JR SERIES
100% OUTSIDE AIR DESIGN
AIR SOURCE, HEATING AND COOLING
WATER SOURCE HEAT PUMP
AIR SOURCE HEAT PUMP

3–70 TON COOLING CAPACITY
UP TO 18,000 CFM
MODEL VINTAGE D

Issue Date:
November 12, 2019
IMPORTANT!
READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, and operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:

- **DANGER**
  Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.

- **WARNING**
  Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.

- **CAUTION**
  Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.

- **NOTE**
  Highlights additional information useful to the technician in completing the work being performed properly.

*WARNING:*
External wiring, unless specified as an optional connection in the manufacturer’s product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls’ published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer’s warranty and cause serious damage to property or personal injury.

**WARNING:** Cancer and Reproductive Harm — [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).
CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls’ policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls QuickLIT website at http://cgproducts.johnsoncontrols.com.

It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating/service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the equipment.

CHANGE BARS

Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

ASSOCIATED LITERATURE

<table>
<thead>
<tr>
<th>MANUAL DESCRIPTION</th>
<th>FORM NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Commissioning / Start-Up Checklist</td>
<td>100.54-CL1</td>
</tr>
<tr>
<td>Unit Controller Installation and Operation Manual</td>
<td>100.54-NO1</td>
</tr>
<tr>
<td>Unit Controller Quick Start-Up Guide</td>
<td>100.54-SU1</td>
</tr>
</tbody>
</table>

INSTALLER: Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

OWNER: Keep this manual in a safe place in order to provide your service technician with necessary information.

For your safety, if you smell gas:

1. Open windows.
2. DO NOT try to light any appliance.
3. DO NOT use electrical switches.
4. DO NOT use any telephone in your building.
5. Extinguish any open flame.
6. Leave the building.
7. Immediately call your local fuel supplier after leaving the building. Follow the fuel supplier’s instructions. If you cannot reach your fuel supplier, call the Fire Department.

Keep all flammable objects, liquids, and vapors the minimum required clearances to combustibles away from equipment. Some objects will catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury, or property damage.

Improper installation, adjustment, alteration, service, or maintenance can result in death, injury, or property damage. Read the Installation, Operation, and Maintenance manual thoroughly before installing or servicing this equipment.

Installation must be completed by a registered installer/contractor qualified in the installation and service of air conditioning equipment.
NOMENCLATURE

Example Pin Number:

JROA-660H8A-4DABJ-AH1B4-1FJBO-H2700-0C000-0000B1-H100-ABD0-AL00

DIGITS 1–2: PRODUCT FAMILY
JR: YORK Packaged Rooftop

DIGIT 3: TYPE
O: Outside Air

DIGIT 4: APPLICATION
A: Air-Cooled
W: Water Source Heat Pump
H: Air Source Heat Pump

DIGITS 5–7: NOMINAL CAPACITY
036: 3 ton 300: 25 ton
048: 4 ton 360: 30 ton
060: 5 ton 420: 35 ton
072: 6 ton 480: 40 ton
084: 7 ton 540: 45 ton
096: 8 ton 600: 50 ton
120: 10 ton 660: 55 ton
150: 12.5 ton 720: 60 ton
180: 15 ton 780: 65 ton
210: 17.5 ton 840: 70 ton
240: 20 ton

DIGITS 8–9: CABINET SIZE
A0: A Cab with 0 Cond Fans
B0: B Cab with 0 Cond Fans
F0: BXL Cab with 0 Cond Fans
C0: CXL Cab with 0 Cond Fans
D0: D Cab with 0 Cond Fans
H0: DXL Cab with 0 Cond Fans
E0: E Cab with 0 Cond Fans
J0: JXL Cab with 0 Cond Fans

A1: A Cab with 1 Cond Fans
A2: A Cab with 2 Cond Fans
B1: B Cab with 1 Cond Fans
B2: B Cab with 2 Cond Fans
B4: B Cab with 4 Cond Fans
F1: BXL Cab with 1 Cond Fans
F2: BXL Cab with 2 Cond Fans
F4: BXL Cab with 4 Cond Fans
C2: C Cab with 2 Cond Fans
C4: C Cab with 4 Cond Fans
C6: C Cab with 6 Cond Fans
K2: CL Cab with 2 Cond Fans
K4: CL Cab with 4 Cond Fans
G2: CXL Cab with 2 Cond Fans
G4: CXL Cab with 4 Cond Fans
G6: CXL Cab with 6 Cond Fans
D4: D Cab with 4 Cond Fans
D6: D Cab with 6 Cond Fans
B8: D Cab with 8 Oversized Cond Fans
H4: DXL Cab with 4 Cond Fans
H6: DXL Cab with 6 Cond Fans
H8: DXL Cab with 8 Oversized Cond Fans
E4: E Cab with 4 Cond Fans
E6: E Cab with 6 Cond Fans
E8: E Cab with 8 Oversized Cond Fans
H4: EXL Cab with 4 Cond Fans
H6: EXL Cab with 6 Cond Fans
H8: EXL Cab with 8 Oversized Cond Fans

DIGIT 10: CONTROLS
A: ALC, Standard Program, DOAS
B: ALC, Standard Program, DOAS w/ Recirc NSB
D: ALC, Std Program, w/ Economizer, Enthalpy
E: ALC, Std Program, DOAS for Lonworks
F: ALC, Std Program, DOAS w/ Recirc NSB for Lonworks
H: ALC, Std Program, w/ Economizer, Sensible
M: Compressor Lockout Thermostat
P: ALC, Std Program, w/ Economizer, Sensible for Lonworks

DIGIT 11: VOLTAGE
2: 208/3/60
3: 230/3/60
4: 460/3/60
5: 575/3/60

DIGIT 12: MODEL VINTAGE
D: Model Generation

DIGIT 13: AIRFLOW CONFIGURATION
A: Vertical supply and vertical return
B: Horizontal supply and vertical return
C: Vertical supply and side return
D: Horizontal supply and side return
E: Vertical supply and no return
F: Horizontal supply and no return

DIGITS 14–15: SUPPLY BLOWER/SIZE TYPE
AC: 12 inches DD, Airfoil
AD: 14 inches DD, Airfoil
AE: 16 inches DD, Airfoil
AF: 18 inches DD, Airfoil
AG: 20 inches DD, Airfoil
AH: 22 inches DD, Airfoil
AJ: 25 inches DD, Airfoil
BA: 10 inches DD, BI
BB: 11 inches DD, BI
BC: 12 inches DD, BI
BD: 14 inches DD, BI
BE: 16 inches DD, BI
BF: 18 inches DD, BI
BG: 20 inches DD, BI
BH: 22 inches DD, BI
BJ: 25 inches DD, BI
CA: 280mm Single ECM (CIW.087.5FA)
CR: 355mm Single ECM (CIB.112.6FF IE)
CM: 450mm Single ECM (CIB.140.6IF)
C1: EC 310
C2: EC 350
C3: EC 450 (Low) (460V Only)
C4: EC 450 (Hi)
C5: EC 500 (Low)
C6: EC 500 (Hi) (460V Only)
C7: EC 560 (208, 230V Only)
DA: 280mm Dual ECM (CIW.087.5FA)
DK: 355mm Dual ECM (CIB.112.6FF IE)

DIGIT 16: SUPPLY BLOWER OPTIONS
D: Dual EC 310
E: Dual EC 450 (Low) (460V Only)
F: Dual EC 450 (Hi)
H: Dual EC 500 (Low)
EA: Dual 14 inches DD, BI
EB: Dual 14 inches DD, AF
EC: Dual 16 inches DD, BI
ED: Dual 16 inches DD, AF
EE: Dual 18 inches DD, BI
EF: Dual 18 inches DD, AF
EG: Dual 20 inches DD, BI
EH: Dual 20 inches DD, AF

DIGIT 17: SUPPLY MOTOR SIZE
A: 1.0 HP
B: 1.5 HP
C: 2.0 HP
D: 3.0 HP
E: 5.0 HP

DIGIT 18: SUPPLY MOTOR TYPE
1: High efficiency ODP with VFD (CV)
2: High efficiency TEFC with VFD (CV)
3: ECM (CV)
4: High efficiency ODP with VFD and DPT (VAV)
5: High efficiency TEFC with VFD and DPT (VAV)
6: ECM and DPT ALC Only (VAV)

DIGIT 19: COOLING COIL
0: None
B: 6 row Copper Tube Aluminum Fin DX Coil

DIGIT 20: COMPRESSOR TYPE
0: None
1: Single Scroll/Single Circuit
2: Dual Scroll/Dual Circuit
3: Single Digital Scroll/Single Circuit
4: Single Digital Scroll and Single Scroll/Dual Circuit
5: Dual Digital Scroll/Dual Circuit
6: Dual Scroll/Dual Circuit with Lead Circuit VFD

DIGIT 21: MCA
1: 0–30
2: 30.1–60
3: 60.1–100
4: 100.1–200
5: 200.1–400
6: 400+
DIgits22–23: Refrigeration Controls Options

00: None
AE: Hot Gas Bypass (Lead Circuit)
AF: Hot Gas Bypass (Lag Circuit)
AG: Hot Gas Bypass (Dual Circuit)
AH: Hot Gas Reheat (Single Circuit)
AJ: Hot Gas Reheat (Dual Circuit)
AK: Hot Gas Reheat, Modulating (Single Circuit)
AL: Hot Gas Reheat, Modulating (Dual Circuit)
AM: Liquid Sub Cooling, Switchable, All Circuits
DA: AE + AH
DP: AE + AJ
DB: AE + AK
DV: AE + AL
DC: AE + AM
DM: AF + AH
DQ: AF + AJ
DT: AF + AK
DW: AF + AL
DZ: AF + AM
DN: AG + AH
DR: AG + AJ
DU: AG + AK
DX: AG + AL
EU: AG + AM
DD: AH + AM
DE: AK + AM
FA: AE + AH + AM
FB: AE + AK + AM
FF: AF + AH + AM
FJ: AF + AK + AM
FG: AG + AH + AM
FK: AG + AK + AM

Digit24: Heating Type
0: None
A: Electric Heat
B: Natural Gas Heat
D: LP Gas Heat
F: Hot Water Heat
G: Electric Preheat
H: B + G
J: D + G
K: F + G

Digit25: Electric Heating Capacity
0: None
A: 5 kW 240/480/575v – 3.75 kW 208v
B: 10 kW 240/480/575v – 7.5 kW 208v
C: 15 kW 240/480/575v – 11.25 kW 208v
D: 20 kW 240/480/575v – 15 kW 208v
E: 25 kW 240/480/575v – 18.75 kW 208v
F: 30 kW 240/480/575v – 22.5 kW 208v
G: 35 kW 240/480/575v – 26.25 kW 208v
H: 40 kW 240/480/575v – 30 kW 208v
K: 50 kW 240/480/575v – 37.5 kW 208v
M: 60 kW 240/480/575v – 45 kW 208v
N: 70 kW 240/480/575v – 52.5 kW 208v
P: 80 kW 240/480/575v – 60 kW 208v
R: 100 kW 240/480/575v – 75 kW 208v
S: 110 kW 240/480/575v – 81.4 kW 208v
T: 120 kW 240/480/575v – 90 kW 208v
U: 130 kW 240/480/575v – 97.5 kW 208v
V: 140 kW 240/480/575v – 105 kW 208v
W: 150 kW 240/480/575v – 112.5 kW 208v

Digit26–27: Gas Heating Capacity
00: None
A1: 75 MBH
B1: 100 MBH
C1: 150 MBH
D1: 200 MBH
E1: 250 MBH
F1: 300 MBH
G1: 350 MBH
H1: 400 MBH
J1: 500 MBH
K1: 600 MBH
A2: 100 + 100 MBH
B2: 200 + 200 MBH
C2: 250 + 250 MBH
D2: 300 + 300 MBH
F2: 350 + 350 MBH
E2: 400 + 400 MBH
H2: 500 + 500 MBH
J2: 600 + 600 MBH
A4: (4) 200 MBH
B4: (4) 250 MBH
C4: (4) 300 MBH
D4: (4) 350 MBH
E4: (4) 400 MBH

Digit28: Heater Control
0: None
1: 1 Stage
2: 2 Stage
3: 4 Stage
9: 8 Stage
4: SCR
6: Modulating 5:1 NG, 3:1 LPG
7: Modulating 10:1 NG, 6:1 LPG
8: Modulating 20:1 NG, 12:1 LPG

Digit29: Heating Gas Safety Controls
0: None

Digit30: Energy Recovery Options
0: None
A: On/Off Defrost
B: VFD Temp Defrost
C: Bypass
D: A + C
E: B + C
F: Standard Control
G: C + F

Digit32: Ventilation
A: Hood & Birdscreen w/o Damper
B: Manual OA Damper w/o Actuator
C: Motorized 2-Position OA Damper (Class 1 Rated) w/ 2-Position Actuator (ALC, Field DDC, EM)
D: Motorized Proportional OA Damper (Class 1 Rated) w/ 0–10VDC Actuator (ALC, Field DDC)
E: Motorized 2-Position OA & RA Dampers (Class 1 Rated) w/ 2-Position Actuators (ALC, Field DDC)
F: Motorized OA & RA Dampers (Class 1 Rated) w/ 0–10VDC Actuators (ALC, Field DDC)

Digit33–34: Exhaust Blower Size
00: None
AC: 12 inches DD, Airfoil
AD: 14 inches DD, Airfoil
AE: 16 inches DD, Airfoil
AF: 18 inches DD, Airfoil
AG: 20 inches DD, Airfoil
AH: 22 inches DD, Airfoil
AJ: 25 inches DD, Airfoil
BA: 10 inches DD, BI
BB: 11 inches DD, BI
BC: 12 inches DD, BI
BD: 14 inches DD, BI
BE: 16 inches DD, BI
BF: 18 inches DD, BI
BG: 20 inches DD, BI
BH: 22 inches DD, BI
BJ: 25 inches DD, BI
CA: 280mm Single ECM (C1W.087.5FA)
CR: 355mm Single ECM (CIB.112.6FF IE)
CM: 450mm Single ECM (CIB.140.6IF)
C1: EC 310
C2: EC 350
C3: EC 450 (Low) (460V Only)
C4: EC 450 (Hi)
C5: EC 500 (Low)
C6: EC 500 (Hi) (460V Only)
C7: EC 560 (208,230V Only)
DA: 280mm Dual ECM (C1W.087.5FA)
DK: 355mm Dual ECM (CIB.112.6FFF IE)
D1 = Dual EC 310
D2 = Dual EC 450 (Low) (460V Only)
D3 = Dual EC 450 (Hi)
D4 = Dual EC 500 (Low)
EA: Dual 14 inches DD, BI
EB: Dual 14 inches DD, AF
EC: Dual 16 inches DD, BI
ED: Dual 16 inches DD, AF
EE: Dual 18 inches DD, BI
EF: Dual 18 inches DD, AF
EG: Dual 20 inches DD, BI
EH: Dual 20 inches DD, AF
**DIGIT 35: EXHAUST BLOWER OPTIONS**

0: None (No Exhaust)

D: Gravity Relief Damper (ECM and No Exhaust Fan only)

E: Actuator Damper (ECM and No Exhaust Fan only)

H: Gravity Relief Damper + Corset (ECM only)

L: Actuator Damper + Corset (ECM only)

F: Gravity Relief Damper + Rubber Isolation (Comrefi only)

J: Actuator Damper + Rubber Isolation (Comrefi only)

M: Gravity Relief Damper + Rubber Isolation + Piezo Ring (Comrefi only)

G: Gravity Relief Damper + Spring Isolation (Comrefi only)

K: Actuator Damper + Spring Isolation (Comrefi only)

P: Gravity Relief Damper + Spring Isolation + Piezo Ring (Comrefi only)

Q: Actuator Damper + Spring Isolation + Piezo Ring (Comrefi only)

T: Gravity Relief Damper + Rigid Mount (Comrefi only)

U: Actuator Damper + Rigid Mount (Comrefi only)

V: Gravity Relief Damper + Rigid Mount + Piezo Ring (Comrefi only)

W: Actuator Damper + Rigid Mount + Piezo Ring (Comrefi only)

**DIGIT 36: EXHAUST MOTOR SIZE**

0: None

A: 1.0 HP

B: 1.5 HP

C: 2.0 HP

D: 3.0 HP

E: 5.0 HP

F: 7.5 HP

G: 10.0 HP

H: 15.0 HP

M: ECM

**DIGIT 37: EXHAUST MOTOR TYPE**

1: High efficiency ODP w/ VFD (CV)

2: High efficiency TEF w/ VFD (CV)

3: ECM (CV)

4: High efficiency ODP w/ VFD and DPT (VAV)

5: High efficiency TEF w/ VFD and DPT (VAV)

6: ECM and DPT ALC Only (VAV)

**DIGITS 38–39: CORROSION PROTECTION**

00: None

A1: Corrosion Protection Coating - Cabinet

F1: Corrosion Protection Coating - Condenser Coil

H1: Corrosion Protection Coating - Indoor Coils

AE: A1 + F1

AR: A1 + H1

BS: A1 + F1 + H1

**DIGITS 40–41: MAINTENANCE OPTIONS**

00: None

A1: 115V Convenience Outlet (Field Wired)

B1: 115V Convenience Outlet (Factory Wired)

C1: Magnahelic Gauge (One) by Rule

D1: Magnahelic Gauge (Two) by Rule

E1: Magnahelic Gauge (Three) by Rule

F1: Clogged Filter Indicator

G1: Condensate Overflow Switch

AA: A1 + C1

AC: A1 + E1

AD: A1 + F1

AE: A1 + G1

BA: B1 + C1

BB: B1 + D1

BC: B1 + E1

BD: B1 + F1

BE: B1 + G1

CA: C1 + F1

CB: C1 + G1

DB: D1 + F1

DA: D1 + G1

EB: E1 + F1

EA: E1 + G1

FA: F1 + G1

JA: A1 + C1 + F1

JB: A1 + C1 + G1

JC: A1 + D1 + F1

JD: A1 + D1 + G1

JE: A1 + E1 + F1

JK: A1 + E1 + G1

JL: A1 + F1 + G1

KA: B1 + C1 + F1

KB: B1 + C1 + G1

KE: B1 + D1 + F1

KF: B1 + D1 + G1

KJ: B1 + E1 + F1

KK: B1 + E1 + G1

KL: B1 + F1 + G1

LA: C1 + F1 + G1

MA: D1 + F1 + G1

NA: E1 + F1 + G1

RA: A1 + C1 + F1 + G1

RG: A1 + D1 + F1 + G1

RN: A1 + E1 + F1 + G1

SA: B1 + C1 + F1 + G1

SG: B1 + D1 + F1 + G1

SN: B1 + E1 + F1 + G1

**DIGIT 42: MOCP**

A: 15 Amps

B: 20 Amps

C: 25 Amps

D: 30 Amps

E: 35 Amps

G: 45 Amps

H: 50 Amps

J: 60 Amps

K: 70 Amps

L: 80 Amps

M: 90 Amps

N: 100 Amps

P: 110 Amps

Q: 125 Amps

R: 150 Amps

S: 175 Amps

U: 225 Amps

V: 250 Amps

W: 300 Amps

Y: 350 Amps

Z: 400 Amps

**DIGIT 43: DISCONNECT TYPE**

0: None

1: Nonfused

2: Fused

**DIGIT 44–45: CONTROL OPTIONS**

00: None

AA: Exhaust Fan Interlock

AB: Energy Management Relay

BA: AA + AB

**DIGITS 46–47: SAFETY CONTROLS**

00: None

AA: High Temperature Alarm (Firestat)

AB: Factory Installed Smoke Detector

AE: Carbon Dioxide Detector

BA: AA + AB

**DIGIT 48: PRE-FILTER**

A: 2" MERV8 Pleated

B: 4" MERV8 Pleated

C: 4" MERV11 Pleated

D: 4" MERV14 Pleated

E: 4" MERV8 Pleated w/ 2" MERV8 Pleated

F: 4" MERV11 Pleated w/ 2" MERV8 Pleated

G: 4" MERV14 Pleated w/ 2" MERV8 Pleated

H: 2" Metal Mesh

J: 4" MERV8 Pleated w/ 2" Metal Mesh

K: 4" MERV11 Pleated w/ 2" Metal Mesh

L: 4" MERV14 Pleated w/ 2" Metal Mesh

**DIGIT 49: RESERVE FOR FUTURE USE**

0: None

**DIGITS 50–51: ALC OPTIONS**

00: None

AA: Bacview (Ship With)

