  | E  | A  | F  | F  | B  | 0  | C  | 0  | A  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0 |

**Feature 12: TONNAGE**
0 = Standard - None  
A = 2 ton Capacity  
B = 3 ton Capacity  
C = 4 ton Capacity  
D = 5 ton Capacity  
E = 6 ton Capacity  
F = 7 ton Capacity  
G = 8 ton Capacity  
U = 9 ton Capacity  
H = 10 ton Capacity  
V = 11 ton Capacity  
W = 13 ton Capacity  
J = 14 ton Capacity  
Y = 15 ton Capacity  
Z = 16 ton Capacity  
K = 17 ton Capacity  
L = 18 ton Capacity  
2 = 20 ton Capacity  
M = 22 ton Capacity  
3 = 26 ton Capacity  
N = 30 ton Capacity  
P = 31 ton Capacity  
Q = 34 ton Capacity  
R = 40-45 ton Capacity  
S = 50-55 ton Capacity  
4 = 60 ton Capacity  
T = 63 ton Capacity  
5 = 70 ton Capacity

**Feature 13: ENERGY RECOVERY TYPE**  
0 = Standard – None  
A = Energy Recovery Wheel – Total + High CFM, Polymer  
C = Energy Recovery Wheel – Total + High CFM, 1% Purge, Polymer  
E = Energy Recovery Wheel – Sensible + High CFM, Polymer  
G = Energy Recovery Wheel – Sensible + High CFM, 1% Purge, Polymer  
13: **ENERGY RECOVERY TYPE Continued**  
J = Energy Recovery Wheel – Total + High CFM, Aluminum  
L = Energy Recovery Wheel – Total + High CFM, 1% Purge, Aluminum  
N = Energy Recovery Wheel – Sensible + High CFM, Aluminum  
Q = Energy Recovery Wheel – Sensible + High CFM, 1% Purge, Aluminum

**Feature 14: GPM**  
14A: **GPM COOLING COIL**  
0 = Standard - None  
14B: **GPM HEATING COIL**  
0 = Standard - None

**Feature 15: CONTROL PANEL**  
0 = Internal Control Panel (Front or back access required)  
A = Small Control Panel - 12” x 12”  
B = Medium Control Panel - 25” x 22”  
C = Large Control Panel - 48” x 22”  
D = Removable Internal Control Panel (Single side access)

**Feature 16: SHIPPING SPLIT**  
0 = Standard – None  
A = 1 Shipping Split (2 pallets)  
B = 2 Shipping Splits (3 pallets)  
C = 3 Shipping Splits (4 pallets)  
D = 4 Shipping Splits (5 pallets)  
E = 5 Shipping Splits (6 pallets)  
H = Special Shipping Split (SPA Required)
# V3 Series Feature String Nomenclature

| GEN | SIZE | ORENT | MREV | VLT | CORR | A1 | A2 | A3 | A4 | B1 | B2 | B3 | 1A | 1B | 1C | 1D | 2 | 3 | 4 | 5A | 5B | 5C | 6A | 6B | 6C |
|-----|------|-------|------|-----|------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|----|----|----|----|----|----|----|
| V3  | -    | R     | B    | 2   | 0   | 2  | 6  | H  | A  | E  | E  | A  | B  | C  | H  | A  | 0 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |

**Feature 17: ENERGY RECOVERY CABINET**

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

**Feature 18: BLANK**

0 = Standard - None

**Feature 19: EXHAUST FAN**

0 = Standard - None  
A = 250 mm Exhaust Fan, 800 W EC Motor  
B = 310 mm Exhaust Fan, 1.0 kW EC Motor  
C = 310 mm Exhaust Fan, 1.7 kW EC Motor  
D = 355 mm Exhaust Fan, 1.7 kW EC Motor  
E = 450 mm Exhaust Fan, 3.0 kW EC Motor  
F = 450 mm Exhaust Fan, 6.0 kW EC Motor  
G = Dual 310 mm Exhaust Fan, 1.0 kW EC Motor  
H = Dual 310 mm Exhaust Fan, 1.7 kW EC Motor  
J = Dual 355 mm Exhaust Fan, 1.7 kW EC Motor  
K = Dual 450 mm Exhaust Fan, 3.0 kW EC Motor  
L = Dual 450 mm Exhaust Fan, 6.0 kW EC Motor

**Feature 20: CRATING**

0 = Standard - None  
A = Export Crating  
B = Forkliftable Base - 5” Base  
C = Options A + E  
D = Options A + B  
E = Shipping Shrink Wrap  
F = Options B + E  
G = Options A + B + E

**Feature 21: PULLEY COMBINATION**

0 = Standard - None

**Feature 22: WARRANTY**

0 = Standard - 1 Year Parts

**Feature 23: TYPE**

0 = Standard  
X = Special Pricing Authorization
General Information

AAON® V3 Series indoor air handling units have been designed for indoor installation only. Units are assembled, wired, charged with dry nitrogen and run-tested at the factory. V3 Series units are not intended for residential use. 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 should 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. Certified as a Category IV forced air furnace with or without cooling.
b. Certified for indoor installation.

Certification of Steam or Hot Water Heat Models
a. Certified as a forced air heating system with or without cooling.
b. Certified for indoor installation only.

certification of Cooling Models
a. Certified as a commercial central air conditioner with or without electrically operated compressors.
b. Certified for indoor installation only.
c. Certified with refrigerant R-410A coils or with chilled water cooling coils.

CAUTION
This equipment is protected by a standard limited warranty under the condition that initial installation, service, startup and maintenance is performed according to the instructions set forth in this manual. This manual should be read in its entirety prior to installation and before performing any service or maintenance work.

Equipment described in this manual is available with many optional accessories. If you have questions after reading this manual in its entirety, consult other factory documentation or contact your AAON Sales Representative to obtain further information before manipulating this equipment or its optional accessories.
Codes and Ordinances

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

Installation of V3 Series units must conform to the ICC standards of the International Mechanical Code, the International Building Code, Installation of Air Conditioning and Ventilating Systems Standard, NFPA 90A, and local building, plumbing and waste water codes. All appliances must be electrically grounded in accordance with local codes, or in the absence of local codes, the current National Electric Code, ANSI/NFPA 70 or the current Canadian Electrical Code CSA C22.1. Units with gas heaters must conform to the National Fuel Gas Code ANSI Z223.1 (NFPA 54) in the United States and Can/CGA-B149 Installation Code in Canada.

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

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

If repairs must be made to damaged goods, then the factory should be notified before any repair action is taken in order to protect the warranty. Certain equipment alteration, repair, and manipulation of equipment without the manufacturer’s consent may void the product warranty. Contact the AAON Technical Support 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 remote sensors. Consult order and shipment documentation to identify potential loose-shipped items. Loose-shipped items may have been placed inside unit cabinet for security. Installers and owners should secure all doors with locks or nuts and bolts to prevent unauthorized access.

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.
Figure 1 - Lockable Handle

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

Direct Expansion (DX) Systems
All DX refrigerant coils are factory charged with a nitrogen holding charge. All DX systems include evaporator coils and thermal expansion valves (TXV).

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

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

Always control the unit from the thermostat, or control panel, never at the main power supply, except for emergency or complete shutdown of the unit.

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

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

CAUTION
CRANKCASE HEATER OPERATION
Some units are equipped with compressor crankcase heaters, which should be energized at least 24 hours prior to cooling operation, to clear any liquid refrigerant from the compressors.
Note: Low Ambient Operation
Air-cooled DX units without a low ambient option, such as condenser fan cycling or the 0°F low ambient option, will not operate in the cooling mode of operation properly when the outdoor temperature is below 55°F. Low ambient and/or economizer options are recommended if cooling operation below 55°F is expected.

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.

Airflow should be adjusted 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.

The maximum supply air temperature from the gas heater is 140°F and the minimum allowable entering air temperature is 40°F. The maximum temperature rise for the gas heater is 100°F.

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

Condensate Drain Pans
Units require field installed drain p-traps and lines to be connected to the condensate drain pans of the unit.

For condensate drain lines, the line should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines. See Installation section of this manual for more information.

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

⚠️ CAUTION
Emergency drain pan is recommended for all applications where a risk of water damage to surrounding structure or furnishings. Refer to local codes.
Table 1 - Electric and Gas Heating Capacities

<table>
<thead>
<tr>
<th></th>
<th>Electric Heat Capacity</th>
<th>Gas Heat Input Capacity</th>
<th>Gas Heat Output Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kW (230V, 460V)</td>
<td>kW (208V)</td>
<td>MBH</td>
</tr>
<tr>
<td>A = Heat A</td>
<td>7.0</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>B = Heat B</td>
<td>14.0</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>C = Heat C</td>
<td>21.0</td>
<td>15.8</td>
<td>45 MBH</td>
</tr>
<tr>
<td>D = Heat D</td>
<td>28.0</td>
<td>21.0</td>
<td>60 MBH</td>
</tr>
<tr>
<td>E = Heat E</td>
<td>35.0</td>
<td>26.3</td>
<td>72 MBH</td>
</tr>
<tr>
<td>F = Heat F</td>
<td>42.0</td>
<td>31.5</td>
<td>80 MBH</td>
</tr>
<tr>
<td>G = Heat G</td>
<td>49.0</td>
<td>37.0</td>
<td></td>
</tr>
<tr>
<td>H = Heat H</td>
<td>56.0</td>
<td>42.0</td>
<td>108 MBH</td>
</tr>
<tr>
<td>J = Heat J</td>
<td>63.0</td>
<td>47.3</td>
<td>120 MBH</td>
</tr>
<tr>
<td>K = Heat K</td>
<td>70.0</td>
<td>52.5</td>
<td></td>
</tr>
<tr>
<td>L = Heat L</td>
<td>77.0</td>
<td>57.8</td>
<td>160 MBH</td>
</tr>
<tr>
<td>M = Heat M</td>
<td>84.0</td>
<td>63.0</td>
<td></td>
</tr>
<tr>
<td>N = Heat N</td>
<td>7.5</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>P = Heat P</td>
<td>10.0</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Q = Heat Q</td>
<td>15.0</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td>R = Heat R</td>
<td>20.0</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>S = Heat S</td>
<td>22.5</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>T = Heat T</td>
<td>30.0</td>
<td>22.5</td>
<td></td>
</tr>
<tr>
<td>U = Heat U</td>
<td>40.0</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>V = Heat V</td>
<td>50.0</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>W = Heat W</td>
<td>60.0</td>
<td>45.1</td>
<td></td>
</tr>
</tbody>
</table>

**Installation**

AAON equipment has been designed for quick and easy installation. Startup and service must be performed by Factory Trained Service Technician.

The V3 unit can either be shipped assembled or shipped in sections. See the Unit Assembly section of this document for instructions on assembling the sections.

**Locating the Unit**

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

Verify floor, foundation or suspension support can support the total unit weight, including accessory weights. Unit must be level in both horizontal axes to support the unit and reduce noise and vibration from the unit.
Gas fired unit combustion air inlets and flue vent gas discharges are located on the front of the unit. See Figure 2. There must be 18 inches of clearance between the front of the V3 and building walls or equipment. If equipment is for replacement and required clearances are not available, contact AAON for recommendations.

Figure 2 - High Efficiency Gas Heater

For gas fired unit, do not position flue opening to discharge into a fresh air intake of any other piece of equipment. Unit should also be installed so that the flow of combustion intake air is not obstructed from reaching the furnace.

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

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

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

Allow adequate space for piping access and panel removal. To ensure proper access for field service, maintain minimum clearances for field piping and other obstructions as indicated by Table 2 and Figure 3. Consult local building codes for additional service clearance requirements.