AB: ZS Standard Zone Sensor

AC: ZS Standard Zone Sensor w/ Humidity

AD: ZS Standard Zone Sensor w/ CO2

AE: ZS Standard Zone Sensor w/ Humidity and CO2

AF: ZS Plus Zone Sensor

AG: ZS Plus Zone Sensor w/ Humidity

AH: ZS Plus Zone Sensor w/ CO2

AJ: ZS Plus Zone Sensor w/ Humidity and CO2

AK: ZS Pro Zone Sensor

AL: ZS Pro Zone Sensor w/ Humidity

AM: ZS Pro Zone Sensor w/ CO2

AN: ZS Pro Zone Sensor w/ Humidity and CO2

AP: Smoke Detector

BA: AA + AB

BB: AA + AC

BC: AA + AD

BD: AA + AE

BE: AA + AF

BF: AA + AG

BG: AA + AH

BH: AA + AJ

BJ: AA + AK

BK: AA + AL

BL: AA + AM

BM: AA + AN

CA: AA + AP

CB: AB + AP

CC: AC + AP

CD: AD + AP

CE: AE + AP
CF: AF + AP  
CG: AG + AP  
CH: AH+ AP  
CJ: AJ + AP  
CK: AK + AP  
CL: AL + AP  
CM: AM + AP  
CN: AN + AP  
DA: AA + AB + AP  
DB: AA + AC + AP  
DC: AA + AD + AP  
DD: AA + AE + AP  
DE: AA + AF + AP  
DF: AA + AG + AP  
DG: AA + AH + AP  
GH: AA + AJ + AP  
DJI: AA + AK + AP  
DJI: AA + AL + AP  
DL: AA + AM + AP  
DM: AA + AN + AP  

DIGITS 52–53: JR ROOF CURBS  
00: None  
AA: A Cab Roof Curb 14" Air Handler w/ Exhaust  
AB: A Cab Roof Curb 14" w/ 1 Cond Fan w/ Exhaust  
AC: A Cab Roof Curb 14" w/ 2 Cond Fan w/ Exhaust  
AD: A Cab Roof Curb 14" Air Handler No Exhaust  
AE: A Cab Roof Curb 14" w/ 1 Cond Fan No Exhaust  
AF: A Cab Roof Curb 14" w/ 2 Cond Fan No Exhaust  
BA: B Cab Roof Curb 14" Air Handler w/ Exhaust  
BB: B Cab Roof Curb 14" w/ 1 Cond Fan w/ Exhaust  
BC: B Cab Roof Curb 14" w/ 2 Cond Fan w/ Exhaust  
BD: B Cab Roof Curb 14" w/ 3 Cond Fan w/ Exhaust  
BE: B Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
BF: B Cab Roof Curb 14" Water Source w/ Exhaust  
BG: B Cab Roof Curb 14" Air Handler No Exhaust  
BH: B Cab Roof Curb 14" w/ 1 Cond Fan No Exhaust  
BI: B Cab Roof Curb 14" w/ 2 Cond Fan No Exhaust  
BJ: B Cab Roof Curb 14" w/ 3 Cond Fan No Exhaust  
BK: B Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
BL: B Cab Roof Curb 14" Wtr Source No Exhaust  
FA: BXL Cab Roof Curb 14" Air Handler w/ Exhaust  
FB: BXL Cab Roof Curb 14" w/ 1 Cond Fan w/ Exhaust  
FC: BXL Cab Roof Curb 14" w/ 2 Cond Fan w/ Exhaust  
FD: BXL Cab Roof Curb 14" w/ 3 Cond Fan w/ Exhaust  
FE: BXL Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
FF: BXL Cab Roof Curb 14" Wtr Source w/ Exhaust  
FG: BXL Cab Roof Curb 14" Air Handler No Exhaust  
FH: BXL Cab Roof Curb 14" w/ 1 Cond Fan No Exhaust  
FI: BXL Cab Roof Curb 14" w/ 2 Cond Fan No Exhaust  
FJ: BXL Cab Roof Curb 14" w/ 3 Cond Fan No Exhaust  
FK: BXL Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
FL: BXL Cab Roof Curb 14" Wtr Source No Exhaust  
CA: C Cab Roof Curb 14" Air Handler w/ Exhaust  
CB: C Cab Roof Curb 14" w/ 2 Cond Fan w/ Exhaust  
CC: C Cab Roof Curb 14" w/ 3 Cond Fan w/ Exhaust  
CD: C Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
CE: C Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
CF: C Cab Roof Curb 14" Wtr Source w/ Exhaust  
CG: C Cab Roof Curb 14" Air Handler No Exhaust  
CH: C Cab Roof Curb 14" w/ 2 Cond Fan No Exhaust  
CI: C Cab Roof Curb 14" w/ 3 Cond Fan No Exhaust  
CJ: C Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
CK: C Cab Roof Curb 14" w/ 6 Cond Fan No Exhaust  
CL: C Cab Roof Curb 14" Wtr Source No Exhaust  
GA: CXL Cab Roof Curb 14" Air Handler w/ Exhaust  
GB: CXL Cab Roof Curb 14" w/ 2 Cond Fan w/ Exhaust  
GC: CXL Cab Roof Curb 14" w/ 3 Cond Fan w/ Exhaust  
GD: CXL Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
GE: CXL Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
GF: CXL Cab Roof Curb 14" Wtr Source w/ Exhaust  
GH: CXL Cab Roof Curb 14" Air Handler No Exhaust  
GI: CXL Cab Roof Curb 14" w/ 2 Cond Fan No Exhaust  
GJ: CXL Cab Roof Curb 14" w/ 3 Cond Fan No Exhaust  
GK: CXL Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
GL: CXL Cab Roof Curb 14" Wtr Source No Exhaust  
DA: D Cab Roof Curb 14" Air Handler w/ Exhaust  
DB: D Cab Roof Curb 14" w/ 2 Cond Fan w/ Exhaust  
DC: D Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
DD: D Cab Roof Curb 14" w/ 6 Oversized Cond Fan w/ Exhaust  
DE: D Cab Roof Curb 14" Wtr Source w/ Exhaust  
DF: D Cab Roof Curb 14" Air Handler No Exhaust  
DG: D Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
DH: D Cab Roof Curb 14" w/ 6 Cond Fan No Exhaust  
DI: D Cab Roof Curb 14" w/ 6 Oversized Cond Fan No Exhaust  
DJ: D Cab Roof Curb 14" Wtr Source No Exhaust  
HA: DXL Cab Roof Curb 14" Air Handler w/ Exhaust  
HB: DXL Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
HC: DXL Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
HD: DXL Cab Roof Curb 14" w/ 6 Oversized Cond Fan w/ Exhaust  
HE: DXL Cab Roof Curb 14" Water Source w/ Exhaust  
HF: DXL Cab Roof Curb 14" Air Handler No Exhaust  
HG: DXL Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
HH: DXL Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
HI: DXL Cab Roof Curb 14" w/ 6 Oversized Cond Fan No Exhaust  
HJ: DXL Cab Roof Curb 14" Water Source No Exhaust  
EA: E Cab Roof Curb 14" Air Handler w/ Exhaust  
EB: E Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
EC: E Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
ED: E Cab Roof Curb 14" w/ 6 Oversized Cond Fan w/ Exhaust  
EE: E Cab Roof Curb 14" Water Source w/ Exhaust  
EF: E Cab Roof Curb 14" Air Handler No Exhaust  
EG: E Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
EH: E Cab Roof Curb 14" w/ 6 Cond Fan No Exhaust  
EI: E Cab Roof Curb 14" w/ 6 Oversized Cond Fan No Exhaust  
EJ: E Cab Roof Curb 14" Wtr Source No Exhaust  
JA: EXL Cab Roof Curb 14" Air Handler w/ Exhaust  
JB: EXL Cab Roof Curb 14" w/ 4 Cond Fan w/ Exhaust  
JC: EXL Cab Roof Curb 14" w/ 6 Cond Fan w/ Exhaust  
JD: EXL Cab Roof Curb 14" w/ 6 Oversized Cond Fan w/ Exhaust  
JE: EXL Cab Roof Curb 14" Wtr Source w/ Exhaust  
JF: EXL Cab Roof Curb 14" Air Handler No Exhaust  
JG: EXL Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust  
JH: EXL Cab Roof Curb 14" w/ 6 Cond Fan No Exhaust  
JI: EXL Cab Roof Curb 14" w/ 6 Oversized Cond Fan No Exhaust  
JJ: EXL Cab Roof Curb 14" Water Source No Exhaust
# TABLE OF CONTENTS

## SECTION 1 - INSTALLATION

- Safety .......................................................................................................................... 13
- Description of Operation............................................................................................ 13
- Inspection and Setup.................................................................................................. 13
  - Receiving and Inspection ....................................................................................... 13
- Storage ....................................................................................................................... 14
  - Critical Considerations ........................................................................................ 14
  - Safety Labels and Placement ............................................................................... 14
  - California Proposition 65 ..................................................................................... 14
- Installer Responsibility ............................................................................................... 16
  - Corrosive Chemicals ............................................................................................. 16
  - Required Equipment and Materials ...................................................................... 16
- Required Clearances .................................................................................................. 17
  - Service Clearances ............................................................................................... 17
  - Ventilation Clearances ......................................................................................... 17
- Placement Considerations .......................................................................................... 18
- National Standards and Applicable Codes ................................................................. 18
  - Refrigerant Handling Practices ............................................................................ 18
  - Fuel Codes ............................................................................................................ 18
  - Installation Codes ................................................................................................ 18
  - Aircraft Hangars .................................................................................................. 18
  - Parking Structures and Repair Garages ................................................................. 18
  - Electrical ............................................................................................................... 19
  - Venting ................................................................................................................. 19
  - High Altitude ......................................................................................................... 19
- Specifications .............................................................................................................. 19
- Lifting a JR Series Unit ............................................................................................... 19
  - Preparing to Move/Lift the Unit ............................................................................ 19
  - Rigging and Handling ............................................................................................. 19
- Roof Curb ................................................................................................................... 20
  - Roof Curb Assembly and Installation .................................................................. 20
  - Unit Mounting to Roof Curb ................................................................................ 21
- Duct Considerations ................................................................................................... 21
  - Return Air Ductwork ............................................................................................ 22
  - Discharge Ductwork ............................................................................................. 22
- Refrigeration Circuits ................................................................................................ 22
  - Refrigerant ............................................................................................................ 22
  - Refrigerant Charging ......................................................................................... 22
- Components and Configurations ............................................................................... 24
  - Compressors ......................................................................................................... 24
  - Energy Conservation Wheels ................................................................................ 29
  - Gas Furnaces ....................................................................................................... 31
  - Electric Heaters .................................................................................................... 38
  - Electrical ................................................................................................................ 52

## SECTION 2 - SEQUENCE OF OPERATION

- Unit Configuration .................................................................................................... 53
- Controls Options ....................................................................................................... 53
- Basic Sequence of Operation .................................................................................... 54
- Controls Options ....................................................................................................... 54
# TABLE OF CONTENTS (CONT'D)

## SECTION 3 - START-UP

Installation Code and Quarterly Inspections .............................................. 55  
Pre-Start Checks ....................................................................................... 64  
   Ductwork and Electrical Connections ..................................................... 64  
   Condensate Drain ................................................................................ 64  
   Supply and Exhaust Fans .................................................................... 64  
   Compressors ....................................................................................... 65  
   Energy Conservation Wheel .................................................................. 65  
   Gas Furnace ....................................................................................... 65

## SECTION 4 - MAINTENANCE

Installation Code and Quarterly Inspections .............................................. 67  
General ................................................................................................... 67  
   Quarterly ............................................................................................ 67  
   Unit Exterior ...................................................................................... 67  
      Cabinet Exterior ............................................................................. 67  
      Unit Location ................................................................................ 67  
   Direct Drive Supply and Exhaust Fans ................................................ 67  
      Blower Wheel ................................................................................. 67  
      Motors .......................................................................................... 67  
   Condensing Fans ............................................................................... 68  
   Refrigeration Circuit Components ...................................................... 68  
      Evaporator Coil ............................................................................. 68  
      Condenser Coil ............................................................................. 68  
      Compressors ................................................................................ 68  
   Condensate Drain Pan and Drain ........................................................ 68  
   Dampers ............................................................................................ 68  
      Dampers ...................................................................................... 68  
      Damper Motor/Linkages ................................................................. 68  
   Energy Conservation Wheel .................................................................. 68  
      Bearings ....................................................................................... 68  
      Drive Motor .................................................................................. 68  
      Drive Belts .................................................................................... 68  
      Seals ............................................................................................. 68  
      Wheel ............................................................................................ 68  
   COAX 4 Water Coil ............................................................................. 69  
   Gas Furnace ...................................................................................... 69  
      Gas Line ....................................................................................... 69  
      Manual Safety Shut Off Valve ......................................................... 69  
      Direct Spark Igniter ....................................................................... 69  
      Gas Valve ...................................................................................... 69  
      Burners ......................................................................................... 69  
      Heat Exchanger ............................................................................. 69  
      Draft Inducer ................................................................................. 69  
      Vent Pipe/Terminal ......................................................................... 70  
      Condensation Drain ....................................................................... 70

Electric Heater Wiring and Wiring Connections ...................................... 70  
   Control Panel ..................................................................................... 70  
   Heating Elements ............................................................................... 70
**TABLE OF CONTENTS (CONT'D)**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filters</td>
<td>70</td>
</tr>
<tr>
<td>Replacement Parts</td>
<td>72</td>
</tr>
<tr>
<td><strong>SECTION 5 - TROUBLESHOOTING</strong></td>
<td>73</td>
</tr>
<tr>
<td>Supply Fan</td>
<td>73</td>
</tr>
<tr>
<td>Compressor</td>
<td>73</td>
</tr>
<tr>
<td>Refrigeration Circuit</td>
<td>75</td>
</tr>
<tr>
<td>Variable Speed Head Pressure Control</td>
<td>77</td>
</tr>
<tr>
<td>Energy Wheel Conservation</td>
<td>78</td>
</tr>
<tr>
<td>Gas Furnace</td>
<td>79</td>
</tr>
<tr>
<td>Electric Heater</td>
<td>79</td>
</tr>
<tr>
<td><strong>SECTION 6 - WARRANTY</strong></td>
<td>81</td>
</tr>
<tr>
<td>Johnson Controls Coverage</td>
<td>81</td>
</tr>
<tr>
<td>Not Covered by Johnson Controls</td>
<td>81</td>
</tr>
<tr>
<td>Voided Warranty</td>
<td>81</td>
</tr>
<tr>
<td>Contacting the Company</td>
<td>81</td>
</tr>
<tr>
<td>Temperature</td>
<td>83</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

FIGURE 1 - Label Placement Drawing ............................................................................................................. 15
FIGURE 2 - JR Series Unit with Exhaust Cabinet Clearance ........................................................................... 17
FIGURE 3 - JR Series Unit without Exhaust Cabinet Clearance ...................................................................... 17
FIGURE 4 - Lifting Lugs ....................................................................................................................................... 20
FIGURE 5 - Curb Mounting ............................................................................................................................. 21
FIGURE 6 - Manufacturer's Data Tag .............................................................................................................. 23
FIGURE 7 - Circuit Diagram for Standard Compressor and Hot Gas Bypass w/ No Hot Gas Reheat ............. 25
FIGURE 8 - Circuit Diagram for Standard Compressor, Hot Gas Bypass, and Standard Hot Gas Reheat .... 26
FIGURE 9 - Circuit Diagram for Standard Compressor, Hot Gas Bypass, and Modulating Hot Gas Reheat... 26
FIGURE 10 - Circuit Diagram for Digital Compressor and Modulating Hot Gas Reheat .................................. 27
FIGURE 11 - Circuit Diagram for Standard Compressor, Hot Gas Bypass, and Standard Hot Gas Reheat and Subcooling .................................................................................................................. 27
FIGURE 12 - Circuit Diagram for Standard Compressor, Hot Gas Bypass, and Modulating Hot Gas Reheat and Subcooling .................................................................................................................. 28
FIGURE 13 - Circuit Diagram for Digital Compressor, Modulating Hot Gas Reheat and Subcooling ............ 28
FIGURE 14 - Energy Conservation Wheel (ECW) ............................................................................................... 29
FIGURE 15 - Gas Furnace Component Location .............................................................................................. 31
FIGURE 16 - Tee Fitting on P-Trap .................................................................................................................... 33
FIGURE 17 - Condensate Drain Fitting on Furnace Module .............................................................................. 33
FIGURE 18 - Vertical Flue Gas Discharge .......................................................................................................... 33
FIGURE 19 - 208/230/460/575-3-60 Wiring Diagram ....................................................................................... 40
FIGURE 20 - P-Trap .......................................................................................................................................... 64

LIST OF TABLES

TABLE 1 - Ambient Charge Tables .................................................................................................................... 23
TABLE 2 - Energy Conservation Wheel (ECW) Specifications ........................................................................... 30
TABLE 3 - Gas Furnace Specifications .............................................................................................................. 32
TABLE 4 - Manifold Size and Minimum Pressures ............................................................................................ 32
TABLE 5 - Electric Heater Data ......................................................................................................................... 39
TABLE 6 - Gas Furnace Inlet and Manifold Pressures ....................................................................................... 65
TABLE 7 - Motor Lubrication Intervals .............................................................................................................. 67
TABLE 8 - JR Series Filter Options .................................................................................................................... 70
TABLE 9 - SI Metric Conversion ....................................................................................................................... 83
SECTION 1 - INSTALLATION

SAFETY

Installation, service, and at a minimum, quarterly inspection of this Dedicated Outside Air System (DOAS) unit must be done by a contractor qualified in the installation and service of air conditioning equipment.

Read this manual carefully before installation, operation, or service of this equipment.

The instructions in this manual, local codes and ordinances, and applicable standards that apply to piping, electrical wiring, and ventilation must be understood and followed when proceeding with the installation.

Protective gear is to be worn during installation, operation, and service in accordance to the Occupational Safety and Hazard Administration (OSHA). Gear must be in accordance to NFPA 70E, latest revision when working with electrical components. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended.

Before installation, check that the electrical supply and/or fuel conditions and adjustment of the equipment are compatible.

This equipment must be applied and operated under the general concepts of reasonable use and installed using best building practices.

This equipment is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the equipment by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the equipment.

Optional gas furnace in this equipment is not designed for use in atmospheres containing flammable vapors, flammable dust, or chlorinated or halogenated hydrocarbons. Recirculated room air may be hazardous if containing flammable solids, liquids, and gases; explosive materials; and/or substances that may become toxic when exposed to heat (e.g, refrigerants, aerosols).

DESCRIPTION OF OPERATION

The JR Series unit is a factory-assembled packaged system that can operate within a broad range of ambient conditions and introduce ventilation air into a building at neutral conditions. It consists of matched refrigeration and air moving components (system controls, compressor[s], evaporator section, condensing section, and fan[s]) designed to treat 100% outside air. This system has the ability to filter, cool, heat, and/or dehumidify air.

The unit may be provided with several different options and/or controls to meet various application requirements, including optional hot gas reheat, energy recovery wheel, supplemental heat (gas, electric, hot water, or steam), and variable air volume delivery. Be sure to read this entire manual before installation and start-up.

INSPECTION AND SETUP

The unit was leak-tested, pressure-tested, evacuated, charged, and run-tested prior to shipment. Immediately upon receipt of the unit, check the electrical supply and/or fuel characteristics of the unit and verify that they match the electrical supply and/or fuel available. Verify that the specifications on the unit rating plate match your order. Check the unit for any damage that may have occurred during shipment. If any damage is found, file a claim with the transporting agency. Do not refuse shipment. Check the installation location to ensure proper clearances.

Receiving and Inspection

Upon arrival at the destination, the following steps must be taken:

- Verify that the data on the Manufacturer’s Data Tag matches project documents including Purchase Order and Bill of Lading (BOL)
- Verify ALL items noted on Packing List and BOL are received
- Visually inspect the exterior of the unit for shipping damage

If the destination inspection reveals damage, file a claim with the carrier immediately.
Please contact the factory for any shortages after carefully inspecting the control compartment for field-installed sensor and controls. The factory takes pictures of all control compartments to document shipment of field-installed sensors and controls.