Condensate drain connection for the coils is located on the access side of the unit. The high efficiency gas heater condensate drain connection is located on the front side of the unit. See Figure 3 for orientation.
Table 2 - V3 Series Clearances

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Access Side Clearance (dimension X on Figure 3)</th>
<th>Opposite access side</th>
<th>Front or Back$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3-A</td>
<td>36 inches$^1$</td>
<td>6 inches$^2$</td>
<td>33 in</td>
</tr>
<tr>
<td>V3-B</td>
<td>33 in</td>
<td></td>
<td>33 in</td>
</tr>
<tr>
<td>V3-C</td>
<td>33 in</td>
<td></td>
<td>33 in</td>
</tr>
<tr>
<td>V3-D</td>
<td>35 in</td>
<td></td>
<td>35 in</td>
</tr>
<tr>
<td>V3-E</td>
<td>35 in</td>
<td></td>
<td>35 in</td>
</tr>
</tbody>
</table>

1. Additional clearance may be required to allow for coil removal. See Table 3
2. May be installed flush depending upon local codes.
3. For units with internal control panel, the clearance in the table is needed for either front or back, but not both. The clearance is for supply fan removal. Front access must be at least 18 inches for units with gas heat. If no gas heat, and no internal control panel, front or back clearance is 6 inches with note #2.

Table 3 – Clearances for Coil Pull

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Access Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3-A</td>
<td>32 inches</td>
</tr>
<tr>
<td>V3-B</td>
<td>32 inches</td>
</tr>
<tr>
<td>V3-C</td>
<td>44 inches</td>
</tr>
<tr>
<td>V3-D</td>
<td>58 inches</td>
</tr>
<tr>
<td>V3-E</td>
<td>58 inches</td>
</tr>
</tbody>
</table>

**Internal Control Panel**

V3 units with internal control panel have removable access panels on the front and back of the supply fan section. V3 units that have energy recovery only have one removable supply fan access panel on the front of the unit. The supply flanges can be interchanged with the access panels if necessary as the openings have the same dimensions, except on size E.
Floor Mounted Units
Make sure the unit is level and mounted on a field supplied platform with a minimum height to allow for proper depth of the condensate line p-trap. Other installation provisions may be necessary according to job specifications. V3 Series vertical air handling units are designed for up flow applications only.

Suspended Units
V3 Series vertical air handling units are not equipped for suspended installations.

V3 Series Vertical Air Handling Units are designed for up flow applications only.

Note: Access doors may be on the “left” or “right” side as designated by the unit orientation on the configurator string. “Back” will always be the same side as the pre-filter and return air opening. “Front” will always be the side opposite the pre-filter and return air opening.

Lifting and Handling the Unit
Before lifting unit, be sure that all shipping material has been removed from unit.

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

WARNING
UNIT HANDLING
Incorrect lifting can cause damage to the unit, injury or death. Lifting equipment capacity should exceed unit weight by an adequate safety factor. Always test lift unit not more than 24 inches high to verify proper center of gravity lift point.
Unit Assembly
Although V3 Series units are shipped factory assembled as standard, the unit may be ordered as shipping splits for certain applications such as for assembly in existing structures where modules must be manipulated separately. If the unit was ordered as shipping splits, then they must be assembled in the field.

Locate the schematic in the equipment’s literature packet.

1. Identify and Situate Splits
   V3 Units can have the following ship split sections:
   1. Exhaust Fan
   2. Energy Recovery
   3. Air Handler
   4. Electric Heat
   5. Gas Heat
   6. Pre Filter
   7. Mixing Box

2. Connect Power and Control Wiring between sections
   V3 Series units are equipped with low and high voltage quick connects to connect wiring from one section to the next. It might be necessary to increase the hole size in the cabinet in order to get the quick connector through the opening. See the Electrical section for more information.

   Figure 6 - V3 Schematic with (1) Exhaust Fan, (2) Energy Recovery, (3) Air Handler

   Figure 7 - Low & High Voltage Quick Connect

   A color-coded wiring diagram is laminated and affixed to the inside of the control compartment access door.

   V3 Series units are equipped with a single point power connection. Wire from the unit to external controls and power sources must be provided in the field.

3. Connect Sections
   Remove the access side panels by removing the screws and pulling the panels off. Using the V3 Schematic as an example, section 1 will have a duct flange, and it will connect to section 2 on the side that does not have a flange.

   Apply ½” thick, 5/8” wide adhesive gasket around the edges of the box without the flanges.
Push section 1 and 2 together so that the flange from section 1 is inside of section 2.

Figure 8 - Connect Sections

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

Figure 9 - Bar Clamp

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

Figure 10 - Flange Overlap

V3 units with a forklift base must be bolted together at the connecting sections. See Figure 12

Figure 11 - Self-Tapping Screw

Figure 12 – Forklift Base Assembly

4. Re-attach Access Side Panels

5. Final Sealing

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

CAUTION

Installing Contractor is responsible for proper sealing of the electrical and piping entries into the unit. Failure to seal the entries may result in damage to the unit and property.
Control Box
Some V3 units include an external control box that must be mounted in the field. The control box is designed with two mounting holes on the back panel. Make sure the wall fasteners can hold the weight of the control box. See Figure 13.

Figure 13 - Back View External Control Box

Duct Connection
Attach duct to flanges provided on the unit. The installer is responsible for sealing ducts to the flanges to prevent water leaks.

See Figure 5 for return and supply air duct locations. Ductwork should be sized in accordance with the ASHRAE Handbook. Ductwork should be installed in accordance with NFPA Standard 90A.

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

On units with gas heaters, a supply air temperature sensor must be mounted in the supply air duct at least 5 feet but less than 20 feet downstream of the furnace discharge to limit the maximum discharge air temperature. If possible, locate the sensor after a turn in the duct for better air mixing.

Condensate Drain Piping
A p-trap and drain line must be installed on the drain connection, with the p-trap not to exceed 6” from the drain connection. The lines should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines.

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

Draw-through cooling coils will have a negative static pressure in the drain pan area. This will cause an un-trapped drain to back up due to air being pulled up through the condensate drain piping.

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

Condensate Drain Piping
A p-trap and drain line must be installed on the drain connection, with the p-trap not to exceed 6” from the drain connection. The lines should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines.

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

Draw-through cooling coils will have a negative static pressure in the drain pan area. This will cause an un-trapped drain to back up due to air being pulled up through the condensate drain piping.

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

Note: The drain pan connection is a 1” MPT fitting.
The X dimension on the draw-through trap should be at least equal to the absolute value of the negative static pressure in the drain pan plus one inch. To calculate the static pressure at the drain pan add the pressure drops of all components upstream of the drain pan, including the cooling coil, and add the return duct static pressure. Include the dirt allowance pressure drop for the filters to account for the worst-case scenario. The height from top of the bottom bend of the trap to the bottom of the leaving pipe must be at least equal to one half of the X dimension. This ensures that enough water is stored in the trap to prevent losing the drain seal during unit startup.

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

<table>
<thead>
<tr>
<th>Table 4 - Drain Trap Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Draw-Through</strong></td>
</tr>
<tr>
<td>Drain Pan Pressure</td>
</tr>
<tr>
<td>(inches of water)</td>
</tr>
<tr>
<td>-0.50</td>
</tr>
<tr>
<td>-1.00</td>
</tr>
<tr>
<td>-1.50</td>
</tr>
<tr>
<td>-2.00</td>
</tr>
<tr>
<td>-2.50</td>
</tr>
<tr>
<td>-3.00</td>
</tr>
<tr>
<td>-3.50</td>
</tr>
<tr>
<td>-4.00</td>
</tr>
</tbody>
</table>

**Heating Coils**

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

Connect the steam heating supply to the top of the coil and the return to the bottom.

![Steam Distributing Piping](image)

**Table 5 - Steam Distributing Coil Sweat Connection Sizes**

<table>
<thead>
<tr>
<th>Model (V3-)</th>
<th>Supply and Return Connection Size (OD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-E</td>
<td>2 1/8&quot;</td>
</tr>
</tbody>
</table>

Air handling units with steam heating coils **MUST BE** installed high enough to allow for a minimum of 1 foot condensate drop leg off of the steam coil, or as recommended by the steam trap manufacturer. Lines should be insulated with approved insulation and be properly fastened, sloped, and supported according to local code requirements.

**Table 6 - Hot Water Coil Sweat Connection Sizes**

<table>
<thead>
<tr>
<th>Model (V3-)</th>
<th>Supply and Return Connection Size (OD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>1 1/8&quot;</td>
</tr>
<tr>
<td>C</td>
<td>1 3/8&quot;</td>
</tr>
<tr>
<td>D &amp; E</td>
<td>1 5/8&quot;</td>
</tr>
</tbody>
</table>
Connect the hot water heating supply to the bottom of the coil and return to the top.

![Figure 16 - Hot & Chilled Water Piping](image)

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

Water supply lines must be insulated, properly fastened, drained, and supported according to local code requirements. Chilled Water Coil

Factory installed four, six or eight row chilled water cooling coils can be factory mounted. These coils are supplied from a building chilled water source. All valve controls for the cooling coil operation are field supplied and field installed.

Table 7 - Chilled Water Coil Sweat Connection Sizes

<table>
<thead>
<tr>
<th>Model (V3-</th>
<th>Supply and Return Connection Size (OD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 1/8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>1 3/8&quot;</td>
</tr>
<tr>
<td>C</td>
<td>1 5/8&quot;</td>
</tr>
<tr>
<td>D &amp; E</td>
<td>2 1/8&quot;</td>
</tr>
</tbody>
</table>

Connect the chilled water supply to the bottom of the coil and return to the top.

Water supply lines must be insulated with closed cell type pipe insulation or insulation that includes a vapor barrier. Lines should be properly fastened, drained and supported according to local code requirements, and job specifications.

**WARNING**

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

**CAUTION**

Installing Contractor is responsible for proper sealing of the water piping entries into the unit. Failure to seal the entries may result in damage to the unit and property.
Evaporator Coil
The air handling unit coils are pressurized. The copper caps must be punctured to permit a gradual escape of the pressure prior to un-sweating those caps. Immediately couple the tubing to the indoor unit to avoid exposing the coils to moisture. A properly sized filter drier is furnished in the condenser. When making solder connections, make sure dry nitrogen flows through the lines, when heating the copper, to prevent oxidization inside of the copper. **Field piping between the condensing unit and the air handler is required.** Line sizes must be selected to meet actual installation conditions, not simply based on the connection sizes.

**CAUTION**

**REFRIGERANT PIPING**
Line sizes must be selected to meet actual installation conditions, not simply based on the connection sizes at the condensing unit or air handling unit.

Thermal Expansion Valve
Thermal expansion valve bulbs should be mounted with good thermal contact on a horizontal section of the suction line close to the evaporator, but outside the cabinet, and well insulated. On suction lines less than or equal to 7/8” OD, mount in the 12 o’clock position. On suction lines greater than 7/8” OD, mount in either the 4 o’clock or 8 o’clock position.

Hot Gas Reheat
Hot Gas Reheat (HGRH) is available for use with DX systems that need humidity control. The AAON modulating hot gas reheat system diverts hot discharge gas from the condenser to the air handling unit through the hot gas line. **Field piping between the condensing unit and the air handler is required.** Line sizes must be selected to meet actual installation conditions, not simply based on the connection sizes.

The line delivers the hot discharge gas to the reheat coil and/or the hot gas bypass valve, so it is sized as a discharge line.