If concealed damage is discovered, contact the carrier immediately to document this discovery. A concealed damage claim must be filed within 15 days of receipt. Do not remove packaging material; document the observed condition with photos, and request a joint inspection to establish that the damage did not occur after delivery.

**STORAGE**

If installation does not occur when the unit is delivered, this equipment should be stored on a hard, flat surface out of the site traffic patterns. During storage, all cabinets over 12 feet in length must be supported at six points—at each corner and at the base rail bolted seam.

**Critical Considerations**

Any small options that do not come attached to the unit (e.g., sensors) will be found inside the unit control enclosure.

If the unit must be temporarily stored (e.g., the job site is not ready for installation of the unit), the unit should be set on 4 inches x 4 inches (10 centimeters x 10 centimeters) pieces of timber on the ground in a protected area. The unit should be covered to be protected from the environment.

**Safety Labels and Placement**

Product safety signs or labels should be replaced by product user when they are no longer legible.

**California Proposition 65**

In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (e.g., near equipment’s serial plate). See Figure 1 on page 15 for label location. Avoid placing label on areas with extreme heat, cold, corrosive chemicals, or other elements.
ITEM # | PART # | DESCRIPTION
--- | --- | ---
1 | 91070002 | Warning Label
2 | 91031108 | Door Latch Label
3 | 91070016 | CA Cancer Warning Label
4 | 91060002 | Manufacturer's Data Label
5 | 91060002 | R-410A Label
6 | 9-21577 | Hot Surface Label
7 | 0527N-0018 | Condensate Trap Label
8 | 0527-0048 | Copper Conductor Label
9 | S-8238 | Additional Parts Label
10 |  | Brand Label
11 | 0527N-0620 | Rotation Label

**FIGURE 1 - LABEL PLACEMENT DRAWING**
INSTALLER RESPONSIBILITY

The installer is responsible for the following:

- To install and commission the unit, as well as the connection to required utilities, in accordance with applicable specifications and codes
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation
- To furnish all needed materials not furnished as standard equipment
- To plan location of supports
- To provide access to unit for servicing
- To provide the owner with a copy of this Installation, Operation, and Maintenance manual
- To ensure there is adequate air circulation around the unit and to supply air for combustion, ventilation, and distribution in accordance with local codes
- To assemble or install any accessories or associated duct work using best building practices
- To properly size supports and hanging materials
- To verify that the unit is delivering design airflow by having an air balancing test performed
- To have refrigerant technician certification per Section 608 of the US Environmental Protection Agency (EPA) Clean Air Act of 1990 or equivalent certification program
- To have all required equipment to work on direct expansion and/or chilled water air conditioning system

Corrosive Chemicals

Johnson Controls cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the sub-contractor, or the owner identifies the presence of combustible materials, corrosive chemicals, or halogenated hydrocarbons* anywhere in the premises.

* Halogenated Hydrocarbons are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the unit components will be greatly reduced. An outside air supply must be provided to the burners whenever the presence of these compounds is suspected. Warranty will be invalid if the unit is exposed to halogenated hydrocarbons.

Required Equipment and Materials

When lifting of the unit is required, the installing contractor is responsible for supplying or arranging for the appropriate lifting equipment so that the unit may be placed in a safe manner.

The qualified installing/service technician is responsible for having the appropriate equipment and materials for the safe installation and start-up of a unit. Tools and materials required to commission the unit include, but are not limited to, the following:

- Various screwdriver types and sizes
- Various wrench types and sizes
- Drill motor and various drill bits
- Voltmeter
- Clamp style ammeter
- Butyl caulk
- Gauges and accessories
- Direct expansion gauge set
- Appropriate trade tools as necessary
REQUIRED CLEARANCES

The clearances below are the required distances that the unit must be away from objects and other units to allow service access and proper operation of the unit.

Service Clearances

Minimum recommended service clearance is 48 in (121.9 cm) on sides of unit with access doors.

Ventilation Clearances

In order to help ensure proper operation of an air source unit, a 24 in (61.0 cm) clearance for ventilation must be maintained on sides.

In addition, specific ventilation situational clearance guidelines are listed below:

- Do not locate the unit under an overhang or near a wall/other equipment that fosters short circuiting hot air to the condenser coil intakes.
- Do not locate unit within 10 feet (3.0 meters) or directly downwind from exhaust fans or flues.
- Do not locate adjacent unit condenser sections closer than 6 feet to reduce the possibility of condenser air recirculation.

*NOTE: The minimum clearance is required for side removal of the energy recovery wheel and/or DX coils. For top removal of these components, the minimum side clearance can decrease to 56 inches.
SECTION 1 - INSTALLATION

PLACEMENT CONSIDERATIONS

The unit is typically mounted on a curb with ductwork and utility connections usually going through the curb. The unit may also be pad-mounted. (Contact factory for specific instructions if unit is to be mounted in a different way [e.g. on mounting stand].)

Select a location where external water drainage cannot collect around the unit. Installation must be completed so roof runoff water does not pour directly on the unit. Provide gutter or other shielding at roof level. Where snowfall is anticipated, mount the unit so all intakes and discharges are above the maximum snow depth for the area. Unit shall not be installed with inlet opening facing into the prevailing wind direction in order to help prevent the possibility of moisture entrainment.

If unit routinely operates where outside air (OA) air contains fog, mist, or excessive moisture, it may be necessary to use cleanable 2-inch metal mesh filters to avoid filter collapse.

When installed at ground level, the unit should be mounted on a level concrete slab that should extend at least 2 inches (5.1 centimeters) beyond the unit on all sides. The top of the slab should be 2 inches (5.1 centimeters) above the ground level. The depth of the slab below the ground level and its structural design is governed by the type of soil and climatic conditions. The slab must not be in contact with any part of the building wall or foundation. The space between the slab and the building wall prevents the possibility of transmitting vibration to the building.

When installing a unit on the roof of a building, the structural members supporting the unit must be sufficiently strong for the combined weight of the installation. Transmission of sound into the building can be a problem if the structure is not strong enough.

Do not install the unit in an indoor location. Do not locate the air inlets near contaminated air or near exhaust vents. For optimal operation of the unit, adequate combustion and ventilation air must be provided in compliance with Section 5.3 (Air for Combustion and Ventilation) of the National Fuel Gas Code, ANSI Z223.1 (American National Standards Institute).

NATIONAL STANDARDS AND APPLICABLE CODES

Refrigerant Handling Practices

The handling, reclaiming, recovering, and recycling of refrigerants as well as the equipment to be used and the procedures to be followed must comply with the national and local codes.

United States: Refer to Federal Clean Air Act, latest revision.

Canada: Refer to Canadian Environmental Protection Act, latest revision.

Fuel Codes

The type of fuel appearing on the nameplate must be the type of fuel used. Installation must comply with national and local codes and requirements of the local fuel company.

United States: Refer to NFPA 54/ANSI Z223.1, latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1, latest revision, Natural Gas and Propane Installation Code.

Installation Codes

Installations must be made in accordance with NFPA 90A, latest revision, Standard for the Installation of Air-Conditioning and Ventilation Systems.

Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, NFPA 409, latest revision.

Canada: Refer to Standard CSA B149.1, latest revision, Natural Gas and Propane Installation Code.

Parking Structures and Repair Garages

Installation in garages must be in accordance with the following codes:


Canada: Refer to CSA B149.1, latest revision, Natural Gas and Propane Installation Code.
Electrical
Electrical connection to unit must be in accordance with the following codes:

United States: Refer to National Electrical Code®, NFPA 70, latest revision. Wiring must conform to the most current National Electrical Code, local ordinances, and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1, latest revision.

Venting
The optional gas furnace in the unit must be vented in accordance with the requirements within this manual and with the following codes and any state, provincial, or local codes that may apply:

United States: Refer to NFPA 54/ANSI Z223.1, latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1, latest revision, Natural Gas and Propane Installation Code.

High Altitude
The optional gas furnace in the unit is approved for installations up to 2,000 feet (609.6 meters) (US), 4,500 feet (1371.6 meters) (Canada) without modification. Consult factory if U.S. installation is above 2,000 feet (609.6 meters) or Canadian installation is above 4,500 feet (1371.6 meters).

SPECIFICATIONS
All specification, dimension, and weight information is available in the JR Series Dimension and Selection Guides. Contact your Johnson Controls sales representative for information.

LIFTING A JR SERIES UNIT
The unit must be installed in compliance with all applicable codes. The qualified installer or service technician must use best building practices when installing the unit.

For unit weights and center of gravity information, contact a Johnson Controls representative.

Preparing to Move/Lift the Unit
Prior to moving/lifting the unit, the following steps must be performed.

1. Inspect the unit to verify that there is no damage as a result of shipping or during storage.
2. Ensure that it is appropriately rated for the utilities available at the installation site.
3. Verify that the lifting lugs are intact, undamaged, and secured to the DOAS unit.
4. Verify the installation location to be ready to accept the unit (i.e., roof curb is correct size).
5. Confirm that the moving/lifting equipment can handle the unit’s weight.

Rigging and Handling
Proper rigging and handling of the equipment is mandatory during unloading and setting it into position to retain warranty status. All lifting lugs must be used to prevent twisting and damage to the unit.

Care must be taken to keep the unit in the upright position during rigging and to prevent damage to the watertight seams in the unit casing. Avoid unnecessary jarring or rough handling.

It is also mandatory that an experienced and reliable rigger be selected to handle unloading and final placement of the equipment. The rigger must be advised that the unit contains internal components and that it be handled in an upright position. Care must be exercised to avoid twisting the equipment structure.

Unit weights must be referred to when selecting a crane for rigging and figuring roof weight loads. Contact your Johnson Controls representative if you have any questions regarding unit weights.

The unit should be lifted so that it is directly above the roof curb and duct openings. Be sure to check that the gasket is in place beforehand. Lower the unit carefully onto the curb and align the unit to the proper utility and duct openings. Make sure the unit is properly seated on the curb and that it is level.
SECTION 1 - INSTALLATION

LIFTING LUGS: JR SERIES A, B, C, D
NO EXHAUST, AND BXL CABINETS

FIGURE 4 - LIFTING LUGS

ROOF CURB

Roof curbs are available for units that are to be installed on a typical flat roof (e.g., bonded or corrugated) with no seismic restraint requirements.

- If seismic restraint is required for the unit, please contact factory.
- If high wind load (hurricane) installation is required, please contact the factory.

**Before installation, verify that you have the correct roof curb and that all required components are present.**

Roof Curb Assembly and Installation

Make openings in the roof decking that are large enough to allow for duct penetration and work space only. Do not make the openings larger than necessary. Make sure the curb is level in both horizontal axes and aligns properly with the openings. This is necessary for the unit to drain properly and reduce noise and vibration. Correct placement of the unit onto the curb is important to operating performance. Ensure that there is proper duct opening alignment.

The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket with the roof curb. An improperly applied gasket can also cause air leaks and lead to reduced performance of the unit.

Place the curb on the roof in the position in which it will be installed. Check that the diagonal measurements are within 1/16 inch (1.6 millimeters) of each other. To ensure a weatherproof seal between the unit and the curb, the curb must be level with no twist from end to end. Shim level as required and secure curb to roof deck using best building practices. Inspect curb to ensure that none of the field piping routed through the curb protrude above the curb. Install roofing material as required.

**Check the installation location to ensure proper clearances to combustibles and clearance for access.**
Unit Mounting to Roof Curb
After the curb has been installed, the unit can be placed on the curb. There must be a suitable gasket between the top of the curb and the underneath of the unit, such as a 3/8-inch (0.95-centimeter) x 2-inch (5.1-centimeter) closed cell neoprene insulation (supplied by others) to provide a proper air seal and prevent moisture from leaking into the building (e.g., from driving rains or melting snow).

The installer is responsible for securing the unit to the curb per all applicable codes. In local jurisdiction with wind load or required hurricane qualifications, additional project specific securing may be required.

Consult the curb manufacturer’s documentation for specific curb installations recommendations.

DUCT CONSIDERATIONS
The unit has been selected and ordered to operate at a project specific air volume and external static pressure. This external static pressure is generated by any additional components that are added to the air stream (ductwork, etc). Additional static pressure beyond the original design will affect the performance of the packaged air conditioning unit and reduce the air volume that can be delivered. To minimized duct losses and sound transmission, duct work should be designed per ASHRAE Standards and Sheet Metal and Air Conditioning Contractors National Association (SMACNA) recommendations.

The JR Series product line has been designed so that all fan selections operate within compartments that provide radial and axial clearances that exceed those clearances used when AMCA fan performances curves were generated by the fan manufacturers. The fan performance can be accurately predicted using fan performance information without the application of cabinet correction factors.

Proper engineering methods must be used when calculating external duct and component static pressure losses (e.g., 2009 ASHRAE Handbook – Fundamentals, Chapter 21).

The system ductwork should comply with SMACNA or any other recognized standards.

It is recommended that flexible duct connections be incorporated into the ductwork design to prevent the transmission of any vibrations, either mechanical or harmonic.

As a general rule, all ducts should have a straight run of at least three hydraulic duct diameters immediately before and after the unit before adding any fittings, elbows, restrictions, etc.
Hydraulic duct diameter for round ducts (in inches):

\[ Dh = d \]

\( Dh \): hydraulic diameter
\( d \): round duct inside diameter

Hydraulic duct diameter for rectangular ducts (in inches):

\[ Dh = \frac{2*H*W}{H+W} \]

\( Dh \): hydraulic diameter
\( H \): rectangular duct inside height
\( W \): rectangular duct inside width

The unit is not designed to support the weight of ductwork. Ductwork must be constructed in a fashion that is self-supporting.

Depending on the options ordered with the unit, collars (either external or internal) are provided to facilitate connection of ductwork. In cases where duct collars are not provided, flat surfaces on the exterior skin of the unit are provided to facilitate connection of ductwork.

The provided duct collars or exterior skin of the unit should not be used to support the weight of the ductwork. Ductwork support must come from the building structure.

Ductwork passing through unconditioned spaces must be insulated (including a vapor barrier) to prevent unnecessary energy losses and/or condensation.

**Return Air Ductwork**

Return air ductwork must be properly sized for a reasonable static pressure drop at maximum cfm.

**Discharge Ductwork**

Discharge air ductwork must be properly sized for a reasonable static pressure drop at maximum cfm.

**REFRIGERATION CIRCUITS**

**Refrigerant**

The JR Series product utilizes R-410A, a refrigerant with a very low ozone depletion rating. Equipment utilizing R-410A refrigerant operates at higher pressures than other typical refrigerants, such as R-22 systems. Do not use R-22 service and equipment or components on systems designed for the use of R-410A. Do not vent R-410A into the atmosphere. The U.S. Clean Air Act requires the recovery of any residual refrigerant.

System components have been sized and pressure switch settings have been adjusted for the reduced refrigerant flows and higher operating pressures.

The unit has a broad application range. For optimum performance and efficiency, it may be necessary to adjust the refrigerant charge to maintain desired subcooling and superheat at design operating temperature extremes. The performance and efficiency of the system is very dependent upon having the correct amount of refrigerant in the system. All testing and required addition or removal of refrigerant should be done by a qualified, EPA licensed refrigeration systems technician.

**Refrigerant Charging**

The JR Series comes from the factory with the appropriate operating charge of R-410A.

The specific operating charge for each refrigerant circuit can be found in the upper left-hand corner on the Manufacturer’s Data Tag, as shown in Figure 6 on page 23. The unit will operate at design ambient at this charge level. If unit charge has been lost (leak), additional refrigerant can be added or adjusted by checking system superheat and subcooling.

Charge adjustment might be necessary if subcooling temperatures are too high due to excess refrigerant in the system that is subsequently backed up in the condenser. This symptom could also indicate a failed TXV or line restriction. If there is no line restriction and the TXV is working correctly, reclaim enough R-410A refrigerant so the system ambient compensated pressure readings are at the desired levels. Use a refrigerant recovery unit to safely remove the refrigerant, because it is illegal to release R-410A refrigerant into the atmosphere. After the addition or removal of refrigerant, the unit must be allowed to stabilize for at least 10 minutes before reaching any conclusions if any other adjustments need to be made.
The type of unit and operation determines the ranges for liquid subcooling and evaporator superheat. The system is overcharged if the subcooling temperature is too high and the evaporator is fully loaded. High superheat results in increased subcooling. The system is defined as undercharged if the superheat is too high and the subcooling is too low.

To correct an undercharged system, add refrigerant to reduce the superheat and raise subcooling. If the subcooling is correct and the superheat is too high, the TXV may need adjustment to correct the superheat.

When checking charge, units with hot gas reheat must be checked with the hot gas reheat valves closed and the system in cooling mode. To confirm proper charge, the unit should be left in reheat mode to check for proper operation.

The charge for heat pump units must be checked in the heating mode, and after adjusting charge, the unit operation in cooling mode must be checked when compared to Table 1 on page 23. Adjust charge as necessary. If the operating charge is changed in the cooling mode, system operation must be checked again in heating mode to proper readings.

### TABLE 1 - AMBIENT CHARGE TABLES

<table>
<thead>
<tr>
<th>AMBIENT AIR TEMP</th>
<th>95.0°F</th>
<th>85.0°F</th>
<th>75.0°F</th>
<th>65.0°F</th>
<th>55.0°F</th>
<th>45.0°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcool</td>
<td>10.0–12.0°F</td>
<td>No Reheat circuit in unit</td>
<td>In Heating mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subcool</td>
<td>12.0–15.0°F</td>
<td>No Reheat circuit in unit</td>
<td>In Heating mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superheat</td>
<td>13.0–16.0°F</td>
<td>No Reheat circuit in unit</td>
<td>In Heating mode</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Subcooling readings must be taken with the reheat circuit disabled.

To calculate subcooling temperature, convert liquid line head pressure to condensing temperature. Then subtract liquid line temperature.
TABLE 1 - AMBIENT CHARGE TABLES (CONT'D)

<table>
<thead>
<tr>
<th>AMBIENT AIR TEMP</th>
<th>95.0°F</th>
<th>85.0°F</th>
<th>75.0°F</th>
<th>65.0°F</th>
<th>55.0°F</th>
<th>45.0°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcool</td>
<td>12.0–15.0°F</td>
<td></td>
<td></td>
<td></td>
<td>15.0–18.0°F</td>
<td></td>
</tr>
<tr>
<td>Superheat</td>
<td>10.0–12.0°F</td>
<td>8.0–10.0°F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Subcooling readings must be taken with the reheat circuit disabled

To calculate subcooling temperature, convert liquid line head pressure to condensing temperature. Then subtract liquid line temperature.

HEAT PUMP UNIT SUBCOOL AND SUPERHEAT

<table>
<thead>
<tr>
<th>AMBIENT AIR TEMP</th>
<th>95.0°F</th>
<th>85.0°F</th>
<th>75.0°F</th>
<th>65.0°F</th>
<th>55.0°F</th>
<th>45.0°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcool</td>
<td>8.0–10.0°F</td>
<td></td>
<td></td>
<td></td>
<td>In Heating mode</td>
<td></td>
</tr>
<tr>
<td>Superheat</td>
<td>10.0–18.0°F</td>
<td>In Heating mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Subcooling readings must be taken with the reheat circuit disabled

To calculate subcooling temperature, convert liquid line head pressure to condensing temperature. Then subtract liquid line temperature.