Hot Gas Bypass
Hot Gas Bypass is available for use with DX systems that may experience low suction pressure during the operating cycle. This may be due to varying load conditions associated with VAV applications or units supplying a large percentage of outside air. Hot Gas Bypass is not necessary in units with variable capacity compressors. The system is designed to divert refrigerant from the compressor discharge to the low pressure side of the system in order to keep the evaporator from freezing and to maintain adequate refrigerant velocity for oil return at minimum load.

Hot discharge gas is redirected to the evaporator inlet via an auxiliary side connector (ASC) to false load the evaporator when reduced suction pressure is sensed. **Field piping between the condensing unit and the evaporator is required.** Line sizes must be selected to meet actual installation conditions, not simply based on the connection sizes.

---

Figure 17 - TXV Bulb Position
Purge Circuit
The purge circuit is required on hot gas reheat or hot gas bypass lines. The purge circuit needs to be field furnished and installed at the lowest point of the line set.

With this installation, oil drains into the drain leg of the hot gas reheat line. Oil accumulates until it reaches the level of the 1/8”OD capillary tubing.

Figure 18 - Hot Gas Purge Circuit

The combination of capillary action and the pressure difference between the hot gas reheat line (high pressure) and the suction line (low pressure) causes the oil to travel through the capillary tube into the suction line of the first circuit to return the oil to the compressor. The capillary tube connection to the suction line of the first circuit must be a minimum of 5 feet from the inlet to the compressor to allow the oil time to dissipate into the suction vapor and not slug the compressor with liquid oil.

Figure 19 - Energy Recovery Wheel

Energy Recovery Units
Some V3 units have been equipped with an energy recovery wheel. This section is provided to assure the energy recovery feature will be properly setup to perform in accordance with the job specifications for your particular application.

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

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

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

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

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

**Initial Mechanical Check and Setup**

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

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

**Air Seal Adjustments**

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

**Wheel to Air Seal Clearance**

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

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

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

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

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

**Airflow Balancing and Checking**

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

**Controls**

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

**WARNING**

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

*Routine Maintenance and Handling*

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

![Figure 21 - Lifting Hole Locations](image)

Routine maintenance of the Energy Recovery
Cassettes includes periodic cleaning of the
Energy Recovery Wheel as well as inspection
of the Air Seals and Wheel Drive
Components as follows:

**Cleaning**

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

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

In a reasonably clean indoor environment
such as a school or office building,
measurable reductions of airflow or loss of
sensible (temperature) effectiveness may not
occur for several years. Measurable changes
in latent energy (water vapor) transfer can
occur in shorter periods of time in
applications such as moderate occupant
smoking or cooking facilities. In applications
experiencing unusually high levels of
occupant smoking or oil based aerosols such
as industrial applications involving the
ventilation of machine shop areas for
example, annual washing of energy transfer
may be necessary to maintain latent transfer
efficiency. Proper cleaning of the energy
recovery wheel will restore latent effectiveness to near original performance. To clean, gain access to the energy recovery wheel and remove segments. Brush foreign material from the face of the wheel. Wash the segments or small wheels in a 5% solution of non-acid based coil cleaner or alkaline detergent and warm water.

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

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

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

Adjust seals towards wheel surface until a slight friction on the feeler gauge (paper) is detected when gauge is moved along the length of the spoke. Retighten adjusting screws and recheck clearance with “feeler” gauge.

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

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

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

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

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

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

CAUTION
Do Not use acid based cleaners, aromatic solvents, steam or temperatures in excess of 170°F; damage to the wheel may occur!
To verify, make certain that the distance between wheel rim and bearing beam is the same at each end of the bearing beam, to within 1/4 of an inch (dimension A & B). This amount of racking can be compensated for by adjusting the diameter seals.

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

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

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

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

**Operation**

![Figure 22 - Avoid Racking of Cassette Frame](image)

**CAUTION**

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

**Startup Procedure**

1. By hand, turn wheel clockwise (as viewed from the pulley side), to verify wheel turns freely through 360° rotation.

2. Before applying power to drive motor, confirm wheel segments are fully engaged in wheel frame and segment retainers are completely fastened. (See Segment Installation Diagram).
To install wheel segments follow steps one through five below. Reverse procedure for segment removal.

1. Unlock two segment retainers (one on each side of the selected segment opening).

2. With the embedded stiffener facing the motor side, insert the nose of the segment between the hub plates.

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

4. Close and latch each Segment Retainer under Segment Retaining Catch.

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

Wheel Drive Motor and Pulley Replacement
1. Disconnect power to wheel drive motor.

2. Remove belt from pulley and position temporarily around wheel rim.

3. Loosen set screw in wheel drive pulley using a hex head wrench and remove pulley from motor drive shaft.

4. While supporting weight of drive motor in one hand, loosen and remove (4) mounting bolts.

5. Install replacement motor with hardware kit supplied.

6. Install pulley to dimension as shown and secure set screw to drive shaft.

7. Stretch belt over pulley and engage in groove.

8. Follow start-up procedure.

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


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.

Table 8 - Nameplate Voltage Markings

<table>
<thead>
<tr>
<th>Voltage Feature</th>
<th>Nameplate Voltage Marking</th>
<th>Min/Max VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  230V/1Φ/60Hz</td>
<td>230</td>
<td>197/252</td>
</tr>
<tr>
<td>2  230V/3Φ/60Hz</td>
<td>230</td>
<td>197/252</td>
</tr>
<tr>
<td>3  460V/3Φ/60Hz</td>
<td>460</td>
<td>456/504</td>
</tr>
<tr>
<td>4  575V/3Φ/60Hz</td>
<td>575</td>
<td>570/630</td>
</tr>
<tr>
<td>8  208V/3Φ/60Hz</td>
<td>208</td>
<td>197/228</td>
</tr>
<tr>
<td>9  208V/1Φ/60Hz</td>
<td>208</td>
<td>197/228</td>
</tr>
</tbody>
</table>

Route power and control wiring, separately, through the utility entry in the unit. Do not run power and control signal wires in the same conduit.

⚠️ WARNING

The foam insulation releases dangerous fumes when it is burnt. Do not cut a foam part with a cutting torch or plasma cutter. Do not weld to a foam filled part.

All units require field supplied electrical overcurrent and short circuit protection. Device must not be sized larger than the Maximum Overcurrent Protection (MOP) shown on the unit nameplate.

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

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

Electrical

Verify the unit name plate agrees with power supply. V3 Series units are provided with single point power wiring connections. Connection terminations are made to the main terminal block. A complete set of unit specific wiring diagrams, showing factory and field wiring are laminated in plastic and located inside the control compartment door.
On units with external control box, electrical supply can enter through either side of the controls compartment.

![Figure 28 - External control box electrical connections](image)

On units with internal control panel, electrical supply can enter through the return air side (rear) of the V3 unit.

![Figure 29 - V3 internal control panel electrical connections](image)

A single point connection to a terminal block is provided. High voltage conductors should enter the control panel in a separate opening and separate conduit than low voltage conductors.

---

**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.

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

**Cutting Electrical Openings**

1. Locate the placement of the hole. Be sure that the conduit will not interfere with the operation of any component or prevent access of any door or removable panel. Field cut openings must be a minimum of 6 inches away from all components and wiring to prevent damage due to drilling or cutting.
2. Drill a pilot hole all the way through the foam panel.
3. Using a hole saw, cut the hole through the metal on both sides of the foam part.
4. With a knife cut the foam out of the hole.
5. After the conduit is installed in the hole caulk the entire perimeter of the hole on both sides with an industrial grade silicone sealant or a duct seal compound.

---

**CAUTION**

Installing Contractor is responsible for proper sealing of the electrical and gas entries into the unit. Failure to seal the entries may result in damage to the unit and property.
If a larger cut-out is needed for additional duct connections not provided by the factory, or for any other reason, it is very important that the foam be completely sealed. Insulation covers should be fabricated from sheet metal to cover the foam at the cut. The edges and corners that are not covered should then be sealed using silicone caulking or a duct seal compound.

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

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

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

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

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

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

---

### 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 5%.

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

Example:

\[
\frac{(218V+237V+235V)}{3} = 230V, \text{ then } 100\times\frac{(230V-218V)}{230V} = 5.2\%, \text{ which exceeds the allowable imbalance.}
\]

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.

### CAUTION

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

Wire control signals to the unit’s low voltage terminal block located in the controls compartment.
If any factory installed wiring must be replaced, use a minimum 105°C type AWM insulated conductors.

**Thermostat Control Wiring**

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

<table>
<thead>
<tr>
<th>Wire Size (Stranded) - Copper Conductors Only</th>
<th>Total Wire Distance Allowable</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 AWG</td>
<td>200 ft</td>
</tr>
<tr>
<td>18 AWG</td>
<td>350 ft</td>
</tr>
<tr>
<td>16 AWG</td>
<td>500 ft</td>
</tr>
<tr>
<td>14 AWG</td>
<td>750 ft</td>
</tr>
<tr>
<td>12 AWG</td>
<td>1250 ft</td>
</tr>
</tbody>
</table>

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

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

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

Example:

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

According to the Table 9, 16 AWG allows for 63ft (500 ft/8 wires) and 14 AWG allows for 94ft (750 ft/8 wires). Thus, 14 AWG should be used.

**Gas Heating**

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.

**WARNING**

**Unit Location and Clearances**

1. Be sure unit is located with respect to building construction and other equipment to provide ready access and clearance to access panels or doors that must be opened to permit adjustment and servicing of the heating module.

2. The heating unit provided is listed for installation on the positive side of the circulating air blower only.

3. Locate unit to insure an adequate supply of fresh air to replace air used in the combustion and ventilation process.
4. Do not install exhaust vent where flue products can be drawn into adjacent building openings such as windows, doors, or fresh air intakes. Location should minimize the number of elbows or turns in flue vent pipe.

5. Do not install unit where it may exposed to potentially explosive or flammable vapors.

6. Do not locate unit in areas where corrosive vapors (such as chlorinated, halogenated, or acidic) are present in the atmosphere or can be mixed with combustion air entering heater.

**Condensate Drain Piping**

Unit may be equipped with a high efficiency gas heater which requires a condensate drain system.

The condensate drain system includes a factory installed condensate trap for proper system performance. The ¾” PVC condensate connection is located on the front of the unit. See Figure 5 for unit orientation.

![Figure 30 - Gas Heat Condensate Trap](image)

All connecting joints must be watertight to prevent leakage. Glue the necessary PVC pipe and fittings to connect condensate piping to a suitable drain. Be sure to apply sealant to threads to prevent leakage. Installation of a union ahead of the trap is preferred to permit maintenance of drains and accommodate servicing of the heater.

**Never connect condensate drain directly into a sewer line.** If connection to a sewer is permitted by code, drain line must terminate in an open sewer tap (separated by an air gap).

Where condensate drains are located outside a heated space or in a space where temperatures may fall below freezing, the **drain line must be freeze protected.**

The drains must be extended through the heater base and into the heated space below to prevent freezing of condensate in the drain piping. Trap must be located in a heated space or protected to avoid freezing.

Where condensate drains are located outside a heated space or in a space where temperatures may fall below freezing, the **drain line must be freeze protected.**

For installations where the building drain lines are above the level of the furnace drain system, a condensate pump is required.

**Condensate Neutralization**

Some municipalities require that the acidic condensate produced be neutralized before being discharged into a sewer or drain.

A field provided and installed condensate neutralizer kit may be necessary. Where condensate drains and/or neutralization kit(s) are located outside a heated space or in a space where temperatures may fall below freezing, all components and drain lines must be freeze protected.
An overflow bypass drain line must be installed.

When connecting drain line(s) to building drain, an air gap must be present for proper operation of the condensate disposal system. Inspect and monitor effectiveness of neutralization media within cartridge. Replace or refill as necessary.

**General Venting**
Safe operation of indirect-fired gas furnaces requires a properly operating flue vent system which exhausts all the products of combustion (flue gases) to the outside atmosphere.

Venting must be in accordance with local codes and section 5.3 of the National Fuel Gas Code NFPA54 / ANSI Z223.1 in the United States or sections 7.2, 7.3, or 7.4 of CAN/CSA B149.1 Natural and Propane Installation Code in Canada. Local requirements typically supersede national requirements.

### WARNING

**FURNACE VENTING**
Failure to provide proper venting affects furnace performance and may result in a health hazard which could cause serious personal injury or death.

V3 furnaces are listed as IV heaters. Category IV furnaces operate with a positive vent pressure and flue vent gas temperatures typically less than 150 °F. The venting system must be gas tight and water tight. Proper installation of the vent system must also assure drainage of condensate to prevent deterioration of the vent system.

The vent piping must be exclusive to a single furnace. Do not use dampers in vent pipes. All pipe openings external to building must have a protective screen installed.

Exhaust flue vent ducting must NOT be joined (no common flue).

Flue vent pipe used for this furnace may be Schedule 40 PVC pipe or vent pipe listed to UL 1738 or ULC S636. All field installed vent pipe and fittings must be from the same manufacturer. DO NOT intermix vent system parts from different vent manufacturers. All furnaces include a vent connector/ couplings for attachments of the vent pipe. Minimum length before any turns in pipe is 12”. In Canada, the PVC vent pipe must be approved to ULC S636.

To ensure that piping is leak free after installation, PVC sections must be solvent welded (glued) consistent with industry standards and applicable local codes. Primer and cement for joints must conform to applicable ASTM standards.

The flue vent and combustion air piping must be properly supported. A 10ft. long section of schedule 40 PVC pipe weighs approximately 14 lbs for 3 in. diameter and 20 lbs. for 4 in. diameter. Horizontal sections must be installed with an upward pitch of not less than ¼ in./ft. (21 mm/m) and securely supported every 3ft. For suspended support, use cradle type hangers to allow for expansion and contraction.
When flue vent pipe is run through unheated spaces where temperatures may be below freezing, pipe should be insulated using ½ inch (22.7mm) thick Armaflex-type insulation or heated with a thermostatically controlled heat tape.

Gas furnaces feature high efficiency operation and produce condensate during operation. In locations where the outside air temperature is below freezing, icicles may form on vent terminations from the condensate formed in the vent system.

**WARNING**

**VENT TERMINATION**

In locations where the outside temperature falls below freezing, icicles may form on vent terminations due to condensate in the vent system. Locate vent termination where a falling icicle would not be a hazard.

**WARNING**

**VENT TERMINATION**

Vent terminals must be positioned and located away from fresh air intakes, doors, and windows to minimize the possibility of products of combustion from entering occupied space.

*Open Combustion Venting*

An open combustion gas heater draws combustion air from the space surrounding the heating unit. Louvered combustion air openings are provided in the access panel to the burner vestibule area. Installation must be in an unconfined space with sufficient volume for all appliances located in the space.

A single, properly sized pipe from the exhaust vent connector to the outdoors must be provided. The exhaust vent connection from the unit is a 2” x 4” rubber coupling for connection to 4”PVC. If 2” or 3” PVC is used instead, remove the provided coupling and replace it with the necessary rubber coupling.

Vent pipe diameter and maximum vent length are determined by furnace input rating as shown in Table 10. Flue gases must be directed downward.

<table>
<thead>
<tr>
<th>Model Size</th>
<th>Input (MBtu/hr)</th>
<th>Maximum Vent Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2” PVC</td>
</tr>
<tr>
<td>V3-A</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>V3-B</td>
<td>72</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>108</td>
<td>15</td>
</tr>
<tr>
<td>V3-C</td>
<td>80</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Notes:**

1. Maximum flue vent length is the equivalent linear length of the pipe and fittings. See Table 11 for equivalent lengths for fittings.
2. DWV pipe and fittings should be used instead of SCH 40 pressure pipe and fittings to reduce overall vent pressure drop.
3. For separated combustion systems, the maximum vent length is a combination of the combustion air intake and flue vent exhaust pipes. For example a 60MBtu/hr heater using 3”PVC can have a 50 ft combustion air intake run and a 50 ft flue vent exhaust run.
Table 11 - Equivalent DWV Fittings Length

<table>
<thead>
<tr>
<th>Equivalent DWV Fittings Length</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>90° Elbow</td>
<td>5 ft</td>
</tr>
<tr>
<td>45° Elbow</td>
<td>2.5 ft</td>
</tr>
<tr>
<td>Tee 90° Turn</td>
<td>7.5 ft</td>
</tr>
<tr>
<td>Tee Pass Through</td>
<td>2.5 ft</td>
</tr>
</tbody>
</table>

Vertical flue vents should terminate as shown in Figure 32. Maintain proper spacing between adjacent buildings and walls. The flue vent shall not terminate over public walkways, near soffit vents or crawl space vents or other areas where condensate vapor could create a nuisance or hazard or cause property damage; or where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

**Separated Combustion Venting**

A separated combustion gas heater requires a two (2) pipe separated combustion vent system with separate air intake and flue vent. Combustion air is supplied from outdoors into the furnace burner compartment through a single properly sized pipe attached to the air intake collar. These furnaces are Category IV vented appliances. Flue vent piping must be gas tight and water tight. Both the furnace and vent system must be connected to a condensate removal system.

The heating unit must include the following:

1.) For flue vent pipe and fittings conveying flue gases, use only Category IV vent materials listed to UL1738 / ULC S636 from same vent manufacturer. DO NOT intermix vent system parts from different vent manufacturers. Follow instruction provided with approved venting materials used.

2.) For combustion air piping, use PVC and glue joints.

3.) Flue vent pipe and air inlet pipe size depends on input rating of the furnace. Minimum vent length is 5 ft.

4.) The inlet and outlet terminals must be located in the same pressure zone to provide for safe appliance operation.

The venting and combustion air supply must be exclusive to a single furnace. The gas heater is not approved for concentric venting. Separated combustion systems may not be common vented. Do not use dampers in flue vent or combustion air pipes.

The exhaust vent connection from the unit is a 2” x 4” rubber coupling for connection to 4”PVC. If 2” or 3” PVC is used instead, remove the provided coupling and replace it with the necessary rubber coupling.
The combustion air connection from the unit is a 3” rubber coupling.

If 2” or 4” PVC is used instead, remove the provided coupling and replace it with the necessary rubber coupling.

Minimum length before any turns in pipe is 12”.

The flue vent and combustion air piping must be properly supported. Horizontal sections must be installed with an upward pitch of not less than ¼ in./ft. (21 mm/m) toward the termination and securely supported every 3ft.

Flue vent pipe runs through unheated spaces must be insulated.

The vent drip leg must use reducers from the outlet to the drain connection to meet requirements for Canadian installations (OLC S636). This method is also acceptable in the US.

**DANGER**

The gas pipe in the unit should be checked for leaks before startup. Leak checking is the responsibility of the installing contractor. All connections should be checked for leaks annually. Failure to leak check could result in fire, explosion, or other hazardous situations.

Gas piping must be installed in accordance with local codes, or in the absence of local code, installation must 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.
Gas piping must be sized for the total Btu input of all units (heaters) serviced by a single supply. See Table 12 or Table 13 to help size the gas piping. The gas connection size from the unit is ½”NPT.

### Table 12 - Natural Gas (ft³/hr) Maximum Piping Capacities
Specific Gravity = 0.6, Supply Pressure ≤ 0.5 psi, Pressure Drop = 0.5”wc

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length of Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 ft</td>
</tr>
<tr>
<td>1/2”</td>
<td>120</td>
</tr>
<tr>
<td>3/4”</td>
<td>250</td>
</tr>
<tr>
<td>1”</td>
<td>465</td>
</tr>
<tr>
<td>1-1/4”</td>
<td>950</td>
</tr>
<tr>
<td>1-1/2”</td>
<td>1460</td>
</tr>
<tr>
<td>2”</td>
<td>2750</td>
</tr>
<tr>
<td>2-1/2”</td>
<td>4350</td>
</tr>
</tbody>
</table>

### Table 13 - Propane (kBtu/hr) Maximum Piping Capacities
Specific Gravity = 1.52, Supply Pressure = 11”wc., Pressure Drop, 0.5”wc

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length of Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 ft</td>
</tr>
<tr>
<td>1/2”</td>
<td>189</td>
</tr>
<tr>
<td>3/4”</td>
<td>393</td>
</tr>
<tr>
<td>1”</td>
<td>732</td>
</tr>
<tr>
<td>1-1/4”</td>
<td>1496</td>
</tr>
<tr>
<td>1-1/2”</td>
<td>2299</td>
</tr>
<tr>
<td>2”</td>
<td>4331</td>
</tr>
</tbody>
</table>

After verifying gas inlet pressure and manifold pressure the service technician must time the gas flow rate through the gas meter with a stopwatch to verify the gas input rate. A factory installed pressure tap on the outlet end of the gas valve can be used to verify the manifold pressure.

### Table 14 - Gas Inlet Pressure

<table>
<thead>
<tr>
<th>Gas Inlet Pressures (“wc”)</th>
<th>Natural Gas</th>
<th>Propane Gas (LP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>6.0”wc</td>
<td>11.0”wc</td>
</tr>
<tr>
<td>Maximum</td>
<td>10.5”wc</td>
<td>13.0”wc</td>
</tr>
</tbody>
</table>

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

Do not use gas piping smaller than unit gas connections. Natural gas pipe runs longer than 20 feet and propane gas pipe runs longer than 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/ft³ and a specific gravity of 0.6 (Obtain these values from the local gas supplier.)

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

From the natural gas maximum capacities table, at 100 ft and 1080 ft³/hr the required minimum pipe size is 2”.

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

\[
270 \text{ MBH} = 270 \text{ kBtu/hr}
\]

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 6” wc and maximum inlet gas pressure to the unit is 10.5” wc. For propane units, the minimum inlet gas pressure to the unit is 11” wc and the maximum inlet gas pressure to the unit is 13” wc.

A field provided 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 3.5” wc for natural gas, or 10.5” wc for propane V3-A & V3-B (10.0” wc on size V3-C).

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

Gas Pressure Regulator & Overpressure Protection Device
A gas pressure regulator must be installed if natural gas supply pressure to the unit is greater than 10.5” wc and less than 2 psi (55.4” wc). Regulators must 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) must be installed if gas supply pressure to the unit is greater than 2 psi (55.4” wc) and less than 5 psi (138.4” wc), in compliance with ANSI Z21.80/CSA 6.22. For proper heater operation, pressure to the regulator MUST NOT be greater than 5 psi (138.4” wc).

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

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Support Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2” to 3/4”</td>
<td>Every 6 ft</td>
</tr>
<tr>
<td>3/4” to 1”</td>
<td>Every 8 ft</td>
</tr>
<tr>
<td>1-3/4” or Larger (Horizontal)</td>
<td>Every 10 ft</td>
</tr>
<tr>
<td>1-1/4” or Larger (Vertical)</td>
<td>Every Floor</td>
</tr>
</tbody>
</table>


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 should be labeled. A drip leg should be installed near the unit connection to trap sediment and condensate. Pipe joint compounds used on all gas piping connections should 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.

A 1/8” NPT tap is provided on the inlet side of the gas valve to the heater. A fitting suitable for connection to a pressure gauge capable of measuring gas pressure should be connected to each heater serviced by a single regulator so that gas pressure at each heater can be measured with all heaters in operation.