COMPONENTS AND CONFIGURATIONS

Compressors

**Principal of Operation**

All JR Series models have multiple compressor options available for configuration. Refer to the JR Series NOMENCLATURE to determine which option is included in the unit. The units have the following features:

- Fully hermetic, scroll compressor(s) with overload protection and short cycle protection with minimum run and off cycle timers
- All rotating components including compressors and fans are phased at the factory
- The optional digital compressor is available on the lead or both refrigeration circuits. The unit’s controller will provide control over the digital compressor, as well as provide protection and maintain operation inside of the design envelope. The control system is capable of unloading the compressor in an unlimited number of steps from 100% capacity down to 10% capacity when such operation is within the design envelope
- On larger circuits, the compressors are tandem type, with the option of the lead compressor in each tandem being a digital compressor
- Compressors are mounted on rubber in shear isolators and refrigerant lines to include reaction torque loops. Reverse rotation protection shall be provide or all compressors
- Crankcase heaters must be energized at least 24 hours before starting the system’s compressor to clear any liquid refrigerant that has settled in the crankcase
- After initial start-up, the crankcase heater must be energized when the compressor is in an off cycle, either by demand or unoccupied cycle

There are many different refrigeration circuit variations available. Depending on the configuration, the unit may include, but is not limited to, the following components:

- Accumulator
- Coil
- Evaporator coil
- Condenser coil
- Coaxial coil
- Compressor
- Standard scroll
- Digital scroll
- Filter drier
- Hot gas bypass valve
- Hot gas reheat component
- Check valve Coil
- Solenoid valve (standard)
- Modulating bypass
• Modulating reheat valve(s)
• Oil separator
• Receiver
• Refrigerant pressure switches
  • High and Low
  • Non-adjustable
• Switchable liquid sub-cooling components
• Coil(s)
• Check valve
• Thermal expansion valve (TXV)

See Figure 7 on page 25 through Figure 13 on page 28 for schematics of the most common refrigeration circuit configurations. All schematics illustrate a single compressor, single circuit, cooling only system.

• For single-circuit systems with a tandem compressor, the pair of compressors is mounted on a common base that is used together on a single refrigeration circuit
• For dual-circuit systems with two independent compressors, the circuitry and components are duplicated for the second circuit
• For heat-pump systems, a reversing valve is included

**FIGURE 7 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR AND HOT GAS BYPASS W/ NO HOT GAS REHEAT**
SECTION 1 - INSTALLATION

FIGURE 8 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND STANDARD HOT GAS REHEAT

FIGURE 9 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND MODULATING HOT GAS REHEAT
**Figure 10** - CIRCUIT DIAGRAM FOR DIGITAL COMPRESSOR AND MODULATING HOT GAS REHEAT

**Figure 11** - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND STANDARD HOT GAS REHEAT AND SUBCOOLING
SECTION 1 - INSTALLATION

FIGURE 12 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND MODULATING HOT GAS REHEAT AND SUBCOOLING

FIGURE 13 - CIRCUIT DIAGRAM FOR DIGITAL COMPRESSOR, MODULATING HOT GAS REHEAT AND SUBCOOLING
Energy Conservation Wheels

Principal of Operation

The energy conservation wheel (ECW) module is designed to recover energy that would normally be lost through the exhaust component of ventilation, as required by today’s codes and standards for comfort and health. The energy recovery cassette is a self-contained unit that consists of a frame, wheel, wheel drive motor with VFD, and energy transfer segments. The segments rotate through a 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 components’ individual functions are listed as the following:

- Enthalpy wheel: Active air-to-air heat exchanger portion of the module. It is constructed on corrugated synthetic fiber-based media impregnated with a non-migrating water selective molecular sieve desiccant. Standard wheels are 4 inches (10.1 centimeters) thick and transfer the total energy (sensible and latent) between the opposing airstreams
- Cassette: Steel structure composed of bent and punched sheet metal that houses the enthalpy wheel
- Drive Motor: Constant speed, 220/1/60 motor rotates the enthalpy wheel at a typical speed of 45 RPM
- Variable Frequency Drive (Optional): Drive can be used to vary the wheel's rotation speed

![Figure 14 - Energy Conservation Wheel (ECW)](LD22578)
### TABLE 2 - ENERGY CONSERVATION WHEEL (ECW) SPECIFICATIONS

<table>
<thead>
<tr>
<th>ECW MODEL</th>
<th>FLOW RATE (SCFM)</th>
<th>MAX CFM</th>
<th>DRIVE MOTOR (HP)</th>
<th>WHEEL DEPTH (IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>244</td>
<td>900</td>
<td>1177</td>
<td>1/20</td>
<td>4</td>
</tr>
<tr>
<td>324</td>
<td>1500</td>
<td>2092</td>
<td>1/2</td>
<td>4</td>
</tr>
<tr>
<td>364</td>
<td>2000</td>
<td>2647</td>
<td>1/2</td>
<td>4</td>
</tr>
<tr>
<td>424</td>
<td>3000</td>
<td>3607</td>
<td>1/2</td>
<td>4</td>
</tr>
<tr>
<td>484</td>
<td>4000</td>
<td>4710</td>
<td>1/2</td>
<td>4</td>
</tr>
<tr>
<td>486</td>
<td>5000</td>
<td>5966</td>
<td>1/2</td>
<td>6</td>
</tr>
<tr>
<td>544</td>
<td>5000</td>
<td>5962</td>
<td>3/4</td>
<td>4</td>
</tr>
<tr>
<td>604</td>
<td>6000</td>
<td>7357</td>
<td>3/4</td>
<td>4</td>
</tr>
<tr>
<td>606</td>
<td>7500</td>
<td>9319</td>
<td>3/4</td>
<td>6</td>
</tr>
<tr>
<td>664</td>
<td>7500</td>
<td>8902</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>666</td>
<td>9500</td>
<td>11276</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>706</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>724</td>
<td>9500</td>
<td>10597</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>726</td>
<td>11000</td>
<td>13423</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>784</td>
<td>11000</td>
<td>12434</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>786</td>
<td>13000</td>
<td>15750</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>812</td>
<td></td>
<td>15750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>844</td>
<td>13000</td>
<td>14422</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>846</td>
<td>15000</td>
<td>18268</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>8412</td>
<td></td>
<td>18268</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pre Start-up Checks

Before starting up the unit, check the following:

1. Does the rotor rotate freely by hand? If not, re-check the seal to determine whether or not it is binding and if so, adjust seals following the instructions below.

2. Is the motor rotation correct? This can be checked by detaching the belts from the drive sheave and bumping the motor. The sheave should be rotating in the direction that the belt will result in rotation per the exterior markings. If not, rewire the motor.

3. Does the airflow orientation match up to design? See the identification markings on the cassette and/or refer to the general arrangement drawing to check the four duct connections to the unit.

4. Are the belts on correctly and sufficiently tight? Belt length is set by the manufacturer. Consult NovelAire if the belt appears too loose.

5. Is the VFD programmed to control the unit and to prevent frost formation? If not, follow the instructions in the manual accompanying the VFD and/or consult NovelAire.

### Seal Checks

The ECW is provided with a neoprene bulb seal that provides not only an effective seal in both the peripheral and side-to-side sealing directions but also one that is easily adjusted to compensate for seal run-in, shipping misalignment, etc. The neoprene bulb is attached to a metal reinforced U-shaped neoprene grip.

The metal/neoprene grip allows for an expandable grip range that can be moved closer or further from the sealing face as needed. The peripheral bulb seals against the wheel outer band and the inner bulb seals against the wheel face. With the wheel stopped, move seals as close to the sealing surface as possible without exceeding grip range of bulb seal and without pressing the bulb down against the seal face. Bump the motor. If the motor will not turn, the seal is too close and should be nudged back where needed. The seal will seek its equilibrium position based on the closest part of the sealing face. Because the seal is meant to be a non-contact seal, small gaps may be seen between seal and sealing surface once the equilibrium position is reached. Seal leakage is meant to be below 5% at 1 inch of differential between supply and exhaust. Some seal run-in is to be expected; do not be alarmed by small amounts of wear in the neoprene.
### Variable Speed Drive (VFD)
Check the power supply for proper rating. Make sure that the proper jumper orientation is used for the specific control input. Ensure that the unit is programmed for proper input voltage and output voltage.

### Gas Furnaces

#### Principle of Operation
The gas furnace is an 80% efficient, self-contained duct furnace that can burn natural gas or LPG. It is comprised of:

- **Manifold:** Includes combination gas valve incorporating redundant safety shut-off valve, manual shut-off, and gas regulator
- **Burners:** Inshot gas burners with direct spark ignition and remote flame sensor to ensure carry-over across all burners
- **Heat Exchanger:** Serpentine heat exchanger constructed of 409 stainless steel
- **Combustion Blower:** To provide for positive venting of flue gases
- **Pressure Switch:** To prove air supply for combustion
- **Integral 1/8-inch NPT Tapped Test Gauge:** For measuring gas pressure to the burners
- **Multi-Tap Transformer:** To provide 24 VAC control voltage at selected input voltage.

See Figure 15 on page 31 for locations of the main components of the furnace.

---

**FIGURE 15 - GAS FURNACE COMPONENT LOCATION**
### TABLE 3 - GAS FURNACE SPECIFICATIONS

<table>
<thead>
<tr>
<th>MAX INPUT kBTU</th>
<th>TURN DOWN MAX</th>
<th>CFM RISE MAX</th>
<th>MAX APD TEMP RISE MAX</th>
<th>CFM RISE MIN APD TEMP RISE MAX</th>
<th>TOTAL AMPS 230 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>5 to 1</td>
<td>2,778</td>
<td>.02</td>
<td>60</td>
<td>926 .01</td>
</tr>
<tr>
<td>100</td>
<td>10 to 1</td>
<td>3,704</td>
<td>.05</td>
<td>60</td>
<td>1,235 .01</td>
</tr>
<tr>
<td>150</td>
<td>10 to 1</td>
<td>5,556</td>
<td>.14</td>
<td>60</td>
<td>1,852 .03</td>
</tr>
<tr>
<td>200</td>
<td>10 to 1</td>
<td>7,407</td>
<td>.33</td>
<td>60</td>
<td>2,469 .06</td>
</tr>
<tr>
<td>250</td>
<td>10 to 1</td>
<td>9,259</td>
<td>.54</td>
<td>60</td>
<td>3,086 .1</td>
</tr>
<tr>
<td>300</td>
<td>10 to 1</td>
<td>11,111</td>
<td>.91</td>
<td>60</td>
<td>3,704 .17</td>
</tr>
<tr>
<td>350</td>
<td>10 to 1</td>
<td>12,963</td>
<td>1.42</td>
<td>60</td>
<td>4,321 .26</td>
</tr>
<tr>
<td>400</td>
<td>10 to 1</td>
<td>14,815</td>
<td>1.95</td>
<td>60</td>
<td>4,938 .36</td>
</tr>
</tbody>
</table>

### Gas Piping and Pressure

Installation of piping must conform with local building codes and ordinances, or in the absences of local codes, all gas piping to the unit must comply with:

- United States: Refer to NFPA 54/ANSI Z223.1, latest revision, National Fuel Gas Code.
- Canada: Refer to CSA B149.1, latest revision, Natural Gas and Propane Installation Code.

Use a pipe sealant resistant to LP gases on gas supply connections to the heater. Properly support the gas valve with a backup wrench during supply pipe installation to prevent loosening of the valve or damage to the burner assembly or manifold. Gas piping must be sized for the total Btu input of the heater serviced by a single supply.

The gas furnace is equipped to handle a maximum gas supply pressure of 13.5 inches W.C. (33.5 mbar). When gas supply exceeds this maximum gas pressure, an additional high gas pressure gas regulator will be required by others to insure that the correct gas pressure is supplied to the combination gas valve. Regulators must comply with the latest edition of the Standard for Line Pressure Regulators, ANSI Z21.80/CSA6.22.

For minimum inlet gas pressure, refer to Table 4 on page 32.

### TABLE 4 - MANIFOLD SIZE AND MINIMUM PRESSURES

<table>
<thead>
<tr>
<th>MIN HEAT INPUT Btu/h (kW)</th>
<th>GAS NPT CONNECTION Inch</th>
<th>MIN INLET GAS PRESSURE - NG Inches W.C. (mbar)</th>
<th>MIN INLET GAS PRESSURE - LPG Inches W.C. (mbar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 400,000 (117.2)</td>
<td>0.75</td>
<td>5.0 (12.5)</td>
<td>11.0 (27.4)</td>
</tr>
<tr>
<td>&gt; 400,000 (117.2)</td>
<td>1.00</td>
<td>6.0 (14.9)</td>
<td>12.0 (29.9)</td>
</tr>
</tbody>
</table>

The gas train is piped through an outside wall when requested. If is required to go through the curb gas connection, the connection is made as necessary in the furnace vestibule compartment. A manual shut-off valve must be provided by others. Gas piping and the manual shut-off valve must conform to best building practices and local codes. Support piping with hangers and not with the furnace itself.

Two 1/8-inch NPT pressure test ports for measuring manifold inlet pressure are located on the gas valve.

### Condensate Drain Installation

Units utilizing 100% outside air for operation may encounter some condensate in the burner chamber. For this reason, a properly sized condensate trap must be installed at the burner box to allow removal of this condensate.
When this condensate trap is exposed to temperatures below 32.0°F, electric heat trace must be installed as well to prevent freezing and rupturing of the trap.

The electric heat trace is field provided and installed. Power for the heat trace must come from a separate source and not the unit.

**NOTE:** A P-Trap is recommended as the system operates under a negative pressure. A tee fitting is recommended to allow for priming and cleaning the trap. Use a plug in the cleanout opening. DO NOT USE COPPER TUBING for condensate drain lines as the flue gas is slightly acidic.

**VENTING OUTDOOR INSTALLATION**

The venting system is designed for direct discharge of flue gases to the outdoors. The vent discharge should be unobstructed to the outside and should be as far away from the combustion gases as possible. However, the venting and combustion air must be in the same pressure zone.

For horizontal venting, the unit has been provided with downward pitching vent duct for the furnace gases. The rain hood provided prevents driven rain from entering the duct. Ensure the rain hood does not intersect the discharge gases.

Where sufficient horizontal clearance for the proper horizontal ventilation clearance cannot be provided, or in jurisdictions requiring a 4-foot separation between flue gas discharge and the combustion air inlet, flue gases need to be vented vertically. The vent pipe must terminate at a minimum of 1 foot above the top of the unit cabinet. Condensation in the vent pipe is likely to occur during heater start-up, and provision for condensate drainage must be provided. Refer to *Figure 18 on page 33* for a typical vertical flue gas discharge setup.
SECTION 1 - INSTALLATION

**Ventilation**

All gas fired furnaces need an ample supply of air for proper and safe combustion of the fuel gas. If sufficient quantities of combustion air are not available to the furnace, then this will result in poor combustion and inefficient operation. The heating unit cabinet combustion air openings should be unobstructed so that 1 square inch of free area per 4,000 Btu/h of input is available.

**Piping Supports**

Gas supply piping must be supported starting from the connection of the unit. If long stretches of piping are expected to be used, there must be supports at intervals of every 6–8 feet. Metal straps, blocks, or hooks are acceptable to support the gas piping. The piping should never be strained or bent.

**Operating and Safety Controls**

Safety systems are required for proper performance of the gas furnace. The gas furnace shall not be permitted to operate with any safety system disabled. If a fault is found in any of the safety systems, then the system shall be repaired only by a contractor qualified in the installation and service of gas fired heating equipment, using only components that are sold and supplied by Johnson Controls.

- **Combustion Airflow Switch:** An airflow switch is provided as part of the control system to verify airflow through induced draft fan by monitoring the difference in pressure between the fan and the atmosphere. If sufficient negative pressure is not present, indicating lack of proper air movement through heat exchanger, the switch opens shutting off gas supply though the ignition control module. The air pressure switch has fixed settings and is not adjustable.

- **Rollout Switch (Manual Reset):** The furnace is equipped with manual reset rollout switch(es) in the event of burner flame rollout. 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 rollout condition is identified. The rollout switch can be reset by pressing the button on the top of the switch.

- **Primary High Limit Switch:** To prevent operation of the furnace under low airflow conditions, the unit is equipped with a fixed temperature high limit switch mounted on the vestibule panel. This switch will shut off gas to the furnace through the ignition control module before the air temperature reaches 250.0°F (121.1°C). Reduced airflow may be caused by restrictions upstream or downstream of the circulating air blower, such as dirty or blocked filters or restriction of the air inlet or outlet to the unit. The high limit switch will shut off the gas when the temperature reaches its setpoint and then reset when the temperature drops 30.0°F (16.7°C) below the setpoint, initiating a furnace ignition. The furnace will continue to cycle on limit until the cause of the reduced air flow is corrected.

- **Ignition Control Module:** Ignition control modules are available having a number of different operating functions. Refer to Sequence of Operation and Control Diagnostic data sheets provided in the instruction package for a detailed description of the control features, operation, and troubleshooting for the model control installed.

**Wiring**

All electric wiring and connections, including electrical grounding, must comply with:

- United States: Refer to National Electric Code, NFPA 70, latest revision.
- Canada: Refer to Canadian Electric Code, CSA C22.1 Part 1, latest revision.

Check rating plate on unit for supply voltage and current requirements.

If any of the original control wire supplied with the gas furnace must be replaced, replace it with type THHN 221.0°F (105.0°C), 600 V, 16 gauge wire or equivalent. Consult factory for XL-compliant furnace wiring diagrams and information.

**Sequence of Operation for Two-Stage Furnace with 75–200 MBH (21.9–58.6 kW) Input**

When system is powered up, 24 VAC will be applied to the ignition control terminals 24VAC/R and to the timer relay control.

The ignition control will reset, perform a self check routine, flash the diagnostic LED for up to 4 seconds,
and enter the thermostat scan standby state. The amber light on the timer relay control will be lit indicating it is in the ready position.

**Call for Heat**

Controller provides contact closure (1st and 2nd stage) on call for heat.

24 VAC is supplied to ignition control terminal TH, provided limit switch is in closed position.

The control will check that pressure switch contacts are open (ignition control terminal PSW is not powered).

Combustion blower is then energized at high speed.

When the airflow switch closes, a 15-second pre-purge period begins.

At end of pre-purge period, the spark commences and the first stage gas valve is energized for the trial for ignition period. (If the burners fail to light or carryover during a trial for ignition, the control will attempt two additional ignition trials. If no flame is present at the flame sensor within 10 seconds, the spark and gas valve will be de-energized. A 15-second inter-purge period begins and the combustion blower continues to run. After the inter-purge period, another ignition trial will take place. If burner fails to light or prove the flame sensor following the two additional trials, the control will go into lockout. The valve relay in the ignition control will be de-energized, shutting off the gas valve immediately and the combustion blower following a 30 second post-purge period. If the thermostat (controller) is still calling for heat 1 hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.)

Burners ignite and cross light. Timer relay control is powered (terminal 7) simultaneously and begins timing a 90 second warm-up period while maintaining the combustion blower at high speed. The timer relay control will maintain this mode of operation, regardless of status of thermostat second stage.

When flame is detected by flame sensor, the spark is shut off immediately and gas valve(s) and combustion blower remain energized.

When the initial timer in timer relay control times out, it defaults the gas valve to low fire, the combustion blower to low speed, and returns control of the operating mode to the temperature controller.

If the controller is calling for second stage heat timer relay control terminal 6 is powered. After a short time delay (approximately 15 seconds), the system switches the combustion blower to high speed and the second stage gas valve at 3.5 inches W.C. (8.7 mbar) manifold pressure, provided the high air pressure switch is proven.

During heating operation, the thermostat, pressure switch, and main burner flame are constantly monitored by the ignition control to ensure proper system operation.

Operation continues on high fire until the second stage thermostat is satisfied, opening the second stage contact and de-energizing terminal 6 on the timer relay control, turning off the second stage gas valve and returning the combustion blower to low speed.

When the thermostat (controller) is satisfied and the demand for heat ends, the first stage valve is de-energized immediately, the control senses loss of flame, and a 30-second post-purge occurs (at high speed) before de-energizing the combustion blower.

**Sequence of Operation for Two-Stage Furnace with 250–400 MBH (73.3–117.2 kW) Input**

When system is powered up 24 VAC will be applied to the ignition control (ignition control) terminals 24VAC/R and to the timer relay control.

The ignition control will reset, perform a self check routine, flash the diagnostic LED for up to 4 seconds, and enter the thermostat scan standby state. The amber light on the timer relay control will be lit indicating it is in the ready position.

**Call for Heat**

Controller provides contact closure (1st and 2nd stage) on call for heat.

24 VAC to be supplied to ignition control terminal TH, provided limit switch is in closed position.

The control will check that pressure switch contacts are open (ignition control terminal PSW is not powered).

Combustion blower is then energized at high speed.

When the airflow switch closes, a 15-second pre-purge period begins.

At end of pre-purge period, the spark commences and the first stage gas valve is energized for the trial for ignition period. (If the burners fail to light or carryover during a trial for ignition, the control will attempt two
additional ignition trials. If no flame is present at the flame sensor within 10 seconds, the spark and gas valve will be de-energized. A 15-second inter-purge period begins and the combustion blower continues to run. After the inter-purge period, another ignition trial will take place. If burner fails to light or prove the flame sensor following the two additional trials, the control will go into lockout. The valve relay in the ignition control will be de-energized, shutting off the gas valve immediately and the combustion blower following a 30-second post-purge period. If the thermostat (controller) is still calling for heat 1 hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.)

Burners ignite and cross light. Timer relay control is powered (terminal 7) simultaneously and begins timing a 90-second warm-up period while maintaining the combustion blower at high speed. The timer relay control will maintain this mode of operation, regardless of status of thermostat second stage.

When flame is detected by flame sensor, the spark is shut off immediately and gas valve(s) and combustion blower remain energized.

When the initial timer in timer relay control times out, it defaults the gas valve to low fire, the combustion blower to low speed, and returns control of the operating mode to the temperature controller.

If the controller is calling for second stage heat, timer relay control terminal 6 is powered. After a short time delay (approximately 15 seconds), the system switches the combustion blower to high speed and the second stage gas valve at 3.5 inches W.C. (8.7 mbar) manifold pressure, provided the high air pressure switch is proven.

During heating operation, the thermostat, pressure switch, and main burner flame are constantly monitored by the ignition control to assure proper system operation.

Operation continues on high fire until the second stage thermostat is satisfied, opening the second stage contact and de-energizes terminal 6 on the timer relay control, turning off the second stage gas valve and returning the combustion blower to low speed.

When the thermostat (controller) is satisfied and the demand for heat ends, the first stage valve is de-energized immediately, the control senses loss of flame and a 30-second post-purge occurs (at high speed) before de-energizing the combustion blower.

**Sequence of Operation for 20–100% Modulating Furnace with 75–200 MBH (21.9–58.6 kW) Input**

When system is powered up 24 VAC will be applied to the ignition control (ignition control) terminals 24VAC/R and to the timer relay control.

The ignition control will reset, perform a self check routine, flash the diagnostic LED for up to 4 seconds, and enter the thermostat scan standby state. The amber light on the timer relay control will be lit indicating it is in the ready position.

**Call for Heat**

Controller provides contact closure on call for heat.

24 VAC to be supplied to ignition control terminal TH, provided limit switch is in closed position.

The control will check that pressure switch contacts are open (ignition control terminal PSW is not powered).

Combustion blower is then energized at high speed.

When the airflow switch closes, a 15-second pre-purge period begins.

At end of pre-purge period, the spark commences and the first stage gas valve is energized for the trial for ignition period. (If the burners fail to light or carry-over during a trial for ignition, the control will attempt two additional ignition trials. If no flame is present at the flame sensor within 10 seconds, the spark and gas valve will be de-energized. A 15-second inter-purge period begins and the combustion blower continues to run. After the inter-purge period, another ignition trial will take place. If burner fails to light or prove the flame sensor following the two additional trials, the control will go into lockout. The valve relay in the ignition control will be de-energized, shutting off the gas valve immediately and the combustion blower following a 30-second post-purge period. If the thermostat (controller) is still calling for heat 1 hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.)

Burners ignite and cross light. Timer relay control is powered (terminal 7) simultaneously and begins timing a 90-second warm-up period while maintaining the combustion blower at high speed and powers the SC30. The SC30 will output 12–13 VDC to the modulating control valve during the timing duration (90 seconds) of timer relay control, regardless of the analog input signal to SC30 terminals 7 & 8.
When flame is detected by flame sensor, the spark is shut off immediately and gas valve(s) and combustion blower remain energized.

When the initial timer in timer relay control times out, it defaults the gas valve to low fire and the combustion blower to low speed and returns control of the operating mode to the building temperature controller.

If the controller is providing an analog signal between 0.5–5.3 VDC to the SC30 control, the system will continue to run at low speed combustion blower and with only the first stage valve open. The modulating valve will be powered proportional to the input voltage signal from the controller and will open or close changing the gas manifold pressure. Manifold pressure will vary from 0.4–1.2 inches W.C. (1.0–3.0 mbar) operating in this mode.

If the signal increases above 5.3 VDC, the SC30 relay closes powering terminal 6 on the timer relay control, and starts a second time delay of 15 seconds. At the end of this time delay, the fan switches to high speed and the second stage gas valve opens through the timer relay control (terminal 9) provided the high air switch contacts are closed. The manifold pressure will vary from 1.4–3.5 inches W.C. (3.5–8.7 mbar) in this mode.

During heating operation, the thermostat, pressure switch, and main burner flame are constantly monitored by the ignition control to assure proper system operation.

Operation continues in the high fire mode until the controller input signal to the SC30 control drops to 4.7 VDC. At this point, the SC30 relay circuit opens (SC30 terminal 5 has no output), de-energizing the second stage valve, and the timer relay control switches the combustion blower to low speed operation. Low-fire modulation will continue.

When the thermostat (temperature controller) is satisfied and the demand for heat ends, the heat enable contact opens and the first stage valve is de-energized immediately, the control senses loss of flame, and a 30-second post-purge occurs (at high speed) before de-energizing the combustion blower.

**Sequence of Operation for 20–100% Modulating Furnace with 250–400 MBH (73.3–117.2 kW) Input**

When system is powered up, 24 VAC will be applied to the ignition control (ignition control) terminals 24VAC/R and to the timer relay control.

The ignition control will reset, perform a self check routine, flash the diagnostic LED for up to 4 seconds, and enter the thermostat scan standby state. The amber light on the timer relay control will be lit indicating it is in the ready position.

**Call for Heat**

Controller provides contact closure on call for heat.

24 VAC to be supplied to ignition control terminal TH, provided limit switch is in closed position.

The control will check that pressure switch contacts are open (ignition control terminal PSW is not powered).

Combustion blower is then energized at high speed.

When the airflow switch closes, a 15-second pre-purge period begins.

At end of pre-purge period, the spark commences and the first stage gas valve is energized for the trial for ignition period. (If the burners fail to light or carry-over during a trial for ignition, the control will attempt two additional ignition trials. If no flame is present at the flame sensor within 10 seconds, the spark and gas valve will be de-energized. A 15-second inter-purge period begins and the combustion blower continues to run. After the inter-purge period, another ignition trial will take place. If burner fails to light or prove the flame sensor following the two additional trials, the control will go into lockout. The valve relay in the ignition control will be de-energized, shutting off the gas valve immediately and the combustion blower following a 30-second post-purge period. If the thermostat (controller) is still calling for heat 1 hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.)

Burners ignite and cross light. Timer relay control is powered (terminal 7) simultaneously and begins timing a 90-second warm-up period while maintaining the combustion blower at high speed and powers the SC30. The SC30 will output 12–13 VDC to the modulating control valve during the timing duration (90 seconds) of timer relay control regardless of the analog input signal to SC30 terminals 7 & 8.

When flame is detected by flame sensor, the spark is shut off immediately and gas valve(s) and combustion blower remain energized.

When the initial timer in timer relay control times out, it defaults the gas valve to low fire, the combustion blower to low speed, and returns control of the operating mode to the building temperature controller.
If the controller is providing an analog signal between 0.5–5.3 VDC to the SC30 control, the system will continue to run at low speed combustion blower and with only the first stage valve open. The modulating valve will be powered proportional to the input voltage signal from the controller and will open or close changing the gas manifold pressure. Manifold pressure will vary from 0.3–1.2 inches W.C. (0.75–3.0 mbar) operating in this mode.

If the signal increases above 5.3 VDC, the SC30 relay closes powering terminal 6 on the timer relay control, and starts a second time delay of 15 seconds. At the end of this time delay, the fan switches to high speed and the second stage gas valve opens through the timer relay control (terminal 9) provided the high air switch contacts are closed. The manifold pressure will vary from 1.4–3.5 inches W.C. (3.5–8.7 mbar) in this mode.

During heating operation, the thermostat, pressure switch, and main burner flame are constantly monitored by the ignition control to assure proper system operation.

Operation continues in the high fire mode until the controller input signal to the SC30 control drops to 4.7 VDC. At this point, the SC30 relay circuit opens (SC30 terminal 5 has no output), de-energizing the second stage valve, and the timer relay control switches the combustion blower to low speed operation. Low-fire modulation will continue.

When the thermostat (temperature controller) is satisfied and the demand for heat ends, the heat enable contact opens and the first stage valve is de-energized immediately, the control senses loss of flame and a 30-second post-purge occurs (at high speed) before de-energizing the combustion blower.

**Electric Heating Capacity**

Includes nichrome element type, open wire coils with 0.375 inch inside diameter, insulated with ceramic bushings, frame, and control panel mounted in the unit discharge. Coil ends shall be staked and welded to terminal screw slots.

Control panel includes hinged access door, fuses, airflow switch, disconnecting contactors, and safety systems. Power and control wiring is fed back to the unit control panel.

Depending on the unit selected, there are a variety of electric duct heater capacities the unit may be equipped with. Refer to Table 5 on page 39 for capacities.

Safety systems are required for proper performance of the electric heater. The electric heater shall not be permitted to operate with any safety system disabled. If a fault is found in any of the safety systems, then the system shall be repaired only by a contractor qualified in the installation and service of electric heating equipment, using only components that are sold and supplied by Johnson Controls.

- **Air Proving Switch:** An air proving switch is provided as part of the control system to verify airflow across the elements. If sufficient airflow is not present, indicating lack of proper air movement through the elements, the switch opens shutting off the elements. The air proving switch has fixed settings and is not adjustable.

- **Automatic Limit Switch:** To prevent operation of the electric heater under low airflow conditions, the unit is equipped with a fixed temperature high limit switch mounted on the vestibule panel. This switch will shut off heater when the actual discharge air temperature exceeds the switch's setpoint. Reduced airflow may be caused by restrictions upstream or downstream of the circulating air blower, such as dirty or blocked filters or restriction of the air inlet or outlet to the unit.

**Electric Heaters**

**Principle of Operation**

The electric heater is a self-contained duct heater comprised of:

- Power distribution
- Safety circuits
- Control circuit
- Heating elements
### TABLE 5 - ELECTRIC HEATER DATA

<table>
<thead>
<tr>
<th>208 V kW</th>
<th>280/480/575 V kW</th>
<th>208 V 3 PHASE AMPS</th>
<th>240 V 3 PHASE AMPS</th>
<th>480 V 3 PHASE AMPS</th>
<th>575 V 3 PHASE AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.65</td>
<td>5</td>
<td>10</td>
<td>12</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>7.5</td>
<td>10</td>
<td>21</td>
<td>24</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>11.25</td>
<td>15</td>
<td>31</td>
<td>36</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>42</td>
<td>48</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>18.75</td>
<td>25</td>
<td>52</td>
<td>60</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>22.5</td>
<td>30</td>
<td>63</td>
<td>72</td>
<td>36</td>
<td>30</td>
</tr>
<tr>
<td>26.25</td>
<td>35</td>
<td>73</td>
<td>84</td>
<td>42</td>
<td>35</td>
</tr>
<tr>
<td>30</td>
<td>40</td>
<td>83</td>
<td>96</td>
<td>48</td>
<td>40</td>
</tr>
<tr>
<td>37.5</td>
<td>50</td>
<td>104</td>
<td>120</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>45</td>
<td>60</td>
<td>125</td>
<td>144</td>
<td>72</td>
<td>60</td>
</tr>
<tr>
<td>52.5</td>
<td>70</td>
<td>146</td>
<td>168</td>
<td>84</td>
<td>70</td>
</tr>
<tr>
<td>60</td>
<td>80</td>
<td>167</td>
<td>192</td>
<td>96</td>
<td>80</td>
</tr>
<tr>
<td>75</td>
<td>100</td>
<td>208</td>
<td>240</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>81.4</td>
<td>110</td>
<td>229</td>
<td>264</td>
<td>132</td>
<td>110</td>
</tr>
<tr>
<td>90</td>
<td>120</td>
<td>250</td>
<td>288</td>
<td>144</td>
<td>120</td>
</tr>
<tr>
<td>97.5</td>
<td>130</td>
<td>271</td>
<td>312</td>
<td>156</td>
<td>130</td>
</tr>
<tr>
<td>105</td>
<td>140</td>
<td>292</td>
<td>336</td>
<td>168</td>
<td>140</td>
</tr>
<tr>
<td>112.5</td>
<td>150</td>
<td>313</td>
<td>360</td>
<td>180</td>
<td>150</td>
</tr>
</tbody>
</table>
Wiring Diagrams

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM
FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)
Figure 19 - 208/230/460/575-3-60 Wiring Diagram (Cont'd)
FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)
When using a SDR-3/3X Valve (0564P-0002) use SDR-3/3X SW1 settings. All other modulating valves SW1 Normal Settings. See label on valve to insure the proper setting is used for SW1

For normal operation the “CN1” jumper should be at the 0-10V pin position. SW1 dip switch bank should be set as shown below based on the modulating valve used.

To force the reheat valve closed place a jumper between the CLS and REF terminals.
To force the reheat valve open place a jumper between the OPN and REF terminals.

wire all shield wires to closest TB-A or TB-D “GND” terminal at the control panel
Section 1 - Installation

**Form 100.54-NOM2**

**Issue Date: 11/12/2019**

---

**Symbol Legend**

- Factory Wiring
- Field Wiring
- Terminal Board

---

**FACTORY WIRING**

**FIELD WIRING**

**TERMINAL BOARD**

---

**Use Shielded Wire for All Analog Inputs**

**Wire All Shield Wires to Closest TB-A or TB-D "GND" Terminal at the Control Panel**

---

**Notice:** The supply/discharge air temperature/relative humidity (Dx LAT) is factory supplied for field installation. The supply air duct sensor must be installed downstream of the heater. Where it cannot "see" freezing elements. Where sufficient mixing of discharge air occurs. Use 18 AWG shielded wire. Do not run sensor wiring in the same conduit as line voltage wiring or with wiring that switches highly inductive loads such as contactors and relay coils.

---

**Note:** The supply/discharge air temperature/relative humidity (Dx LAT) is factory supplied for field installation. The supply air duct sensor must be installed downstream of the heater. Where it cannot "see" freezing elements. Where sufficient mixing of discharge air occurs. Use 18 AWG shielded wire. Do not run sensor wiring in the same conduit as line voltage wiring or with wiring that switches highly inductive loads such as contactors and relay coils.

---

**Legend:**

- 24VAC
- 24VDC
- 200mA maximum
- Port 2b
FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONTD)
Electrical

Each unit is equipped with a wiring diagram (permanently attached behind clear view plastic on the inside of the control compartment door or on laminated sheets in an inside compartment), which will vary depending on the type of controls and options supplied.

Spark testing or shorting of the control wires by any means will render the transformers inoperative.

Wiring and Electrical Connections

All electrical wiring and connections, including electrical grounding, must comply with

- United States: Refer to National Electrical Code, NFPA 70, latest revision. Wiring must conform also to local ordinances and any special diagrams furnished
- Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1, latest revision

Check rating plate on unit for supply voltage and current requirements.

If any of the original control wire supplied with the unit must be replaced, replace it with type THHN 221°F (105°C), 600 V, 16-gauge wire or equivalent. For all other wires, replace with the equivalent size and type of wire that was originally provided with the unit.

Disconnect

An external weather-tight disconnect switch properly sized for the unit total load is required for each unit. This disconnect can be supplied by the factory or supplied by others.

Do not use the unit disconnect as a method of on/off control. Use the operating controller or thermostat to shut down the unit.

Current Draw

For current requirements of the unit, refer to the unit rating plate.

Wiring Connections

Power wiring should be connected to the main power terminal block located within the unit main control section. Power wiring connections on units with factory-mounted disconnects should be made at the line side of disconnect. Main power wiring should be sized for the minimum wire ampacity shown on the unit rating plate.

Voltage Imbalance

Three phase electrical power to the unit must be within strict requirements for the unit to operate properly. Voltage imbalance is defined as 100 times the maximum deviation from the average voltage divided by the average voltage, where:

\[
\text{Voltage Imbalance} = 100 \times \frac{(AV - VD)}{AV}
\]

AV = Average Voltage.
VD = Voltage reading that is farthest from the average voltage.

Each reading must fall within the utilization range located on the unit nameplate. If any readings do not fall within the required range, contact the power company to resolve this situation before operating the unit.

Excessive three phase voltage imbalance between phases will cause motor overheating and premature failure. The maximum allowable voltage imbalance is 2%. If the voltage imbalance is over 2%, contact your local electric utility company immediately.

Measure and record the voltage between phases 1, 2, and 3. Calculate the imbalance percentage as stated below.

Example: \( \frac{(221+230+227)}{3} = 226 \) average voltage. Then, \( 100\times(226-221)/226 = 2.2\% \) voltage imbalance. This exceeds the allowable imbalance. Refer to the earlier provided instructions on how to resolve this.
SECTION 2 - SEQUENCE OF OPERATION

UNIT CONFIGURATION

Based on the unit's application, the unit may be configured in any of the following styles to achieve the described functionality.

1. Air Source 100% Outside Air; without ECW and without Exhaust Fan; one–six 630 mm fans or six 710 mm fans; and a single gas furnace position
2. Air Source 100% Outside Air; with ECW and with Exhaust Fan; one–six 630 mm fans or six 710 mm fans; and a single gas furnace position
3. Air Source 100% Outside Air; without ECW and without Exhaust Fan; one–six 630 mm fans or six 710 mm fans; and an XL cabinet for two or more gas furnace positions
4. Air Source 100% Outside Air; with ECW and with Exhaust Fan; one–six 630 mm fans or six 710 mm fans; and an XL cabinet for two or more gas furnace positions
5. Configurations 1–4 above with down flow air distribution
6. Configurations 1–4 above with horizontal air distribution
7. Configurations 1–8 above as an air source heat pump
8. Configurations 1–8 above as an water source heat pump

See NOMENCLATURE on page 4.

Controls Options

Unit may be controlled in one of the following ways:

1. Factory-mounted ALC controls (by factory)
2. Factory-mounted DDC controls (by others)
3. Factory-mounted terminal strip for field-mounted DDC controls (by others)
4. Factory-mounted terminal strip for electromechanical controls (by factory or by others)

Factory-Mounted Controls (by Factory)

The Unit Controller consists of a factory-programmed controller and a series of factory-wired sensors. The controller can operate in a 100% standalone mode with the use of a handheld keypad/display. It can also connect to a building automation system (BAS) using one of four compatible protocols (BACnet®, LonWorks with the optional Echelon card, Modbus™, N2). The point mapping to these protocols can be preset so that the protocol and baud rates desired can be easily field-selected without the need for additional downloads or technician assistance.

Depending on the options ordered, remote sensors may be installed and wired to the controller.

Factory-Mounted DDC Controls (by Others)

Field-supplied DDC controls are mounted by the factory per the customer's specifications.

Factory-Mounted Terminal Strip for Field-Mounted DDC Controls (by Others)

Field-supplied DDC controls can be connected to the factory-mounted and factory-wired terminal strip.

Factory-Mounted Terminal Strip for Electromechanical Controls (by Factory or by Others)

A factory-supplied or field-supplied thermostat can be connected to the factory-mounted and factory-wired terminal strip for electromechanical controls. There are four 24V factory-supplied thermostat options:

1. 1 heat/1 cool
2. 1 heat/1 cool with humidity control
3. 3 heat/2 cool
4. 3 heat/2 cool with humidity control

All four thermostats have a 45–90°F (7–32°C) temperature control range with a +/- 1°F (0.5°C) accuracy and are capable of connecting to optional factory-supplied remote indoor air and outdoor air temperature sensors.
BASIC SEQUENCE OF OPERATION

All sequence of operation information for units controlled with standard controls is available in the Sequence of Operation documents. Sequence of operation information specifically for the operation of the gas furnace and electric heater modules can be found on Sequence of Operation.

For Sequence of Operation information for units controlled with field-supplied DDC controls (whether factory-mounted or field-mounted), consult the DDC controls manufacturer and/or installer.