Use a back up wrench on the gas valve when connecting field supply gas piping to avoid loosening pre-piped furnace gas connections during installation.

Heat exchanger comes equipped with a condensate drain which should 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.

The heat exchanger condensate drain connection from the unit is a 3/4” PVC connection.

Leak Testing

Figure 34 - Sediment Trap for Gas Heat

A 1/8” NPT tap is provided on the inlet side of the gas valve to the heater. A fitting suitable for connection to a pressure gauge capable of measuring gas pressure should be connected to each heater serviced by a single regulator so that gas pressure at each heater can be measured with all heaters in operation.

Use a back up wrench on the gas valve when connecting field supply gas piping to avoid loosening pre-piped furnace gas connections during installation.

Heat exchanger comes equipped with a condensate drain which should 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.

The heat exchanger condensate drain connection from the unit is a 3/4” PVC connection.

Leak Testing

**WARNING**

**FIRE OR EXPLOSION HAZARD**

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

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

All components of gas supply system, including manual shut off valves and the piping in the interior of the unit, should 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 should be checked for leaks before startup. Leak checking is the responsibility of the installing contractor. All connections should be checked for leaks annually after installation. Failure to leak check could result in fire, explosion, or other hazardous situations.
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.

**Input**

The correct heat capacity of the furnace is controlled by the burner orifices and the gas manifold pressure. The manifold pressure is factory set but should be checked at the time of start-up.

---

**CAUTION**

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

**WARNING**

Gas pressure to appliance controls must never exceed 14" wc (1/2 psi)

1. When pressure testing at 1/2 psi or less, close the manual shutoff valve on the appliance before testing.

2. When pressure testing gas supply line at 1/2 psi or higher, close manual gas valve and disconnect heater from supply line to be tested. Cap or plug the supply line.

**WARNING**

Those sensitive to odors or gases from trace amounts of residual oils should NOT be present in the conditioned space during the startup of a gas fired installation.
Startup
(See back of the manual for startup form)

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

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

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

Filters
Do not operate the unit without filters in place. Operation of the equipment without filters in place can result in clogged coils. Units are shipped with the selected filters installed. If filters have been removed during installation, open the filter access door and re-install the correct filters with the airflow indicator arrows pointing in the direction of airflow.

Filters should be checked after a few days of operation after the unit has been started up as dust and debris from construction may cause premature filter loading. Replace the filters if necessary.

Supply Fans
V3 Series units are equipped with direct drive backward curved plenum supply fan assemblies that deliver the air volume specified according to unit size and job requirements.

Fan Air Flow Adjustment
A specific air volume is delivered by the fans with Electronically Commutated Motors (ECM). Field air flow adjustment may be required at startup.

Electrically Commutated Motor Airflow Adjustment

![Figure 35 - Typical wiring diagram with EC motor](image)

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

![Figure 36 - Shows the jumper that is to be removed (jumped between 9 and GS)](image)
Note, the potentiometer is still active in the electrical loop. Refer to Figure 35.

![Figure 37 - Potentiometer](image)

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

The fan speed can be modulated using the 0-10 VDC input signal.
To check fan output from the factory, the potentiometer can be dialed to 100%. By sending a 5V signal*, for instance, the rpm can be measured and this reading can be converted to cubic feet of air moved by the fan.

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

---

**Adjusting Refrigerant Charge**

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

---

**CAUTION**

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

**Before Charging**

Unit being charged must be at or near full load conditions before adjusting the charge.

Units equipped with hot gas reheat must be charged with the hot gas reheat valves closed while the unit is in cooling mode to get the proper charge. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation.

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

The type of unit and options determine the ranges for liquid sub-cooling and evaporator superheat. Refer to the tables below when determining the proper sub-cooling.
Checking Liquid Sub-Cooling
Measure the temperature of the liquid line as it leaves the condenser.

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

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

Subtract the measured liquid line temperature from the saturated temperature to determine the liquid sub-cooling.

Compare calculated sub-cooling to the table below for the appropriate unit type and options.

Table 17 - Acceptable Refrigeration Circuit Values

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Cooling Mode Liquid Sub-Cooling Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Only Unit</td>
<td>8-15°F</td>
</tr>
<tr>
<td>Cooling Only Unit with Hot Gas Reheat</td>
<td>5-15°F</td>
</tr>
<tr>
<td>Heat Pump Unit</td>
<td>2-4°F</td>
</tr>
<tr>
<td>Heat Pump Unit with Hot Gas Reheat</td>
<td>2-6°F</td>
</tr>
<tr>
<td>Cooling Only Unit with LAC</td>
<td>8-15°F</td>
</tr>
<tr>
<td>Cooling Only Unit with Hot Gas Reheat &amp; LAC</td>
<td>8-15°F</td>
</tr>
</tbody>
</table>

Notes:
1. Must be charged with the hot gas valve closed. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation.
2. The sub-cooling value in this table is for the unit running in cooling mode of operation. After charging, unit should be operated in heating mode to check for correct operation.
3. The sub-cooling value in this table is for the unit running in cooling mode of operation and the hot gas valve closed. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation and then in heating mode to check for correct operation.
4. Sub-cooling must be increased by 1°F per 10 feet of vertical liquid line rise for R-410A (AHU above CU). For example, a cooling only unit with hot gas reheat and a vertical liquid drop can charge to a sub-cooling value of 5-15°F, but a cooling only unit with hot gas reheat and a vertical liquid rise of 30 ft must charge to a sub-cooling value of at least 8-15°F. DO NOT OVERCHARGE. Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure.
**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 acceptable cooling mode superheat values of 8-15°F for all system types. Superheat will increase with long suction line runs.

For refrigeration systems with tandem compressors, it is critical that the suction superheat setpoint on the TXV is set with one compressor running. The suction superheat should be 10-13°F with one compressor running. The suction superheat will increase with both compressors in a tandem running. Inadequate suction superheat can allow liquid refrigerant to return to the compressors which will wash the oil out of the compressor. Lack of oil lubrication will destroy a compressor. Liquid sub-cooling should be measured with both compressors in a refrigeration system running.

**Adjusting Sub-Cooling and Superheat Temperatures**

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

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

---

**CAUTION**

*DO NOT OVERCHARGE!*

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

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

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

If the sub-cooling is correct and the superheat is too high, the TXV may need adjustment to correct the superheat. Before adjusting the TXV, verify the sensing bulb is in the correct position according to Figure 17 and follows the guidelines below.

1. The suction line is clean where the sensing bulb is attached.
2. The entire length of the sensing bulb is in contact with the suction line.

---

**CAUTION**

Thermal expansion valve must be adjust to approximately 8-15°F of suction superheat. Failure to have sufficient superheat will damage the compressor and void the warranty.
3. The sensing bulb should be placed several inches downstream of the equalizer line.

4. The sensing bulb is fully insulated.

5. If the sensing bulb is installed on a vertical portion of the suction line, the sensing bulb should be placed upstream of suction line trap.

Table 18 - R-410A Refrigerant Temperature-Pressure Chart

<table>
<thead>
<tr>
<th>°F</th>
<th>PSIG</th>
<th>°F</th>
<th>PSIG</th>
<th>°F</th>
<th>PSIG</th>
<th>°F</th>
<th>PSIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>78.3</td>
<td>47</td>
<td>134.7</td>
<td>74</td>
<td>213.7</td>
<td>101</td>
<td>321.0</td>
</tr>
<tr>
<td>21</td>
<td>80.0</td>
<td>48</td>
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<td>46</td>
<td>132.2</td>
<td>73</td>
<td>210.3</td>
<td>100</td>
<td>316.4</td>
<td>127</td>
<td>457.3</td>
</tr>
</tbody>
</table>
Gas Heater

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.
- Use only your hand to move the on/off switch.
- 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 performed.
3. Remove control access panel.
4. Move the on/off switch to the "OFF" position.
5. Replace control access panel.

Figure 38 - Gas Heater Instructions
Gas Heater Startup

1. Turn thermostat or temperature controller to its lowest setting.

2. Turn off gas supply at the manual shut-off valve (supplied by others).

3. Turn off power to the unit at the disconnect switch.

4. This appliance is equipped with an ignition device which automatically lights the burner. Do NOT try to light the burner by hand.

5. Open door to unit module housing the gas heater.


Figure 39 - Gas Control Switch

7. Install a tapped fitting for attachment to a manometer or other gauge suitable for 14.0" wc in the inlet pressure tap. Install a tapped fitting for attachment to a manometer or other gauge suitable for 10.0" wc in the manifold pressure tap.

8. Wait 5 minutes for any gas to clear out. If you smell gas, turn off gas supply at the manual shut-off valve (field installed). If you don’t smell gas or have corrected any leaks, go to the next step.

9. Turn gas control switch to “ON” position.

10. Close door to unit module housing the gas heater.

11. Open all manual gas valves (supplied by others).

12. Turn power on at disconnect switch.

13. Set thermostat or controller to its highest position to initiate call for heat and maintain operation of unit.

14. Draft inducer will run for a 5 second pre-purge period.

15. The control energizes the spark and main gas valve for a 20 second ignition period.

16. The control shuts spark off and waits for a 30 second heat blower on delay period and then energizes the indoor blower heat speed.

17. Control inputs are continuously monitored to ensure limit and pressure switches are closed, flame is established, and the thermostat call for heat remains.

18. Inlet gas pressure should be between 6.0” and 14.0”wc on Natural Gas (11.0” to 13.0”wc on Propane). Adjust supply regulator if necessary or contact utility if unable to obtain proper inlet pressure.

19. At burner ignition, manifold pressure will be 1.7”wc. Furnace will continue at this input rating for 90 seconds.

20. All control systems require a manifold pressure of 3.50”wc at maximum input (high fire) on Natural Gas, and 10.5”wc on Propane Gas V3-A & V3-B (10.0”wc for V3-C).

21. Systems with modulating gas heat require a manifold pressure of 0.40”wc at 33% turndown on Natural Gas.

Failure to Ignite

1. For the initial start-up, or after unit has been off long periods of time, the first ignition trial may be unsuccessful due to need to purge air from manifold at start-up.
2. If ignition does not occur on the first trial, the gas and spark are shut off by the ignition control and the control enters an inter-purge period of 45 seconds, during which the draft inducer continues to run.

3. At the end of the inter-purge period, another trial for ignition will be initiated.

4. Control will initiate up to three ignition trials on a call for heat before lockout of control occurs.

5. Control can be brought out of lockout by either removing power from the control for more than 1 second or setting the thermostat to its lowest position and waiting 5 seconds and then turning back up to call for heat. Some controls provided will automatically reset after one hour and initiate a call for heat.

**Burner Flames**
Prior to completing the start-up, check the appearance of the main burner flame for flame characteristics of properly adjusted natural gas systems.

1. The burner flame should be predominately blue in color and well defined and centered at the tube entry. Distorted flame or yellow tipping of natural gas flame, may be caused by lint and dirt accumulation inside burner or at burner ports, at air inlet between burner and manifold pipe, or debris in the main burner orifice. Soft brush or vacuum clean affected areas after performing Shutdown procedure.

2. Poorly defined, substantially yellow flames, or flames that appear lazy, indicate poor air supply to burners or excessive burner input. Verify gas supply type and manifold pressure with rating plate.

3. Poor air supply can be caused by obstructions or blockage in heat exchanger tubes or flue vent discharge pipe. Inspect and clean as necessary by to eliminate blockage. Vacuum any dirt or loose debris found in the tubes or vents. Clean heat exchanger tubes with stiff brush after performing Shutdown procedure. Poor flame characteristics can also be caused by undersized combustion air openings or flue gas recirculation into combustion air supply. Increase air opening size or re-direct flue products to prevent recirculation.