Controls Options

Controls options include, but are not limited to:

- **Carbon Dioxide Detector**: This option provides a room-mounted carbon dioxide detector for initiating additional outdoor ventilation
- **Clogged Filter Indicator**: This section provides a differential pressure switch and status indication
- **Exhaust Fan Airflow Switch**: This option provides an interlock between an exhaust fan and the unit
- **Firestat**: This option de-energizes the unit when the stat, mounted in the return air section, senses return air above 135.0°F (57.2°C). The firestat must be manually reset
- **Freezestat**: This option shuts down the unit when the discharge temperature falls below the controller's setpoint
- **Service Receptacle**: This option provides a 115V service receptacle with 15A breaker. It is mounted in a 2-inch x 4-inch (51-centimeter x 10.2-centimeter) enclosure. It can be field-wired or factory-wired
- **Smoke Detector**: This option provides an ionization type supply air smoke detector that shuts off the unit if smoke is detected
SECTION 3 - START-UP

Prior to product start-up, the crankcase heaters must operate for 24 hours. Cooling start-up is only recommended when ambient air temperatures are above 55.0°F.

START-UP FORM: 
JR-SERIES UNITS

Field start-up should be performed by a qualified technician. The technician is responsible for assuring that all of the items on this checklist are properly installed and operating. Upon completion, a copy of this form should be returned to Johnson Controls, using the contact information listed in the header.

DANGER

- Electrical Shock Hazard
  - Disconnect electric before service.
  - More than one disconnect switch may be required to disconnect electric from equipment.
  - Equipment must be properly grounded.

- Severe Injury Hazard
  - Do not enter equipment while in operation.
  - Do not operate with door open.
  - Installation, operation and service must be done by a trained technician only.

Failure to follow these instructions can result in death, electrical shock or injury.

WARNING

- Explosion Hazard
  - Leak test all components of equipment gas piping before operation.
  - Gas can leak if piping is not installed properly.
  - Do not high pressure test gas piping with air handler connected.

- Falling Hazard
  - Use proper safety equipment and practices to avoid falling.
  - Do not use any part of equipment as support.

- Burn Hazard
  - Allow equipment to cool before service.
  - Internal components of equipment may still be hot after operation.

Failure to follow these instructions can result in death, injury or property damage.

Installation Code and Quarterly Inspections: All installation and service of Johnson Controls® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Johnson Controls and conform to all requirements set forth in the Johnson Controls manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment.

To help facilitate optimum performance and safety, Johnson Controls recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your Johnson Controls equipment and perform service where necessary, using only replacement parts sold and supplied by Johnson Controls.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through Johnson Controls representatives. Please contact us for any further information you may require, including the Installation, Operation, and Maintenance Manual.

This product is not for residential use. This document is intended to assist licensed professionals in the exercise of their professional judgment.
START-UP FORM:  
JR-SERIES UNITS

www.johnsoncontrols.com  
Page 2 of 6

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Cust Name:</th>
<th>Project Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address:</th>
<th>Contr Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City/State/Zip:</th>
<th>Unit Model No:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phone/Fax:</th>
<th>Unit Serial No:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPLICATION INFORMATION

<table>
<thead>
<tr>
<th>Outdoor Air Temp:</th>
<th>Supply Air Temp:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>db    wb</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Return Air Temp:</th>
<th>Otdr Fn Disch Temp:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>db    wb</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design CFM:</th>
<th>Design Duct ESP:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UNIT OPERATION INFORMATION

PRE-START CHECKS:

- Unit in satisfactory condition
- Shipped blocks removed.
- Unit supply voltage correct.
- Unit checked for debris.
- Electrical connections tight.
- Electrical wiring correct.
- Overloads adjusted.
- Unit noise level acceptable.

UNIT ELECTRICAL CHECKS:

<table>
<thead>
<tr>
<th>Electric Char:</th>
<th>V/Ph/Hz</th>
<th>Amperage:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply Voltage:</th>
<th>L1-L2</th>
<th>L2-L3</th>
<th>L1-L3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COOLING CHECKS:

Cooling Type:  
- Chilled Water
- Mechanical

No. of Circuits:  

<table>
<thead>
<tr>
<th>Control Valve:</th>
<th>No. of Circuits</th>
<th>Control Valve:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If Mechanical:  

If Chilled Water:

<table>
<thead>
<tr>
<th>Refrig Type:</th>
<th>GPM:</th>
<th>WPD:</th>
<th>Glycol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Charge:</th>
<th>Water Temp In:</th>
<th>Water Temp Out:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Installation Code and Quarterly Inspections: All installation and service of Johnson Controls® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Johnson Controls and conform to all requirements set forth in the Johnson Controls manuals and all applicable governmental authorities pertaining to the installation, service, operation and labelling of the equipment. To help facilitate optimum performance and safety, Johnson Controls recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your Johnson Controls equipment and perform service where necessary, using only replacement parts sold and supplied by Johnson Controls.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through Johnson Controls representatives. Please contact us for any further information you may require, including the Installation, Operation, and Maintenance Manual.

This product is not for residential use. This document is intended to assist licensed professionals in the exercise of their professional judgment.
LEAD CIRCUIT CHECKS:

Suct Press: 
Suct Line Temp: 
To calculate Superheat temperature, convert suction pressure to saturation temperature. Then subtract suction line temperature.

Lqd Ln Hd Press: 
Liq Line Temp: 
To calculate Subcooling temperature, convert liquid line head pressure to condensing temperature. Then subtract liquid line temperature.

LAG CIRCUIT CHECKS:

Lag circuit present? [ ] Yes [ ] No

If yes, complete the below section.

Suct Press: 
Suct Line Temp: 
To calculate Superheat temperature, convert suction pressure to saturation temperature. Then subtract suction line temperature.

Lqd Ln Hd Press: 
Liq Line Temp: 
To calculate Subcooling temperature, convert liquid line head pressure to condensing temperature. Then subtract liquid line temperature.
SECTION 3 - START-UP

START-UP FORM:
JR-SERIES UNITS

www.johnsoncontrols.com

Page 4 of 6

SUPPLY FAN AND FAN MOTOR CHECKS:

Fan Mfg: 
Fan Serial No: 
Motor Mfg: 
Motor Serial No: 
VFD Mfg: 

CONDENSER FAN AND FAN MOTOR CHECKS (IF APPLICABLE):

Fan Mfg: 
Fan Serial No: 
Motor Mfg: 
Motor Serial No: 

FILTER CHECKS:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Filters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Filters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SETPOINT CHECKS:

<table>
<thead>
<tr>
<th>High Pressure Switch</th>
<th>Low Pressure Switch</th>
<th>Pumpdown Low Pressure</th>
<th>Oil Failure Control</th>
<th>Cyl. Unloading Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut-In</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut-Out</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONDENSER FAN AND FAN MOTOR CHECKS (IF APPLICABLE):

#1: Voltage: 
Amperage: 
If app, low ambient cut in: 
Cut out: 
#2: Voltage: 
Amperage: 
If app, low ambient cut in: 
Cut out: 
#3: Voltage: 
Amperage: 
If app, low ambient cut in: 
Cut out: 
#4: Voltage: 
Amperage: 
If app, low ambient cut in: 
Cut out: 

Installation Code and Quarterly Inspections: All installation and service of Johnson Controls® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Johnson Controls and conform to all requirements set forth in the Johnson Controls manuals and all applicable governmental authorities pertaining to the installation, service, operation and labelling of the equipment. To help facilitate optimum performance and safety, Johnson Controls recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your Johnson Controls equipment and perform service where necessary, using only replacement parts sold and supplied by Johnson Controls.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through Johnson Controls representatives. Please contact us for any further information you may require, including the Installation, Operation, and Maintenance Manual.

This product is not for residential use. This document is intended to assist licensed professionals in the exercise of their professional judgment.
### HEATING CHECKS (IF APPLICABLE):

- **Type:**
  - ⮞ Coaxial Coil
  - ⮞ NG
  - ⮞ LPG
  - ⮞ Electric
  - ⮞ Hot Water
  - ⮞ Steam

- **If Coax Coil:**
  - GPM:
  - WPD:
  - Water Temp In:
  - Water Temp Out:

- **Control Valve Make and Model:**

- **If NG/LPG:**
  - Burner Modulation Control:
  - Manifold Pressure:
  - Ignition Type:

- **If Electric:**
  - Amperage: L1
  - L2
  - L3

### HOT GAS BYPASS CHECKS (IF APPLICABLE):

- **Hot gas bypass installed?**
  - ☑ Yes
  - ☐ No

- **If yes:**
  - No. of Stages:
  - Setpoints: #1
  - #2
  - #3
  - #4

### HOT GAS REHEAT CHECKS (IF APPLICABLE):

- **Hot gas reheat installed?**
  - ☑ Yes
  - ☐ No

- **If yes:**
  - No. of Stages:
  - Setpoints: #1
  - #2
  - Safeties operate properly.

- **Fans run and cycle properly.**

### ENERGY CONSERVATION WHEEL AND WHEEL MOTOR CHECKS (IF APPLICABLE):

- **Wheel Make:**
- **Catalog No.:**

- **Wheel Mtr Make:**
- **Catalog No.:**

- **Exhaust Air Temperature: Before the Wheel:**
  - db/
  - wb
  - After the Wheel:

- **Entering Air Temperature: Before the Wheel:**
  - db/
  - wb
  - After the Wheel:

- **Pressure Drop Across the Wheel:**
  - Set screws tight.
  - Sheaves tight and adjusted.
  - Belt tension adjusted.

- **Supply Air:**
  - Exhaust Air:

- **HP:**
- **Voltage:**

- **RPM:**
- **Amperage:**

---

**Installation Code and Quarterly Inspections:** All installation and service of Johnson Controls® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Johnson Controls and conform to all requirements set forth in the Johnson Controls manuals and all applicable governmental authorities pertaining to the installation, service, operation and labelling of the equipment. To help facilitate optimum performance and safety, Johnson Controls recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your Johnson Controls equipment and perform service where necessary, using only replacement parts sold and supplied by Johnson Controls.

**Further Information:** Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through Johnson Controls representatives. Please contact us for any further information you may require, including the Installation, Operation, and Maintenance Manual.

This product is not for residential use. This document is intended to assist licensed professionals in the exercise of their professional judgment.
SECTION 3 - START-UP

EXHAUST FAN AND FAN MOTOR CHECKS (IF APPLICABLE):

Fan Make: ________________________________  Catalog No.: ________________________________

Fan Motor Make: ________________________________  Catalog No.: ________________________________

☐ Set screws tight.
☐ Fan wheel rotates freely.
☐ Vibration isolators adjusted.

HP: ____________________ RPM: ____________________
Voltage: ____________________ Amperage: ____________________

VFD Setting (Hz): ____________________

OTHER OPTION CHECKS (IF APPLICABLE):

Liquid Line Solenoid Installed? ☐ Yes ☐ No  If yes, provide details: ________________________________

Phase Monitor Protection Installed? ☐ Yes ☐ No  If yes, provide details: ________________________________

Thermostat Installed? ☐ Yes ☐ No  If yes, provide details: ________________________________

Liquid Injection Installed? ☐ Yes ☐ No  If yes, provide details: ________________________________

Other Option Installed? ☐ Yes ☐ No  If yes, provide details: ________________________________

CONTROLS CHECKS (IF APPLICABLE):

Manufacturer: ________________________________

Installation: ☐ Installed by factory. ☐ Installed in field.

Desc. of Operation: ________________________________

OTHER COMMENTS: ________________________________
DEDICATED OUTSIDE AIR SYSTEM (DOAS)

PRE-COMMISSIONING / START-UP CHECKLIST

Models JROA, JROW, JROH
3.0 to 70.0 Tons

Date: __________________________

Job Name: __________________________

Job Address: __________________________

City: __________________________ State: __________________________ Zip: __________________________

HVAC Contractor: __________________________

Contractor Phone: __________________________ Contractor Fax: __________________________

Contractor’s E-mail Address: __________________________

Number of Units: __________________________

Model Number(s): __________________________

Installation Completion Date: __________________________ Requested Commissioning Date: __________________________

In an effort to provide the highest level of service, the following checklist is provided to ensure that all necessary installation items are completed prior to a scheduled supervised start-up/commissioning for the YORK equipment.

START-UP BY FIRE AND ICE

Please fill out the form completely and return to Fire and Ice at officemanager@fireandicesys.com. Any questions call Linda Kitler at 703-579-7689. If a supervised system commission start-up is requested, please allow at least 10 business days from the date this form is sent for scheduling purposes. The installation related items listed on the next page must be completed prior to arrival. Any additional days needed to complete system start-up/commissioning due to incomplete installation may be billed at a rate of $1,450.00 per day per Fire & Ice Employee plus incurred expenses.

START-UP BY A JOHNSON CONTROLS REGIONAL COMMERCIAL TECHNICAL MANAGER

Please fill out the form completely and return to the Johnson Controls Regional Commercial Technical Manager assisting with the start-up of the equipment. The Johnson Controls Regional Commercial Technical Manager must receive this checklist at least 3 business days prior to start-up. The installation related items listed on the next page must be completed prior to arrival. Any additional days needed to complete systems start-up/commissioning due to incomplete installation may be billed at a rate of $750.00 per day plus incurred expenses.
Reference

This pre start-up sheet covers all pre-start-up checkpoints common to all packaged equipment. In addition, it covers essential start-up checkpoints for a number of common installation options. Depending upon the particular unit being started, not all sections of this start-up sheet may apply. Complete those sections applicable, and use the Observed Product Deficiencies & Concerns section to record any additional information pertinent to your particular installation.

<table>
<thead>
<tr>
<th>General Inspection</th>
<th>Completed</th>
<th>See Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit inspected for shipping, storage, or rigging damage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit installed with proper clearances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit installed with slope limitations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigeration system checked for gross leaks (presence of oil)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal screws and wiring connections checked for tightness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filters installed correctly and clean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside air hoods installed in operating position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damper linkage tight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas heat vent hood installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SENSORS installed property</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improperly installed sensors hamper the start-up and can damage the controller. The sensor may be shipped loose. Extend the wire if necessary to allow proper installation (use of shielded cable is recommended). If the sensor wire is run exterior to the unit, it MUST be in waterproof EMT. DO NOT run the sensor wire in the same conduit with any high voltage wiring.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condensate drain trapped properly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ductwork complete and clear of obstructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water flow and clarity on Water Cooled units verified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas piping properly connected and installed on Gas Furnace units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site is closed in and ready for equipment operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All field wiring (power and control) complete (matching the nameplate)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBSERVED PRODUCT DEFICIENCIES & CONCERNS

I have inspected the installation of the dedicated outside air system (DOAS) and verified the pre-functional checklist is complete and the unit(s) are ready to be started up by an approved technician.

Verified by: ____________________________________________
INSTALATION CODE AND QUARTERLY INSPECTIONS

All installation and service of the YORK DOAS equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Johnson Controls, as well as conform to all requirements set forth in the manuals and all applicable governmental authorities pertaining to the installation, service, operation, and labeling of the equipment.

To help facilitate optimum performance and safety, Johnson Controls recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your YORK equipment and perform service where necessary, using only replacement parts sold and supplied by Johnson Controls.

Check installation site to ensure all codes and engineering specifications are correct. This section of the manual is intended to be used as an instructional guide to the commissioning of the unit. Fill out the previous start-up form and checklist as each step of the procedure is performed. This procedure should be completed by the commissioning contractor and returned to Johnson Controls.

PRE-START CHECKS

Ductwork and Electrical Connections

Ensure that the following ductwork and electrical connections have been made:

- **Ductwork:** Supply and return air connections
- **Electrical:** Line voltage power, control voltage power, and remote sensor connections

Condensate Drain

Units are provided with condensate drain connection(s). Do not operate unit unless a P-Trap is constructed and attached to drain connection. See Figure 20 on page 64. Unit must be level or slightly inclined towards drain. Drain should pitch down and away from the unit. P-Trap pipe diameter should be the same as the drain connection diameter. Units with high internal and external static pressure drops will require a deeper trap. Prime the trap before operating the unit.

**FIGURE 20 - P-TRAP**

Drainage of condensate directly onto roof is acceptable if permitted by local codes. It is recommended that a small drip pad of either stone, tar, wood, or metal be provided to prevent any possible damage to roof. Refer to local codes for additional requirements. Periodically clean to prevent microbial growth/algae buildup from plugging the drain and causing the drain pan to overflow. Clean drain pans to prevent the spread of disease. Cleaning should be performed by qualified personnel.

Supply and Exhaust Fans

1. Make sure electrical power is isolated.
2. Check power settings for voltage and verify that they correspond with the data on the motor plate.
3. Check that the motor is grounded (earthed).
4. Check that all electrical leads are sufficiently insulated.
5. Check that all electrical and system connections are properly made and tightened.
6. Check that all nuts, bolts and setscrews are tightened.
7. Check that the wheel and drive assembly turns freely without rubbing.
8. Check that drives are tightened, properly aligned, and tensioned.
10. Check rotation.
Compressors
With the supply fan operational, prepare for compressor operation.

Verify that the crankcase heaters are operating. These should operate for at least 24 hours before starting the compressors. Crankcase heaters must be operating during off cycles to prevent liquid refrigerant from migrating to the compressor crankcase.

Energy Conservation Wheel
Before starting up the unit, check the following:

1. **Free rotation of rotor when moved by hand:** If not, recheck the seal to determine whether or not it is binding. If so, with the wheel stopped, move seals as close to the sealing surface as possible but without exceeding grip range of bulb seal and without pressing the bulb down against the seal face. Bump the motor. If the motor will not turn, the seal is too close and should be nudged back where needed. The seal will seek its equilibrium position based on the closest part of the sealing face. Because the seal is meant to be a non-contact seal, small gaps may be seen between seal and sealing surface once the equilibrium position is reached. Seal leakage is meant to be fewer than 5% at 1 inch of differential between supply and exhaust. Some seal run-in is to be expected; do not be alarmed by small amounts of wear in the neoprene.

2. **Correct motor rotation:** This can be checked by detaching the belts from the drive sheave and bumping the motor. The sheave should be rotating in the direction in which the belt will result in rotation per the exterior markings. If not, rewire the motor.

3. **Actual airflow orientation matches design:** See the identification markings on the cassette to check the four duct connections to the unit.

4. **Correct and sufficiently tight belts:** Belt length is set by the manufacturer. Consult factory if the belt appears too loose.

5. **Correct VFD wiring and programming to ensure proper wheel operation and prevention of frost formation:** Check the power supply for proper rating. Make sure that the proper jumper orientation is used for the specific control input. Ensure that the unit is programmed for proper input voltage and output voltage.

Gas Furnace
Before starting up the unit, perform the following steps:

1. Confirm gas piping has been completed and leak tested.
2. Turn thermostat or temperature controller to its lowest setting.
3. Turn off gas supply at the manual shut-off valve.
4. Turn off power to the unit at the disconnect switch.
5. Remove access panel or open door to unit vestibule housing the gas heater.
6. Move gas control knob to OFF position.
7. Install a tapped fitting for attachment to a manometer, or other gauge suitable for 14.0” W.C. (34.9 mbar) in the inlet pressure tap, and for 10.0” W.C. (24.9 mbar) in the manifold pressure tap.
8. Wait 5 minutes for any gas to clear out. If you smell gas, see Step 2 and correct leak. If you do not smell gas or have corrected any leaks, go to the next step.
9. Turn gas control knob to ON position.
10. Open all manual gas valves.
11. Turn power on at disconnect switch.
12. Set thermostat or controller to its highest position to initiate call for heat and maintain operation of unit.
14. At the end of the pre-purge, the direct spark will be energized and gas valve will open.
15. Burners ignite.
16. Check for proper inlet and manifold pressures. See Table 6 on page 65

<table>
<thead>
<tr>
<th>TABLE 6 - GAS FURNACE INLET AND MANIFOLD PRESSURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum Inlet</strong></td>
</tr>
<tr>
<td>(50–400 MBH heaters) (&quot;W.C.&quot;)</td>
</tr>
<tr>
<td><strong>Minimum Inlet</strong></td>
</tr>
<tr>
<td>(500–600 MBH heaters) (&quot;W.C.&quot;)</td>
</tr>
<tr>
<td><strong>Maximum Inlet</strong></td>
</tr>
<tr>
<td>(&quot;W.C.&quot;)</td>
</tr>
<tr>
<td><strong>Manifold</strong></td>
</tr>
<tr>
<td>(&quot;W.C.&quot;)</td>
</tr>
</tbody>
</table>
THIS PAGE INTENTIONALLY LEFT BLANK.
SECTION 4 - MAINTENANCE

Prior to any maintenance or service to the unit, shut off, lockout, and tagout the electrical disconnect and fuel valve (if applicable) that supplies the unit in accordance with OSHA regulations and, if the unit includes electric or gas heat, allow ample time for the unit to cool. After maintenance is performed or the unit is serviced, the unit shall be re-commissioned per the start-up procedure as outlined in SECTION 3 - Start-Up.