4. Reduced air delivery can also be the result of fan blade slippage, dirt accumulation the fan blade or low voltage to draft inducer motor. Inspect draft fan assembly and be sure fan blade is secure to motor shaft. Check line voltage to heater.

---

**WARNING**

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
**Operation**
Unit operations should be controlled with thermostat or unit controller, never at the main power supply, except for emergency or complete shutdown of the unit.

**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 10°F during the heating season.

**Split System 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.

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

**Steam or Hot Water Preheating Operation**
Valve control for steam and hot water heating coils are by others. Heating is accomplished by passing steam or hot water through the steam or hot water coil assembly.

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

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

**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 sensing the temperature after the supply fan.

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### Table 19 - Gas Heat Ignition Times

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Purge</td>
<td>5 sec</td>
</tr>
<tr>
<td>Inter-Purge</td>
<td>45 sec</td>
</tr>
<tr>
<td>Post Purge</td>
<td>5 sec</td>
</tr>
<tr>
<td>Ignition Trial</td>
<td>10 sec</td>
</tr>
<tr>
<td>Blower On Delay</td>
<td>30 sec</td>
</tr>
<tr>
<td>Blower Off Delay</td>
<td>120 sec</td>
</tr>
<tr>
<td>Lockout Recovery</td>
<td>60 min</td>
</tr>
</tbody>
</table>

**Gas Heater Operating and Safety Instructions**

1. This furnace does not have a pilot. It is equipped with a direct spark ignition device that automatically lights the gas burner. DO NOT try to light burners by hand.

2. **BEFORE OPERATING**, leak test all gas piping up to heater gas valve. Smell around the unit area for gas. DO NOT attempt to place heater in operation until source of gas leak is identified and corrected.

3. Use only hand force to push and turn the gas control switch to the “ON” position. NEVER use tools. If switch does not operate by hand, replace gas valve prior to staring the unit. Forcing or attempting to repair the gas valve may result in fire or explosion.

4. Do not attempt to operate unit if there is indication that any part or control has been under water. Any control or component that has been under water must be replaced prior to trying to start the unit.

---

**WARNING**

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

---

**Shutdown**

1. Set thermostat or controller to lowest setting.

2. Turn off electrical supply to unit at disconnect switch.

3. Turn off manual gas supply (supplied by others).

4. Disconnect manifold and inlet pressure taps and re-install pipe plugs.

5. Close module door.

**Normal Operation**

1. Turn on electrical supply to unit at disconnect switch.

2. Turn on manual gas supply (supplied by others).

3. Set Thermostat or Temperature controller to desired temperature.
<table>
<thead>
<tr>
<th>Event</th>
<th>Action</th>
<th>Fault</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat call – 24V at W</td>
<td>Control verifies limit switches are closed</td>
<td>Flashes “4” if limit is open</td>
</tr>
<tr>
<td></td>
<td>Control verifies the pressure switch is open</td>
<td>Soft lock-out and flashes “3” if switch is closed</td>
</tr>
<tr>
<td>Energize inducer fan</td>
<td>Control verifies the pressure switch is closed within 10 sec</td>
<td>Flashes “2” if switch is open after 10 sec</td>
</tr>
<tr>
<td>Pre-purge</td>
<td>No flame and pressure switch closed</td>
<td>Soft lock-out if flame is present, flashes “5”</td>
</tr>
<tr>
<td>Ignition trial</td>
<td>3 trials with 45 sec inter-purge period if it doesn’t light in 10 sec</td>
<td>Soft lock-out, flashes “1” alarm</td>
</tr>
<tr>
<td>Blower on delay</td>
<td>Blower delay after ignition proof</td>
<td></td>
</tr>
<tr>
<td>Steady state</td>
<td>Normal operation</td>
<td>Limit or pressure switch faults</td>
</tr>
<tr>
<td>Post purge</td>
<td>Inducer fan runs after heat call is removed</td>
<td></td>
</tr>
<tr>
<td>Blower off delay</td>
<td>Time starts after heat call is removed</td>
<td></td>
</tr>
<tr>
<td>Ignition re-cycle</td>
<td>Re-tries 4 times if flame is lost</td>
<td>Soft lock-out if no ignition, flashes “1” alarm</td>
</tr>
<tr>
<td>Limit switch operation</td>
<td>Only sensed when heat call is present</td>
<td>Flashes “4” if limit is open</td>
</tr>
<tr>
<td>Lockout - soft</td>
<td>Can be reset by removing heat call “W” or power to control.</td>
<td>Soft lock-out, flashes “1” alarm</td>
</tr>
<tr>
<td></td>
<td>Soft lock-out may be caused by failed ignition or too many flame losses.</td>
<td></td>
</tr>
<tr>
<td>Lockout - hard</td>
<td>Controller issue, reset by removing power to the control only.</td>
<td>Hard lock-out, status LED de-energized</td>
</tr>
<tr>
<td></td>
<td>Hard lock-out may be caused by internal RAM or ROM corruption, faults in flame sense circuit, or faults in gas valve drive circuits.</td>
<td></td>
</tr>
</tbody>
</table>

*Service Checks*

Flame current is the current which passes through the flame from the sensor to ground. The minimum flame current necessary to keep the system from lockout is 0.5 microamps. To measure flame current, connect an analog DC microammeter to the FC- and FC+ terminals per Figure 42. Meter should read 0.5 μA or higher. If the meter reads below “0” on scale, meter leads are reversed. Disconnect power and reconnect meter leads for proper polarity.

*Figure 42 - Flame Sensor Current Check*
**Ignition Control Module**

The integrated direct spark ignition control provides control of all furnace functions including control of the induced draft fan, gas valve, pre-purge timing, ignition, flame sensing and monitoring of the safety circuit at all times, and post purge at the completion of a heating cycle. The board includes an LED diagnostic light to monitor control status.

**Air Pressure & Blocked Drain Switch**

An air pressure switch is provided as part of the control system to verify airflow through draft inducer by monitoring the difference in pressure between the draft inducer and the atmosphere. (See “C” in Figure 44). If sufficient negative pressure is not present, indicating lack of proper air movement through heat exchanger, the switch opens shutting off gas supply through the ignition control module. Also, if the drain becomes blocked, the water will back up into the line and the switch will sense no pressure in the line and again the switch opens shutting off gas supply through the ignition control module.

**Blocked Flue Switch**

Another air pressure switch is provided as part of the control system to serve as a blocked flue switch (See “B” in Figure 44). When the heater is running, there is a negative pressure reading in this line that is more negative than the switch setting of -0.18"wc. If the flue were to become blocked, the pressure would become less negative until it reaches the switch setting pressure and shuts the heater off.

**Rollout Switch (Manual Reset)**

The furnace is equipped with manual reset rollout switch in the event of burner overheating (see “A” in Figure 44). The switch will open on temperature rise and shut-off gas supply through the ignition control module. Flame rollout can be caused by insufficient airflow for the burner firing rate (high gas pressure), blockage of the vent system or in the heat exchanger. The furnace should not be placed back in operation until the cause of overheating is identified. The rollout switch can be reset by pressing the button on the top of the switch.
**High Limit Switch**

Two high limit switches are provided on all furnace configurations.

One limit control is mounted in the air stream and will shut-off the gas supply in the event of overheating due to reduced airflow over the heat exchanger. This limit is an automatic reset type and will cycle the burners back on when the temperature drops below the preset differential. The furnace will continue to cycle on limit until the cause of the reduced air flow is corrected.

The other limit control is mounted on the induced draft fan housing and will shut-off the gas supply in the event of excessive flue gas temperatures. This switch is an automatic reset type.

![High Limit Switch in Air Stream](image)

![High Limit Switch on Fan Housing](image)

**Table 21 - Gas Heater LED Diagnostics**

<table>
<thead>
<tr>
<th>LED Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stead on</td>
<td>Indicates power is applied</td>
</tr>
<tr>
<td>1 flash</td>
<td>Control in 1 hour lockout</td>
</tr>
<tr>
<td>2 flash</td>
<td>Pressure switch open with inducer on</td>
</tr>
<tr>
<td>3 flash</td>
<td>Pressure switch closed with inducer off</td>
</tr>
<tr>
<td>4 flash</td>
<td>Limit switch is open</td>
</tr>
<tr>
<td>5 flash</td>
<td>False flame 1 hour lockout</td>
</tr>
</tbody>
</table>
Table 22 - Gas Heater Troubleshooting Guide

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control does not power up</td>
<td>A. Faulty 24VAC or 120VAC wiring</td>
</tr>
<tr>
<td></td>
<td>B. Thermostat or transformer</td>
</tr>
<tr>
<td></td>
<td>C. Bad control module</td>
</tr>
<tr>
<td>Module LED blinks red</td>
<td>A. Determine error code and refer to error codes in Table 21</td>
</tr>
<tr>
<td>Spark no occurring during trial for ignition</td>
<td>A. Faulty spark electrode wiring</td>
</tr>
<tr>
<td></td>
<td>B. Spark gap too wide</td>
</tr>
<tr>
<td></td>
<td>C. Bad control module</td>
</tr>
<tr>
<td>Burner does not light during trial for ignition</td>
<td>A. Faulty valve wiring</td>
</tr>
<tr>
<td></td>
<td>B. Bad valve</td>
</tr>
<tr>
<td></td>
<td>C. Control module not sparking</td>
</tr>
<tr>
<td>Burner lights but valve turns off after trial for ignition</td>
<td>A. Poor flame</td>
</tr>
<tr>
<td></td>
<td>B. Flame not in contact with spark electrode or sensor</td>
</tr>
<tr>
<td></td>
<td>C. Dirty contaminated flame sensor</td>
</tr>
<tr>
<td></td>
<td>D. Faulty flame sensor wiring</td>
</tr>
<tr>
<td></td>
<td>E. Poor ground at burner</td>
</tr>
</tbody>
</table>

**Maintenance**
(See back of the manual for maintenance log.)

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

**WARNING**

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

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

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

**DX Cooling**

Set unit controls to cooling mode of operation with supply fans on. Check the fans for correct operating direction, amperage and voltage.

**Condensate Drain Pans**

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

**WARNING**

Once a year, before the unit is in operation for the heating season, a qualified service technician should 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 should be checked for leaks before startup. Leak checking is the responsibility of the installing contractor. All connections should be checked for leaks annually after installation. Failure to leak check 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 should operate. 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 should 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 should be checked annually for debris and obstructions. If flue vent extensions are used they must meet category IV requirements.

This appliance contains a wire screen at the flue 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 flue vent outlet. A good practice is to check for debris each time the air filters are changed.

In the event the flue 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 flue vent was blocked a qualified technician or service agency should 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 should 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.
Furnace Maintenance

**Condensate Drainage System Inspection**

1. Inspect condensate drain lines to be sure they are free of debris and free flowing.

2. Inspect all condensate lines for freezing and verify operation of freeze protection (heat trace tape). The factory installed section of the condensate line includes a heat trace. All field installed condensate lines must also include heat trace.

3. Inspect and clean out all waterless p-traps of condensate/ mildew buildup.

4. Inspect and replace the condensate neutralizer cartridge if necessary.

**Furnace Exhaust Vent Termination**

1. Inspect all flue exhaust vent terminations/outlets. Remove any ice accumulation. Ice accumulation can affect performance and operation of the furnace.