INSTALLATION CODE AND QUARTERLY INSPECTIONS

All installation and service of Johnson Controls equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Johnson Controls, as well as conform to all requirements set forth in the manuals and all applicable governmental authorities pertaining to the installation, service, operation, and labeling of the equipment.

To help facilitate optimum performance and safety, Johnson Controls recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your JR Series equipment and perform service where necessary, using only replacements parts sold and supplied by Johnson Controls.

GENERAL

Quarterly

Follow the entire start-up procedure at this time and check settings (controls, operating temperatures, operating pressures, power, and control voltages) and operation.

UNIT EXTERIOR

Cabinet Exterior

After installation, touch up scratches. Periodic painting should be done thereafter as required. The caulk should be inspected annually. Re-apply caulk as needed to maintain integrity.

Unit Location

Verify that no flammable objects, liquids, or vapors are present near the unit. If unit includes gas furnace, clearances to combustibles around the vent must be adhered to (see Required Clearances on page 17).

Do not hang anything from or place anything on the unit.

Keep the area around the unit free of all objects.

DIRECT DRIVE SUPPLY AND EXHAUST FANS

Blower Wheel

Inspect blower wheel and clean as necessary. A small build-up of dust can cause a significant decrease in blower performance. Check for excessive vibration. Repair as required.

Motors

Inspection

Inspect motor every 3 months. Keep the motor clean and vent openings clear.

Lubrication

1. Motors with grease fittings must be lubricated based on the table below.

<table>
<thead>
<tr>
<th>NEMA FRAME SIZE (MOTOR HP)</th>
<th>RATED AT 1800 RPM (HRS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 210 (3–5)</td>
<td>6,000</td>
</tr>
<tr>
<td>210–280 (7.5–20)</td>
<td>4,750</td>
</tr>
<tr>
<td>280–360 (25–30)</td>
<td>3,700</td>
</tr>
</tbody>
</table>

NOTE: These intervals are based on severe duty. Over lubricating bearings could result in reduced motor life.

2. A high grade ball or roller bearing grease must be used. Recommended grease for standard service is Mobil Polyrex™ EM. Other compatible greases include ChevronTexaco Polystar®, ChevronTexaco Rykon® Premium 2, Pennzoil® Pen 2 Lube, and ChevronTexaco SRI.

3. Motors without grease fittings are sealed for life and do not require re-lubrication.
Lubricating Instructions
Before greasing, be sure fittings are clean and free from dirt. Remove grease relief plug or plate and, using a low-pressure grease gun, pump in the required grease. Do not over-grease. Re-lubrication intervals are specified in Table 7 on page 67. After re-lubricating, allow motor to run for 10 minutes before replacing relief hardware.

**NOTE**
In general, it is not recommended to mix greases of different brands. The mixing of different types of thickeners may destroy the composition and physical properties of the grease. In the event that a different grease is required by the end user, the following steps can be taken.

Using the Lubricating Instructions, open grease outlet and purge the system as much as possible of the old or unwanted grease. Repeat this same operation after one week of service.

CONDENSING FANS
Manually rotate to ensure free movement. Check that all fan mounting hardware is tight. Check motor bearings for wear.

REFRIGERATION CIRCUIT COMPONENTS
Evaporator Coil
Check for dirt and bent fins. Clean with water from blower side towards filter side.

Condenser Coil
Check for dirt and bent fins. Clean by brushing off with broom.

Compressors
Compressors are factory-supplied with a charge of oil and should not require additional maintenance.

CONDENSATE DRAIN PAN AND DRAIN
Check for blockages. Clean as necessary with mixture of 1/2 cup (0.1 L) bleach and 1 gallon (1.9 L) warm water if signs of mold or algae are present.

DAMPERS
Dampers
Check and clean blades.

Damper Motor/Linkages
Verify that all damper linkages move freely. Lubricate if necessary.

ENERGY CONSERVATION WHEEL
Bearings
Small ECWs (smaller than ECW666) are provided with no maintenance inboard bearings. These bearings should require no maintenance during the life of the unit. Larger ECWs come equipped with an external flanged bearing that should be greased annually. Use a petroleum based lubricant.

Drive Motor
The drive motors should require no maintenance. Replace as necessary.

Drive Belts
Belts are multilink belts with individual links constructed of a high performance polyurethane elastomer reinforced with multiple plies of polyester fabric. This belt provides a strong, yet flexible belting. The multilink feature provides quick, easy servicing or replacement. Adjust and/or replace as necessary.

Seals
Adjust and/or replace as necessary. The seals are made to clip on the cassette or post metal easily.

Wheel
The wheel is somewhat self-cleaning through its normal action of rotating in and out of countercurrent airflow streams.

In the event that routine quarterly inspection indicates that there is dirt or dust buildup within the wheel causing an excessive pressure drop, then wheel cleaning should be performed as follows:

1. Using a standard shop vacuum, vacuum any debris from both faces of the wheel. Slowly work around the entire face of the wheel to complete the procedure. Do not damage wheel face by excessive pressure of the vacuum nozzle on the wheel face.
2. Using 20 psi clean, dry air and a small air nozzle, blow air through one face of the wheel. At a similar location on the opposite side of the wheel, gently apply a shop vacuum to “receive” any remaining debris exiting the wheel.

In the event that this method does not remove visual buildup or return pressure drop to within normal parameters, a wheel washing procedure is recommended. The energy conservation wheels can be washed thoroughly with water without affecting the performance of the wheel. The wheel will simply dry out following a washing procedure and resume normal energy transfer without any deviation in performance.

If the energy conservation wheel can be easily removed from the cassette or unit, it is recommended to do so to facilitate the washing process. However, in most cases, it is impractical to remove larger wheels. Therefore, the washing procedure must take place within the air handling unit, and provisions need to be made to collect the runoff water from the bottom of the unit or collect the water by using a wet vac on the opposite side of the wheel during the procedure.

1. Shield all electrical components and bearings with plastic sheeting. Ensure that an adequate drainage system exists to collect runoff water from the bottom of the unit. Alternatively, use a wet vac with a wide nozzle on the opposite face of the wheel to collect the water during the washing procedure.

2. Disable the drive motor.

3. Using standard pressure water (do not use a high pressure washer) and working from the one side of the wheel, wash the wheel with a standard “garden” nozzle to flush any debris trapped within the flutes of the wheel. If desired, a mild detergent can also be used to enhance cleaning without affecting the performance of the wheel.

**COAX 4 WATER COIL**

Drain and clean periodically. The coil should be inspected for dirt during every start-up or service check. If the coil is dirty, it should be cleaned using a non-acidic coil cleaner and then thoroughly rinsed.

Use a Y-Strainer where necessary. The purpose of the strainer is to protect the valve and coil from rust, mud, and other substances that collect in the piping system. As the openings in the mesh are covered by these substances, this provides more resistance to the flow of water. The reduction of flow reduces the ability of the system to transfer heat.

Strainers should be cleaned or blown down at least once each year. If clogging tends to be a regular occurrence, increase amount of maintenance as necessary.

Use appropriate amount of glycol when necessary. Water coils must be protected against freezing when the ambient temperature is less than 40.0°F. The purpose of the glycol is to lower the freezing point of the mixture.

The location of the system and environmental concerns must be taken into account when selecting the proper mixture of glycol and water. A process located completely indoors will typically require less glycol than a system located outdoors with low temperatures.

Maintaining clean process water and proper glycol content will extend the life of the system and reduce down time.

The coil should be drained in the winter when not in use. The coil must be completely drained using air or nitrogen pressure to blow any remaining water from the coil. Failure to properly protect the coil from freezing may result in damage to the coil and property.

**GAS FURNACE**

**Gas Line**

Check for gas leaks.

**Manual Safety Shut Off Valve**

Check for gas leaks.

**Direct Spark Igniter**

Check for cracked ceramics, excessive carbon residue, or erosion of the electrode. Replace as required.

**Gas Valve**

Check that gas valve seat is not leaking.

**Burners**

Soft brush or vacuum inside burner, at burner ports, and at air inlet between burner and manifold pipe to eliminate accumulation of lint and/or dirt.

**Heat Exchanger**

Inspect for cracks, sagging, bending, or distortion. Clean with vacuum and/or stiff brush.

**Draft Inducer**

Clean with compressed air or vacuum.
**Vent Pipe/Terminal**
Venting must be intact. Using a flashlight, look for obstructions, cracks on the pipe, gaps in the sealed areas, or corrosion. Clean vent terminal.

**Condensation Drain**
Check for blockages.

**ELECTRIC HEATER WIRING AND WIRING CONNECTIONS**
Check all wiring connections. Tighten as necessary.
Check internal wiring. Replace as necessary with type THHN 221°F (105°C), 600V, 16-gauge wire or equivalent.

**Control Panel**
Check heater control panel for dust/dirt and moisture. Clean as necessary.

**Heating Elements**
Check heating elements for dust/dirt buildup and/or broken elements. Replace elements and/or clean elements with low pressure air as necessary.
Check element male/female chassis insulators for breaks and/or cracks. Replace as necessary.
Check element support frame insulators. Replace missing or broken insulators as necessary.

**FILTERS**
Filters should be checked for dirt restriction on a monthly basis (or as required). Replace filters with filters of equal specification when they appear dirty.

### TABLE 8 - JR SERIES FILTER OPTIONS

<table>
<thead>
<tr>
<th>CABINET DESCRIPTION</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>B-C CAB</th>
<th>B-C CAB</th>
<th>C-D CAB</th>
<th>D CAB</th>
<th>D CAB</th>
<th>E CAB</th>
<th>E CAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX DESCRIPTION</td>
<td>20x20 COIL</td>
<td>20x34 COIL</td>
<td>24x42 COIL</td>
<td>32x45 COIL</td>
<td>36x48 COIL</td>
<td>48x48 COIL</td>
<td>64x65 COIL</td>
<td>64x68 COIL</td>
<td>37.5x80 COIL</td>
<td>42.5x80 COIL</td>
<td></td>
</tr>
<tr>
<td>Evaporator Face Area</td>
<td>2.78 sq ft</td>
<td>4.72 sq ft</td>
<td>7.0 sq ft</td>
<td>10.0 sq ft</td>
<td>12.0 sq ft</td>
<td>16.0 sq ft</td>
<td>28.89 sq ft</td>
<td>30.2 sq ft</td>
<td>41.67 sq ft</td>
<td>47.22 sq ft</td>
<td></td>
</tr>
<tr>
<td>2” Pleated Surface, Farr 30/30 (MERV 8)</td>
<td>20x24x2</td>
<td>20x20x2</td>
<td>16x20x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td></td>
</tr>
<tr>
<td>2” Metal Mesh</td>
<td>20x24x2</td>
<td>20x20x2</td>
<td>16x20x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td>2 - 25x16x2</td>
<td></td>
</tr>
<tr>
<td>4” Pleated Surface, 30/30 (MERV 8)</td>
<td>20x24x4</td>
<td>20x20x4</td>
<td>16x20x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td></td>
</tr>
<tr>
<td>4” Pleated Surface, 65% (MERV 11)</td>
<td>20x24x4</td>
<td>20x20x4</td>
<td>16x20x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td>2 - 25x16x4</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 8 - JR SERIES FILTER OPTIONS (CONT'D)

<table>
<thead>
<tr>
<th>CABINET DESCRIPTION</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>B-C CAB</th>
<th>B-C CAB</th>
<th>C-D CAB</th>
<th>D CAB</th>
<th>D CAB</th>
<th>E CAB</th>
<th>E CAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX DESCRIPTION</td>
<td>20x20 COIL</td>
<td>20x34 COIL</td>
<td>24x42 COIL</td>
<td>32x45 COIL</td>
<td>36x48 COIL</td>
<td>48x48 COIL</td>
<td>64x65 COIL</td>
<td>64x68 COIL</td>
<td>37.5x80 COIL</td>
<td>42.5x80 COIL</td>
</tr>
<tr>
<td>Evaporator Face Area</td>
<td>2.78 sq ft</td>
<td>4.72 sq ft</td>
<td>7.0 sq ft</td>
<td>10.0 sq ft</td>
<td>12.0 sq ft</td>
<td>16.0 sq ft</td>
<td>28.89 sq ft</td>
<td>30.2 sq ft</td>
<td>41.67 sq ft</td>
<td>47.22 sq ft</td>
</tr>
<tr>
<td>4&quot; Pleated Surface, 95% (MERV 14)</td>
<td>20x24x4</td>
<td>20x20x4</td>
<td>16x20x4</td>
<td>2 - 25x16x4</td>
<td>2 - 20x25x4</td>
<td>4 - 25x16x4</td>
<td>2 - 24x24x4</td>
<td>2 - 20x20x4</td>
<td>5 - 20x24x4</td>
<td>9 - 20x25x4</td>
</tr>
<tr>
<td>2&quot; FAR 30/30 (MERV 8) + 4IN 30/30 (MERV 8)</td>
<td>20x24x2</td>
<td>20x24x4</td>
<td>2 - 20x20x4</td>
<td>2 - 25x16x4</td>
<td>2 - 20x25x4</td>
<td>4 - 25x16x4</td>
<td>2 - 24x24x4</td>
<td>2 - 20x20x4</td>
<td>5 - 20x24x4</td>
<td>9 - 20x25x4</td>
</tr>
<tr>
<td>2&quot; FAR 30/30 (MERV 8) + 4IN 65% (MERV 11)</td>
<td>20x24x2</td>
<td>20x24x4</td>
<td>2 - 20x20x4</td>
<td>2 - 25x16x4</td>
<td>2 - 20x25x4</td>
<td>4 - 25x16x4</td>
<td>2 - 24x24x4</td>
<td>2 - 20x20x4</td>
<td>5 - 20x24x4</td>
<td>9 - 20x25x4</td>
</tr>
<tr>
<td>2&quot; FAR 30/30 (MERV 8) + 4IN 95% (MERV 14)</td>
<td>20x24x2</td>
<td>20x24x4</td>
<td>2 - 20x20x4</td>
<td>2 - 25x16x4</td>
<td>2 - 20x25x4</td>
<td>4 - 25x16x4</td>
<td>2 - 24x24x4</td>
<td>2 - 20x20x4</td>
<td>5 - 20x24x4</td>
<td>9 - 20x25x4</td>
</tr>
</tbody>
</table>
### TABLE 8 - JR SERIES FILTER OPTIONS (CONT'D)

<table>
<thead>
<tr>
<th>CABINET DESCRIPTION</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>A-B CAB</th>
<th>B-C CAB</th>
<th>B-C CAB</th>
<th>C-D CAB</th>
<th>D CAB</th>
<th>D CAB</th>
<th>E CAB</th>
<th>E CAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporator Face Area</td>
<td>2.78 sq ft</td>
<td>4.72 sq ft</td>
<td>7.0 sq ft</td>
<td>10.0 sq ft</td>
<td>12.0 sq ft</td>
<td>16.0 sq ft</td>
<td>28.89 sq ft</td>
<td>30.2 sq ft</td>
<td>41.67 sq ft</td>
<td>47.22 sq ft</td>
</tr>
<tr>
<td>2&quot; Metal Mesh + 4IN 30/30 (MERV 8)</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot; Metal Mesh + 4IN 65% (MERV 11)</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot; Metal Mesh + 4IN 95% (MERV 14)</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td>20x24x2 20x24x4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### REPLACEMENT PARTS

Before ordering replacement parts, please contact the factory to make sure that the replacement parts are the direct replacement for your specific unit.

Replacement parts used in units with the harsh environment coating option must be coated before being installed.
## SECTION 5 - TROUBLESHOOTING

### SUPPLY FAN

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower motor does not run</td>
<td>Damper limit switch not closed or inoperative</td>
<td>Repair or replace switch</td>
</tr>
<tr>
<td></td>
<td>Motor thermal overloads tripped</td>
<td>For tripped condition-reset</td>
</tr>
<tr>
<td></td>
<td>Fuses blown or missing</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>External power source lacking</td>
<td>Have incoming power lines checked</td>
</tr>
<tr>
<td></td>
<td>Motor inoperative</td>
<td>Repair or replace</td>
</tr>
<tr>
<td>Blower motor runs, but fans do not supply enough make-up air</td>
<td>Intake filters dirty</td>
<td>Replace or clean</td>
</tr>
<tr>
<td></td>
<td>Obstruction in intake</td>
<td>Check dampers for proper operation</td>
</tr>
<tr>
<td></td>
<td>Fan wheel loose on shaft</td>
<td>Clear all intake passages of obstructions</td>
</tr>
<tr>
<td></td>
<td>Access doors and panels not closed</td>
<td>Reposition and tighten</td>
</tr>
<tr>
<td></td>
<td>Excessive discharge resistance from • Dirty filters in discharge • External dampers.</td>
<td>Clean filters and/or readjust dampers</td>
</tr>
<tr>
<td>Excessive fan noise</td>
<td>Fan bearing</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>Fan wheel loose on shaft</td>
<td>Reposition and retighten</td>
</tr>
<tr>
<td></td>
<td>Fan wheel rubbing</td>
<td>Loosen setscrews</td>
</tr>
<tr>
<td></td>
<td>Fan wheel dirty</td>
<td>Reposition cone and tighten</td>
</tr>
<tr>
<td></td>
<td>Loose duct</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>Foreign article in fan or duct</td>
<td>Remove</td>
</tr>
</tbody>
</table>