2. Inspect the roof floor in front and/or below any flue exhaust termination and furnace access door. Remove any ice accumulation.
**Furnace Inspection**

**Turn off all electrical power to the unit before inspection and servicing.**

1. The furnace should be inspected annually by a qualified service agency. The condition of the burners, heat exchanger, draft inducer, vent system, operating controls and wiring should be determined. Check for obvious signs of deterioration, accumulation of dirt and debris and any heat or water related damage. Any damaged or deteriorated parts should be replaced before the unit is put back into service.

2. Clean draft inducer and vent ducts with a soft brush or vacuum.

3. Check Heat Exchanger for cracks. If any are present, replace heat exchanger before putting unit back into service.

4. Check the attachment point of the furnace to the cabinet or ducts to verify that they are air tight.

5. Check the automatic gas valve to insure that the gas valve seat is not leaking.

6. Inspect and clean condensate drain trap(s).

7. If condensate neutralizer tube is installed, recharge per instructions.

8. Inspect and clean secondary coil fins.

9. Check wiring connections to be sure they are secure and inspect wiring for any deterioration.

10. Label all wires prior to disconnection when servicing unit. Wiring errors can cause improper or dangerous operation. Verify proper operation after servicing.

**Furnace Operation Check**

1. Turn on power to the unit and set thermostat or heat controller to call for heat, allowing furnace to operate.

2. Check for proper start-up and ignition as outlined in Start-Up section.

3. Check the appearance of the burner flame.

4. Check that the circulating air fan is operating and verify the proper airflow through furnace.

5. Verify proper flow of condensate from drain system.

6. Return thermostat or heat controller to normal setting.
E-Coated Coil Cleaning

Documented quarterly cleaning of e-coated coils is required to maintain coating warranty coverage. E-Coated Coil Maintenance Record document is available on the AAON website.

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

Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers, dirt and salts into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Quarterly cleaning is required to maintain warranty coverage and is essential to maintain the life of an E-coated coil. Coil cleaning shall be part of the unit's regularly scheduled maintenance procedures.

Failure to clean an E-coated coil on the prescribed quarterly cycle will void the warranty and may result in reduced efficiency and durability in the environment.

A routine two-step quarterly coil cleaning is required to maintain warranty.

Step one is to clean the coil with the below approved coil cleaner (see approved products list under the "Recommended Coil Cleaners” section.

Step two is to use the approved salt/chloride remover under the "Recommended Chloride Remover” section to dissolve soluble salts and revitalize the unit. It is very important when cleaning and/or rinsing not to exceed 130°F and potable water pressure is less than 100 psig to avoid damaging the unit and coil fin edges.

**CAUTION**

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

Failure to clean an E-coated coil will void the warranty and may result in reduced efficiency and durability.

**CAUTION**

Harsh chemicals, household bleach, or acid cleaners should not be used to clean outdoor or indoor e-coated coils. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion and attack the E-coating. If there is dirt below the surface of the coil, use the recommended coil cleaners.
For routine quarterly cleaning, first clean the coil with the below approved coil cleaner. After cleaning the coils with the approved cleaning agent, use the approved chloride remover to remove soluble salts and revitalize the unit.

Recommended Coil Cleaner – Step 1
GulfCoat™ Coil Cleaner, assuming it is used in accordance with the manufacturer's directions on the container for proper mixing and cleaning, has been approved for use on E-coated coils to remove mold, mildew, dust, soot, greasy residue, lint and other particulate. Never use any cleaners that are not approved.

Recommended Chloride Remover – Step 2
CHLOR*RID® Concentrate, assuming it is used in accordance with the manufacturer’s directions on the container for proper mixing, has been approved for use on E-coated coils to remove chlorides/salts & sulfates. Never use any chloride removers that are not approved.

Warranty Protection – Step 1
Complete the coil cleaning following these steps:

1. Ensure that the power to the unit is off and locked out.
2. Clean the area around the unit if needed to ensure leaves, grass or loose debris will not be blown into the coil.
3. Remove panels or tops as required gaining access to the coil(s) to be cleaned.
4. Using a pump up sprayer, fill to the appropriate level with potable water and add the correct amount of approved cleaner as per manufacture instructions leaving room for the pump plunger to be reinserted.

NOTE: Coils should always be cleaned / back flushed, opposite of airflow to prevent impacting the dirt into the coil.

5. If the coils have heavy dirt, fibers, grass, leaves etc. on the interior or exterior face areas, a vacuum and brush should be used to remove those surface contaminants prior to applying cleaner. The interior floor, drain tray or pan areas should also be vacuumed.

6. Apply the mixed cleaner to coil surfaces using a pressurized pump up sprayer maintaining a good rate of pressure and at a medium size nozzle spray, (not a solid stream and not a wide fan but somewhere in the middle). Work in sections/panels ensuring that all areas are covered and kept wetted.

7. 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.

8. Generously soak coils by spraying cleaner directly on and into the fin pack section to be cleaned and allow the cleaning solution to soak for 5 to 10 minutes.

9. Using pressurized potable water, (<100 psi), rinse the coils and continue to always work in sections/panels. Start at the top of the coil and slowly move vertically downward to the bottom. Then, staying in the same vertical area, slowly move back up to the top where you started. Now move over slightly overlapping the area just completed and repeat above. Continue until all coil areas on the inside of the unit have been rinsed.

10. Complete steps 5-9 for the exterior air entering side of the coils.

11. Final rinse – Now complete a quick rinse of both sides of the coil including the headers, piping, u-bends and hairpins.

12. If the coil has a drain pan or unit floor that is holding rinse water or cleaner, extra time and attention will need to
be taken in those areas to ensure a proper rinse has been completed.

Warranty Protection – Step 2
Complete the coil chloride (salt) removal following these steps:

1. CHLOR*RID® is a concentrate to be used for both normal inland applications at a 100:1 mix ratio OR for severe coastal applications 50:1 mix ratio with potable water, (2.56 ounces of Chlor*rid to 1 gal of water). Using a pump up sprayer, fill to the appropriate level with potable water and add the correct amount of CHLOR*RID® salt remover leaving room for the pump plunger to be reinserted.

2. Apply CHLOR*RID® to all external coil surfaces using a pressurized pump up sprayer maintaining a good rate of pressure and at a medium size nozzle spray, (not a solid stream and not a wide fan but somewhere in the middle). Work in sections/panels ensuring that all areas are covered and kept wetted.

3. Generously soak coils by spraying CHLOR*RID® directly on and into the fin pack section. Let stand for 5 to 10 minutes keeping the area wetted. Do not allow to dry before rinsing.

4. Using pressurized potable water, (<100 psi), rinse the CHLOR*RID® and dissolved chlorides/salts off of the coils continuing to always work in sections/panels.

5. Starting at the top of the coil, begin rinsing the coil from side to side until you reach the bottom. Repeat as many times as is necessary to ensure all coil sections/panels have been completed and are thoroughly rinsed.

6. Reinstall all panels and tops that were removed.

Winterizing Coils
In some cases it may be necessary to winterize water coils to prevent them from freezing.

First completely drain the coils. There is a drain located below the ‘water in’ connection and a vent connection located above the ‘water out’ connection. Auxiliary drain piping can also be added to exterior water piping if yearly winterizing is necessary. After the coil is drained, fill with an antifreeze solution using a circulating pump. Then thoroughly drain.

Supply Fans

![CAUTION]

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

![WARNING]

Electric shock hazard. Shut off all electrical power to the unit to avoid shock hazard or injury from rotating parts.
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 should be wired according to unit specific wiring diagram include in the control compartment.

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

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

DPM Setup Procedure

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

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

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

**Default Set-up**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Voltage</td>
<td>460VAC, 3Ø</td>
</tr>
<tr>
<td>Over &amp; Undervoltage</td>
<td>±10%</td>
</tr>
<tr>
<td>Trip Time Delay</td>
<td>5 Seconds</td>
</tr>
<tr>
<td>Re-Start Time Delay</td>
<td>2 Minutes</td>
</tr>
<tr>
<td>Phase Imbalance</td>
<td>5%</td>
</tr>
</tbody>
</table>
Screens
Manufacturer’s Screen
R-K Electronics
DPM v0.0.00

Average Voltage Screen

<table>
<thead>
<tr>
<th>VAvg</th>
<th>Imb</th>
<th>Hz</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>460</td>
<td>0</td>
<td>60</td>
<td>off</td>
</tr>
</tbody>
</table>

Default – the default screen shows the real time voltage detected in each of the 3 phases:
A-B  B-C  C-A
460  459  461  ON

Voltage Selection Screen (Vertical Format) Default = 460V, 3Ø
200, 1Ø; 208, 1Ø; 220, 1Ø; 230, 1Ø; 240, 1Ø;
200, 3Ø; 208, 3Ø; 220, 3Ø; 230, 3Ø; 240, 3Ø; 380, 3Ø; 415, 3Ø; 440, 3Ø;
460, 3Ø; 480, 3Ø; 575, 3Ø; 600, 3Ø;

Over/Under voltage Percentage Screen (Vertical Format) Default = 10%
7%  8%  9%  10%  11%  12%  13%  14%  &  15%

Trip Time Delay Screen (Vertical Format) Default = 5 sec
2S, 3S, 4S, 5S, 6S, 27S, 8S, 9S & 10S

Re-Start Time Delay Screen (Vertical Format) Default = 2 sec
Manual, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 30S, 1M, 2M, 3M & 4M

Phase Imbalance Percentage Screen (Vertical Format) Default = 5%
3%  4%  5%  6%  7%  8%  9%  &  10%

Fault Screen (Vertical Format)
“0” most recent faults, “1” previous fault “2” third oldest fault & “3” fourth oldest fault.

Fault Words:
“Phase a Loss” (There is no voltage sensed on 3-L1/S)
“Voltage Low” (Average line voltage is less than selected Undervoltage Percentage)
“Voltage High” (Average line voltage is more than selected Overvoltage Percentage)
“Imbalance” (One phase is lower than the average voltage by more than the Imbalance percentage)
“Phase Loss” (One phase is more than 30% below the Line Voltage selection)
“Bad Rotation” (The phase rotation sequence is reversed)
“Bad Freq” (Line frequency out of allowable range of 45 to 65 Hz)
Filter Replacement
Monthly filter inspection is required to maintain optimum unit efficiency.

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. Open access panel and pull filters straight out to inspect all of the filters. Replace filters with the size indicated on each filter. Arrow on the replacement filters must point towards the blower.

Replacement Parts
Parts for AAON equipment may be obtained from your local representative [https://www.aaon.com/RepSearch](https://www.aaon.com/RepSearch). When ordering parts, reference the unit serial number and part number.

AAON Technical Support
203 Gum Springs Rd.
Longview, TX 75602
Ph: (918) 382-6450
techsupport@AAON.com
www.AAON.com

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

**Table 23 - V3 Series E Cabinet Pre-Filters**

<table>
<thead>
<tr>
<th>Feature 6A</th>
<th>(Quantity) Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Pre Filters</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>(6) 18” x 24” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>B</td>
<td>(6) 18” x 24” x 4”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Pleated MERV 11</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>Pleated MERV 13</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>Pleated MERV 14</td>
</tr>
<tr>
<td>F</td>
<td>(6) 18” x 24” x 2”</td>
<td>Pleated MERV 8 and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>G</td>
<td>(6) 18” x 24” x 2” and</td>
<td>Pleated MERV 8 and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleated MERV 11</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>Pleated MERV 13</td>
</tr>
<tr>
<td>J</td>
<td></td>
<td>Pleated MERV 8 and</td>
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<tr>
<td></td>
<td></td>
<td>Pleated MERV 14</td>
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Table 24 - V3 Series A Cabinet Unit Filters

<table>
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<th>Type</th>
</tr>
</thead>
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<tr>
<td>A</td>
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<tr>
<td>B</td>
<td></td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>C</td>
<td>(1) 16” x 25” x 4”</td>
<td>Pleated MERV 11</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>Pleated MERV 13</td>
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<tr>
<td>E</td>
<td></td>
<td>Pleated MERV 14</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>Pleated MERV 8  and Pleated MERV 8</td>
</tr>
<tr>
<td>G</td>
<td>(1) 16” x 25” x 2” and (1) 16” x 25” x 4”</td>
<td>Pleated MERV 8 and Pleated MERV 11</td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>Pleated MERV 8  and Pleated MERV 13</td>
</tr>
<tr>
<td>J</td>
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<td>Pleated MERV 8  and Pleated MERV 14</td>
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Table 25 - V3 Series B Cabinet Unit Filters

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<td>B</td>
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</tr>
<tr>
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<td>(1) 24” x 24” x 4”</td>
<td>Pleated MERV 11</td>
</tr>
<tr>
<td>D</td>
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<td>F</td>
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<tr>
<td>G</td>
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<tr>
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<tr>
<td>J</td>
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### Table 26 - V3 Series C Cabinet Unit Filters

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<tr>
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<td>B</td>
<td>(4) 16” x 20” x 4”</td>
<td>Pleated MERV 11</td>
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<tr>
<td>C</td>
<td>(4) 16” x 20” x 2”</td>
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<tr>
<td>D</td>
<td>(4) 16” x 20” x 4”</td>
<td>Pleated MERV 11</td>
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<tr>
<td>E</td>
<td>(4) 16” x 20” x 4”</td>
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<tr>
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<td>H</td>
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<td>J</td>
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### Table 27 - V3 Series D Cabinet Unit Filters

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</tr>
</thead>
<tbody>
<tr>
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<td>No Pre Filters</td>
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</tr>
<tr>
<td>A</td>
<td>(4) 18” x 24” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>B</td>
<td>(4) 18” x 24” x 4”</td>
<td>Pleated MERV 11</td>
</tr>
<tr>
<td>C</td>
<td>(4) 18” x 24” x 2”</td>
<td>Pleated MERV 13</td>
</tr>
<tr>
<td>D</td>
<td>(4) 18” x 24” x 4”</td>
<td>Pleated MERV 13</td>
</tr>
<tr>
<td>E</td>
<td>(8) 16” x 20” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>F</td>
<td>(4) 18” x 24” x 4”</td>
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</tr>
<tr>
<td>G</td>
<td>(4) 18” x 24” x 2”</td>
<td>Pleated MERV 13</td>
</tr>
<tr>
<td>H</td>
<td>(4) 18” x 24” x 4”</td>
<td>Pleated MERV 13</td>
</tr>
<tr>
<td>J</td>
<td>(4) 18” x 24” x 4”</td>
<td>Pleated MERV 13</td>
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### Table 28 - V3 Series Energy Recovery OA Filters (Feature 13 = A-V)

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<thead>
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<th>Unit Size</th>
<th>(Quantity) Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<td>Pleated MERV 8</td>
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<tr>
<td>B</td>
<td>(1) 24” x 24” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>C</td>
<td>(4) 16” x 20” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>D</td>
<td>(4) 18” x 24” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
<tr>
<td>E</td>
<td>(8) 16” x 20” x 2”</td>
<td>Pleated MERV 8</td>
</tr>
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</table>
Refrigerant Piping Diagrams

See the matching Condensing Unit IOM for Piping Diagrams
V3 Series Startup Form

<table>
<thead>
<tr>
<th>Job Name: ________________________________</th>
<th>Date: ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address: __________________________________</td>
<td>__________________</td>
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</table>

<table>
<thead>
<tr>
<th>Model Number: __________________________</th>
<th>Serial Number: ___________</th>
<th>Tag: ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup Contractor: ______________________</td>
<td>Address: ____________________</td>
<td>Phone: __________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre Startup Checklist</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Installing contractor should verify the following items.</td>
<td></td>
</tr>
<tr>
<td>1. Is there any visible shipping damage?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>2. Is the unit level?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>3. Are the unit clearances adequate for service and operation?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>4. Do all access doors open freely and are the handles operational?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>5. Have all shipping braces been removed?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>6. Have all electrical connections been tested for tightness?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>7. Does the electrical service correspond to the unit nameplate?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>8. On 208/230V units, has transformer tap been checked?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>9. Has overcurrent protection been installed to match the unit nameplate requirement?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>10. Have all set screws on the fans been tightened?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>11. Do all fans rotate freely?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>12. Does the field water piping to the unit appear to be correct per design parameters?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>13. Is all copper tubing isolated so that it does not rub?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>14. Have the damper assemblies been inspected?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>15. Are air filters installed with proper orientation?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>16. Have condensate drain and p-trap been connected?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>17. Is the TXV sensing bulb in the correct location?</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>18. Does the TXV sensing bulb have proper thermal contact and is properly insulated?</td>
<td>[ ] Yes [ ] No</td>
</tr>
</tbody>
</table>
### Ambient Temperature

<table>
<thead>
<tr>
<th>Ambient Dry Bulb Temperature</th>
<th>Ambient Wet Bulb Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>______ °F</td>
<td>______ °F</td>
</tr>
</tbody>
</table>

### Supply Fan Assembly

<table>
<thead>
<tr>
<th>Alignment</th>
<th>Check Rotation</th>
<th>Nameplate Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>hp</td>
<td>L1</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VFD Frequency</td>
<td>VAV Controls</td>
<td></td>
</tr>
</tbody>
</table>

### Power Exhaust Fan Assembly

<table>
<thead>
<tr>
<th>Alignment</th>
<th>Check Rotation</th>
<th>Nameplate Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Number</td>
<td>hp</td>
<td>L1</td>
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<td>1</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VFD Frequency</td>
<td>VAV Controls</td>
<td></td>
</tr>
</tbody>
</table>

### Energy Recovery Wheel Assembly

<table>
<thead>
<tr>
<th>Wheels Spin Freely</th>
<th>Check Rotation</th>
<th>FLA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>hp</td>
<td>L1</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dampers

<table>
<thead>
<tr>
<th>OA Operation Check</th>
<th>Damper Wiring Check</th>
<th>Gears Check</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RA Operation Check</td>
<td>Damper Wiring Check</td>
<td>Gears Check</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EA Operation Check</td>
<td>Damper Wiring Check</td>
<td>Gears Check</td>
</tr>
</tbody>
</table>

### Damper Actuator Type:

### Economizer Changeover Type and Operation:
## Refrigeration System 1 - Cooling Mode

<table>
<thead>
<tr>
<th></th>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

## Refrigeration System 2 - Cooling Mode

<table>
<thead>
<tr>
<th></th>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
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<tr>
<td>Liquid</td>
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<td></td>
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<td>N/A</td>
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</tbody>
</table>

## Refrigeration System 3 - Cooling Mode

<table>
<thead>
<tr>
<th></th>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td>N/A</td>
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<tr>
<td>Liquid</td>
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<td>N/A</td>
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</tbody>
</table>

## Refrigeration System 4 - Cooling Mode

<table>
<thead>
<tr>
<th></th>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td>N/A</td>
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<td>Liquid</td>
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</tbody>
</table>

## Compressors/DX Cooling

<table>
<thead>
<tr>
<th>Check Rotation</th>
<th>Number</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>Head Pressure PSIG</th>
<th>Suction Pressure PSIG</th>
<th>Crankcase Heater Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td>L2</td>
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<tr>
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<td>4</td>
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</tbody>
</table>
### Air-Cooled Condenser Fans

<table>
<thead>
<tr>
<th>Alignment □</th>
<th>Check Rotation □</th>
<th>Nameplate Amps</th>
<th>Number</th>
<th>hp</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Refrigeration System 2 - Heating Mode (Heat Pump Only)

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Refrigeration System 3 - Heating Mode (Heat Pump Only)

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Refrigeration System 4 - Heating Mode (Heat Pump Only)

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Saturated Temperature</th>
<th>Line Temperature</th>
<th>Sub-cooling</th>
<th>Superheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Suction</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
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)? ____________________________

Electric Heating

<table>
<thead>
<tr>
<th>Stages</th>
<th>Limit Lockout</th>
<th>Aux. Limit Lockout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>Amps</td>
<td>Stage</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

Gas Heating

<table>
<thead>
<tr>
<th>Natural Gas □</th>
<th>Propane □</th>
<th>Purge Air from Lines □</th>
<th>Verify Pilot Spark □</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>Manifold Pressure (“wc”)</td>
<td>Stage</td>
<td>Manifold Pressure (“wc”)</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gas Heating

1. Have all gas lines & connections been checked for leaks? □ Yes □ No
2. Is there adequate combustion air? □ Yes □ No
3. Have condensate drain lines been installed? □ Yes □ No
4. Has air been purged from the lines? □ Yes □ No
5. Has pilot spark been verified? □ Yes □ No
## Modulating Gas Heat

<table>
<thead>
<tr>
<th>Type of Gas</th>
<th>Natural Gas (5:1)</th>
<th>Propane (3:1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input</td>
<td>VDC</td>
<td>Low Fire @ 0 VDC</td>
</tr>
<tr>
<td>Gas Pressure @ Train Inlet</td>
<td>“w.c.”</td>
<td></td>
</tr>
<tr>
<td>Gas Pressure @ Burner Manifold</td>
<td>“w.c.”</td>
<td></td>
</tr>
<tr>
<td>CO2 in Flue Gas %</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>CO2 in Flue Gas ppm</td>
<td>ppm</td>
<td></td>
</tr>
<tr>
<td>Flue Gas Temp @ Discharge</td>
<td>°F</td>
<td></td>
</tr>
<tr>
<td>Temperature Rise</td>
<td>°F</td>
<td></td>
</tr>
</tbody>
</table>
Maintenance Log
This log must be kept with the unit. It is the responsibility of the owner and/or maintenance/service contractor to document any service, repair or adjustments. AAON Service and Warranty Departments are available to advise and provide phone help for proper operation and replacement parts. The responsibility for proper startup, maintenance and servicing of the equipment falls to the owner and qualified licensed technician.

<table>
<thead>
<tr>
<th>Entry Date</th>
<th>Action Taken</th>
<th>Name/Tel.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
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</tbody>
</table>
Literature Change History

July 2018
Initial Version – See Obsolete H3/V3 IOM (J00188) for obsolete features not found in this version. H3 Series and V3 Series each have their own IOM due to the different gas heaters.

April 2019
Added Model B1 Heating Type 5 = Electric Heat (UL 60335-2-40 Compliant) and Heating Designations N (7.5kW) through W (60kW). Added a table for clearances for coil pull. Added information on forklift base assembly. Change the condensate drain figure. Changed some terminology to fluevent for clarification on gas heat flue venting. Added the exhaust and combustion air connection sizes for the gas heater. Updated Gas Heating tables on the start-up form. Change filters from MERV 10 to MERV 8 and removed ASHRAE efficiency values from filters.

May 2019
Added the minimum/maximum voltage range table in the Electrical section.

June 2019
Updated Table 1 - Electric and Gas Heating Capacities with new electric heat options.

September 2019
Added options 5 and 6 in Model Option B3 Heating Stages. Added D = Stainless Steel Coil Casing and E = E-coated Coil + Stainless Steel Coil Casing in Feature 8 Coil Casing.

March 2020
Updated EC motor wiring figures and potentiometer figure.
AAON
203 Gum Springs Rd.
Longview, TX 75602-1721
www.AAON.com

V3 Series
Installation, Operation &
 Maintenance
G014420· Rev. C  200306
 (ACP J01398)

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.

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