### COMPRESSOR

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor will not start</td>
<td>Power off, loose electrical connections or fuse open</td>
<td>Check disconnect switch, fuses and wiring</td>
</tr>
<tr>
<td></td>
<td>Compressor contactor not closing</td>
<td>Check voltage to contactor coil, transformer slave relay, thermostat</td>
</tr>
<tr>
<td></td>
<td>Internal compressor thermal overload open</td>
<td>If compressor is hot, allow 2 hours to cool – see below</td>
</tr>
<tr>
<td></td>
<td>Compressor defective</td>
<td>Check compressor for electrical failure</td>
</tr>
<tr>
<td></td>
<td>High or low pressure switch open or defective</td>
<td>Compressor may be seized, check for L.R.A.</td>
</tr>
<tr>
<td></td>
<td>Oil pressure control open or defective</td>
<td>Check calibration of high or low pressure switch</td>
</tr>
<tr>
<td>Compressor starts but cuts out on low pressure switch</td>
<td>Low on refrigerant</td>
<td>Check sight glass and check pressures</td>
</tr>
<tr>
<td></td>
<td>Airflow restricted</td>
<td>Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator, VFD settings, check motor amps, duct design</td>
</tr>
<tr>
<td></td>
<td>Restriction in liquid line</td>
<td>Check head pressure, check and adjust TXV if not functioning properly, check pressure drop across filter drier</td>
</tr>
<tr>
<td></td>
<td>Defective low pressure switch</td>
<td>Check calibration of switch</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>POSSIBLE CAUSE</td>
<td>SOLUTION</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Compressor starts but cuts out on high pressure switch</td>
<td>Refrigerant overcharged</td>
<td>Check pressures, charge by subcooling</td>
</tr>
<tr>
<td></td>
<td>Condenser fan control has incorrect setting</td>
<td>Check calibration of the low ambient control</td>
</tr>
<tr>
<td></td>
<td>Fan motor defective</td>
<td>Check fan motor</td>
</tr>
<tr>
<td></td>
<td>Condenser coil inlet obstructed or dirty</td>
<td>Check coil and inlet clearances and for possible air recirculation</td>
</tr>
<tr>
<td></td>
<td>Air or non-condensables in system</td>
<td>Compare liquid refrigerant pressure with the saturated pressure. If the presence of air or non-condensables is suspected, the refrigerant must be reclaimed through a service port. The system must then be re-evacuated to 250–500 microns and recharged. The filter-drier should also be replaced before charging</td>
</tr>
<tr>
<td></td>
<td>Defective high pressure switch</td>
<td>Replace switch</td>
</tr>
<tr>
<td></td>
<td>Restriction in discharge or liquid line.</td>
<td>Check discharge and liquid line pressures, check TXV</td>
</tr>
<tr>
<td>Compressor cuts out on thermal overload</td>
<td>Low voltage</td>
<td>Check incoming voltage leg-to-leg. All three legs must be within 10% of the required voltage and the leg-to-three-leg average voltage variation must be less than 2% on each leg</td>
</tr>
<tr>
<td></td>
<td>Sustained high discharge pressure</td>
<td>Check running amperage and conditions described under high discharge pressure</td>
</tr>
<tr>
<td></td>
<td>High suction and discharge pressures</td>
<td>Check TXV setting, check for air in system</td>
</tr>
<tr>
<td></td>
<td>Defective compressor overload</td>
<td>Allow compressor to cool for two hours if compressor is hot. Recheck for open circuit</td>
</tr>
<tr>
<td></td>
<td>Defective run capacitor</td>
<td>Check run capacitor for compressor and fan motor</td>
</tr>
<tr>
<td></td>
<td>Improper refrigerant charge</td>
<td>Check subcooling</td>
</tr>
<tr>
<td></td>
<td>Bearings or pistons too tight</td>
<td>Check for low oil level</td>
</tr>
<tr>
<td></td>
<td>Allow time for compressor to cool</td>
<td>Check dome temperature of compressor</td>
</tr>
<tr>
<td>Noisy compressor</td>
<td>Scroll compressors are rotation sensitive</td>
<td>Reverse wiring at disconnect switch may require blower be rechecked for rotation</td>
</tr>
<tr>
<td></td>
<td>Refrigerant overcharged</td>
<td>Check pressures and subcooling</td>
</tr>
<tr>
<td></td>
<td>Excess or insufficient oil in compressor crankcase</td>
<td>Check oil level on hermetic compressors, check total equivalent feet of piping, add oil as recommended</td>
</tr>
<tr>
<td></td>
<td>Liquid floodback</td>
<td>Check TXV setting. Refrigerant overcharge refrigerant circuit problem</td>
</tr>
<tr>
<td></td>
<td>Tubing rattle</td>
<td>Dampen by taping or clamping, bend tubing away from contact where possible</td>
</tr>
<tr>
<td></td>
<td>Compressor defective</td>
<td>Replace compressor</td>
</tr>
</tbody>
</table>
## REFRIGERATION CIRCUIT

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noisy operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air noise</td>
<td>Check ductwork. Air Velocity too high</td>
<td></td>
</tr>
<tr>
<td>Chattering contactor</td>
<td>Check for adequate control voltage, check for shorts or breaks, check thermostat, check contactor points</td>
<td></td>
</tr>
<tr>
<td>Tubing rattle</td>
<td>Dampen by taping or clamping, bend tubing away from contact where possible</td>
<td></td>
</tr>
<tr>
<td>High suction pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive load on evaporator coil</td>
<td>Check for high entering wet bulb temperature. Check for excessive airflow</td>
<td></td>
</tr>
<tr>
<td>Broken compressor valves. Scroll compressors do not have valves</td>
<td>Scroll compressors should not be pumped down below 5 PSI</td>
<td></td>
</tr>
<tr>
<td>Compressor is unloaded</td>
<td>Recalibrate unloader pressure switch</td>
<td></td>
</tr>
<tr>
<td>Leaking check valve</td>
<td>Check temperature across check valve</td>
<td></td>
</tr>
<tr>
<td>Expansion valve not secured to suction line or TXV defective</td>
<td>Check the TXV, ensure bulb is insulated</td>
<td></td>
</tr>
<tr>
<td>High discharge pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TXV setting</td>
<td>Check TXV setting and calibrate superheat</td>
<td></td>
</tr>
<tr>
<td>Air inlet to condenser dirty or obstructed</td>
<td>Check for proper clearances and possible air recirculation</td>
<td></td>
</tr>
<tr>
<td>Condenser fan, motor defective</td>
<td>Check condenser fan motor and run capacitor</td>
<td></td>
</tr>
<tr>
<td>Condenser fan control has incorrect setting</td>
<td>Check calibration of low ambient head pressure control</td>
<td></td>
</tr>
<tr>
<td>Suction pressure too low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant undercharge</td>
<td>Check pressures and subcooling</td>
<td></td>
</tr>
<tr>
<td>Blower running backwards</td>
<td>Interchange any two wires connected to motor</td>
<td></td>
</tr>
<tr>
<td>Defective or improperly adjusted expansion valve</td>
<td>Check superheat and adjust TXV</td>
<td></td>
</tr>
<tr>
<td>Dirty filter</td>
<td>Check filter and evaporator coil</td>
<td></td>
</tr>
<tr>
<td>Too little airflow or low entering air temperature</td>
<td>Check airflow and entering air wet bulb conditions</td>
<td></td>
</tr>
<tr>
<td>Restriction in suction or liquid line</td>
<td>Check refrigerant circuit for restriction</td>
<td></td>
</tr>
<tr>
<td>Head pressure too low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient refrigerant charge</td>
<td>Check subcooling, check for leak</td>
<td></td>
</tr>
<tr>
<td>Defective or improperly adjusted expansion valve</td>
<td>Check superheat and adjust TXV</td>
<td></td>
</tr>
<tr>
<td>Low suction pressure</td>
<td>See above – suction pressure too low</td>
<td></td>
</tr>
<tr>
<td>Condenser fan control setting</td>
<td>Check calibration of low ambient control</td>
<td></td>
</tr>
<tr>
<td>Defective compressor</td>
<td>See above – high suction pressure</td>
<td></td>
</tr>
</tbody>
</table>
## SECTION 5 - TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor short cycles</td>
<td>Compressor short cycles</td>
<td>Check thermostat, check heat anticipator setting</td>
</tr>
<tr>
<td></td>
<td>Thermostat location or malfunction</td>
<td>Check thermostat, check heat anticipator setting</td>
</tr>
<tr>
<td></td>
<td>Improper refrigerant charge</td>
<td>Check subcooling, verify superheat</td>
</tr>
<tr>
<td></td>
<td>Defective high or low pressure control</td>
<td>Check high or low pressure switch</td>
</tr>
<tr>
<td></td>
<td>Cycling on internal overload</td>
<td>Possible tight bearings -- see above</td>
</tr>
<tr>
<td></td>
<td>Defective expansion valve</td>
<td>Check TXV and superheat</td>
</tr>
<tr>
<td></td>
<td>Poor air distribution</td>
<td>Check ductwork for recirculation</td>
</tr>
<tr>
<td></td>
<td>High discharge pressure</td>
<td>See above – high discharge pressure</td>
</tr>
<tr>
<td></td>
<td>Leaking discharge valves in compressor</td>
<td>See above – high suction pressure</td>
</tr>
<tr>
<td>Running cycle too long or unit operates</td>
<td>Refrigerant undercharged</td>
<td>Check subcooling</td>
</tr>
<tr>
<td>continuously</td>
<td>Dirty filter or evaporator coil</td>
<td>Check filter, coil and airflow</td>
</tr>
<tr>
<td></td>
<td>Dirty or clogged condenser coil</td>
<td>Check coil and airflow</td>
</tr>
<tr>
<td></td>
<td>Air or other non-condensables in system</td>
<td>Check equalized high side pressure with equivalent outdoor temperature</td>
</tr>
<tr>
<td></td>
<td>Defective compressor</td>
<td>See above – high suction pressure</td>
</tr>
<tr>
<td></td>
<td>Restriction in suction and liquid line</td>
<td>Check for restrictions in refrigerant circuit</td>
</tr>
<tr>
<td></td>
<td>Control contacts stuck</td>
<td>Check thermostat, shorts in wiring, slave relay compressor contactor</td>
</tr>
<tr>
<td>Supply air temperature too high</td>
<td>Refrigerant undercharge or leak in system</td>
<td>Check subcooling and check for leaks</td>
</tr>
<tr>
<td></td>
<td>Evaporator plugged with dirt or ice</td>
<td>Check evaporator, airflow, and filter</td>
</tr>
<tr>
<td></td>
<td>Improperly adjusted or defective expansion</td>
<td>Check superheat and adjust TXV, check bulb</td>
</tr>
<tr>
<td></td>
<td>valve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Defective compressor</td>
<td>Check compressor for proper operation</td>
</tr>
<tr>
<td></td>
<td>High discharge pressure</td>
<td>See above- high discharge pressure</td>
</tr>
<tr>
<td></td>
<td>Airflow is too high</td>
<td>Check external static pressure</td>
</tr>
<tr>
<td>Supply air temperature too low</td>
<td>Airflow is too low</td>
<td>Check evaporator coil, filter, check for closed dampers, grills, drive for loose parts, belts, misalignment, check external static pressure</td>
</tr>
<tr>
<td></td>
<td>Return air temperature too low</td>
<td>Check entering air wet bulb conditions</td>
</tr>
<tr>
<td>Liquid line too hot</td>
<td>Refrigerant undercharged</td>
<td>See above – high discharge pressure,</td>
</tr>
<tr>
<td></td>
<td>High discharge pressure</td>
<td>Restriction upstream at point of frosting</td>
</tr>
<tr>
<td>Suction line frosting</td>
<td>Insufficient evaporator airflow</td>
<td>Check airflow, check fan VFD, closed dampers</td>
</tr>
<tr>
<td></td>
<td>Restriction in suction or liquid line</td>
<td>Restriction upstream at point of frosting</td>
</tr>
<tr>
<td></td>
<td>Malfunctioning or defective expansion valve</td>
<td>Check bulb of TXV</td>
</tr>
<tr>
<td>Blower motor not running</td>
<td>Improper wiring</td>
<td>Check wiring diagram</td>
</tr>
<tr>
<td></td>
<td>Defective motor</td>
<td>Check motor controller</td>
</tr>
<tr>
<td></td>
<td>Defective thermostat or control circuit</td>
<td>Check “R” and “G” Circuit</td>
</tr>
<tr>
<td></td>
<td>Motor off on overload protector</td>
<td>Allow motor to cool, check amperage</td>
</tr>
</tbody>
</table>
## Variable Speed Head Pressure Control

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fan operation</td>
<td>No 24V control voltage</td>
<td>Check for 24 VAC at control</td>
</tr>
<tr>
<td></td>
<td>No input pressure to control</td>
<td>Check alignment of capillary fitting. Schrader valve depressor must depress Schrader valve enough to allow pressure into capillary</td>
</tr>
<tr>
<td></td>
<td>Bad fan motor</td>
<td>Disconnect power. When P266 is used, place a jumper from L1 to M1 and connect power. If fan does not start, motor is bad and should be replaced</td>
</tr>
<tr>
<td></td>
<td>Pressure transducer problem</td>
<td>Disconnect 6 pin connector from right side of control. Place a jumper wire between third pin from the top and bottom pin on the control (not the cable). If fan goes to full speed, check for input pressure. If it has been determined there is adequate pressure, the transducer is bad and the control must be replaced</td>
</tr>
<tr>
<td>Fan stops when pressure reached the high end of the operating range</td>
<td>Control is not wired correctly</td>
<td>See wiring diagrams</td>
</tr>
<tr>
<td>No fan modulation (on-off operation)</td>
<td>Control is not wired correctly</td>
<td>See wiring diagrams</td>
</tr>
<tr>
<td>Fan starts at full speed</td>
<td>Control is not wired correctly</td>
<td>See wiring diagrams</td>
</tr>
<tr>
<td>Erratic fan operation</td>
<td>Control is not wired correctly</td>
<td>See wiring diagrams</td>
</tr>
<tr>
<td></td>
<td>Dirty or blocked condenser coil</td>
<td>Clean condenser coil</td>
</tr>
<tr>
<td>Fan motor is cycling on thermal overload</td>
<td>Dirty or blocked condenser coil</td>
<td>Clean condenser coil</td>
</tr>
<tr>
<td></td>
<td>Wrong motor for fan speed control application</td>
<td>Replace with motor approved for fan speed control application</td>
</tr>
<tr>
<td>Erratic pressure control</td>
<td>Defective regulator</td>
<td>Replace defective part</td>
</tr>
<tr>
<td></td>
<td>Dirt causing regulator to bind</td>
<td>Disassemble regulator and clean internal parts. Install strainer</td>
</tr>
<tr>
<td></td>
<td>Power source to hot gas solenoid or operation of the solenoid is intermittent</td>
<td>Determine if problem is caused by supply voltage, solenoid or excessive MOPD. Make changes necessary to correct problem</td>
</tr>
<tr>
<td>Regulator leakage</td>
<td>Dirt in regulator causing seat to remain open</td>
<td>Clean regulator. Install strainer</td>
</tr>
<tr>
<td></td>
<td>Worn or eroded seating surface on regulator</td>
<td>Replace defective part</td>
</tr>
<tr>
<td>Regulator hunting (chattering) with large fluctuations in controlled pressures</td>
<td>Regulator is oversized</td>
<td>Contact a certified technician for correctly sized regulator</td>
</tr>
<tr>
<td></td>
<td>Regulator and liquid injection thermovalve have control interaction</td>
<td>Increase superheat setting. Dampen bulb response by repositioning</td>
</tr>
<tr>
<td></td>
<td>Regulator and cylinder unloaders have control interaction</td>
<td>Increase differential between the controls by lowering the regulator’s setpoint</td>
</tr>
</tbody>
</table>
### Regulator will provide pressure control

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulator seat is restricted</td>
<td>Locate and remove stoppage. Install strainer</td>
<td></td>
</tr>
<tr>
<td>Pressure adjusting stem is set at a point so high that suction pressure never reaches the setpoint</td>
<td>Re-adjust the regulator</td>
<td></td>
</tr>
<tr>
<td>Strainer clogged at the regulator inlet</td>
<td>Locate and remove stoppage</td>
<td></td>
</tr>
<tr>
<td>MOPD exceeded across the solenoid or loss of source voltage</td>
<td>Replace solenoid or troubleshoot the electrical problem</td>
<td></td>
</tr>
<tr>
<td>Solenoid coil burned out</td>
<td>Replace coil</td>
<td></td>
</tr>
<tr>
<td>Wrong type of distributor for hot gas bypass to the evaporator</td>
<td>Install proper venture-flo type distributor for low pressure drop</td>
<td></td>
</tr>
</tbody>
</table>

### Regulator fails to close

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dirt under seat of regulator</td>
<td>Locate and remove stoppage. Install strainer or filter drier</td>
<td></td>
</tr>
<tr>
<td>Diaphragm failure (leakage around the adjusting stem)</td>
<td>Replace defective parts</td>
<td></td>
</tr>
<tr>
<td>Pressure adjusting stem is set at a point so high that suction never reaches the setpoint</td>
<td>Re-adjust the regulator</td>
<td></td>
</tr>
<tr>
<td>Blocked external equalizer passage</td>
<td>Locate and remove stoppage. Install strainer</td>
<td></td>
</tr>
<tr>
<td>Worn or eroded regulator seat</td>
<td>Replace defective part</td>
<td></td>
</tr>
</tbody>
</table>

### ENERGY WHEEL CONSERVATION

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate wheel performance</td>
<td>Incorrect wheel rotation speed</td>
<td>Check wheel rotation speed</td>
</tr>
<tr>
<td></td>
<td>Worn wheel media or worn/out-of-place seals</td>
<td>Check wheel integrity and seals. Adjust and/or replace seals</td>
</tr>
<tr>
<td></td>
<td>Unanticipated entering air conditions</td>
<td>Check entering air conditions and compare to design</td>
</tr>
<tr>
<td></td>
<td>Dirty media</td>
<td>Check media for dirt and clean</td>
</tr>
<tr>
<td>Improper wheel rotation</td>
<td>Misaligned belts</td>
<td>Check drive belts for engagement with sheaves</td>
</tr>
<tr>
<td></td>
<td>Improper motor operation</td>
<td>Check drive motor and drive motor wiring for proper voltage</td>
</tr>
<tr>
<td></td>
<td>Improper VFD operation</td>
<td>Check VFD programming</td>
</tr>
<tr>
<td></td>
<td>Improper VFD sensor operation</td>
<td>Check VFD input sensor (temperature/relative humidity) for malfunctioning</td>
</tr>
<tr>
<td>High pressure drop</td>
<td>Unanticipated airflow</td>
<td>Check airflow and compare to design</td>
</tr>
<tr>
<td></td>
<td>Dirty filters</td>
<td>Check filters and clean/replace</td>
</tr>
<tr>
<td></td>
<td>Dirty media</td>
<td>Check media for dirt and clean</td>
</tr>
<tr>
<td>Noise</td>
<td>Out-of-place seals</td>
<td>Check seals and adjust</td>
</tr>
<tr>
<td></td>
<td>Worn bearings</td>
<td>Check bearings</td>
</tr>
<tr>
<td></td>
<td>Misaligned belts</td>
<td>Check belts for slippage</td>
</tr>
</tbody>
</table>
## GAS FURNACE

LED flashes on for 0.25 second and off for 0.25 second during fault condition. Pause between fault codes is 3 seconds.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady on - No operation</td>
<td>Internal control fault</td>
<td></td>
</tr>
<tr>
<td>One flash - Combustion airflow fault</td>
<td>Faulty combustion blower</td>
<td>Check for 230V supply and tightness at fan connections. If no power, replace</td>
</tr>
<tr>
<td></td>
<td>Airflow switch not closing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airflow switch opened during operation</td>
<td></td>
</tr>
<tr>
<td>Two flash - Flame with no call for heat</td>
<td>Faulty gas valve</td>
<td>Check voltage to gas valve with thermostat off. Valve should not be powered. If there is gas flow, replace valve</td>
</tr>
<tr>
<td></td>
<td>Ignition control miscommunication</td>
<td>Reset ignition control by removing 24V power to ignition control terminal 24VAC</td>
</tr>
<tr>
<td></td>
<td>Dirty burners</td>
<td>Clean burners to ensure proper flame carryover</td>
</tr>
<tr>
<td></td>
<td>Faulty spark igniter</td>
<td>Check if connecting lead or spark igniter are damaged. If yes, replace</td>
</tr>
<tr>
<td></td>
<td>Faulty flame sensor</td>
<td>Check if connecting lead or flame probe are damaged and/or touching earthed components. If yes, replace</td>
</tr>
<tr>
<td></td>
<td>Incorrect gas pressure at gas valve</td>
<td>Check gas pressure at inlet of valve is correct for gas type. If no, correct pressure problem</td>
</tr>
<tr>
<td>Three flash - Ignition lockout</td>
<td>Faulty gas valve</td>
<td>Check gas pressure at outlet of the valve rises when valve turns on and returns to zero or lower when valve turns off. If no, replace</td>
</tr>
</tbody>
</table>

## ELECTRIC HEATER

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>No heat</td>
<td>No call for heat</td>
<td>Check that the controls are set to call for heating</td>
</tr>
<tr>
<td></td>
<td>No power and control voltage to heater</td>
<td>Check that heater has power and control voltage</td>
</tr>
<tr>
<td></td>
<td>Faulty component</td>
<td>Check components with continuity meter. Replace as necessary</td>
</tr>
<tr>
<td>Not enough heat</td>
<td>Faulty component</td>
<td>Check ampere draw is reasonably close to that on the heater data plate. If more than 10% short, begin testing individual components. Replace as necessary</td>
</tr>
<tr>
<td></td>
<td>Heat anticipator current draw too low, causing short cycling</td>
<td>Check current draw</td>
</tr>
<tr>
<td>Heater cycling on automatic limit</td>
<td>Improper airflow</td>
<td>Check for obstructions to return air, loose or broken fan belt, and clogged filters and/or evaporator coils</td>
</tr>
<tr>
<td></td>
<td>Faulty temperature limit switch</td>
<td>Test and, if necessary, replace</td>
</tr>
<tr>
<td>Open secondary protective device</td>
<td>Stuck contactor</td>
<td>Check contactor</td>
</tr>
<tr>
<td>Contractor chatter</td>
<td>Improper wiring</td>
<td>Check wiring</td>
</tr>
<tr>
<td></td>
<td>Insufficient transformer capacity</td>
<td>Check transformer</td>
</tr>
<tr>
<td>Element failure</td>
<td>Corroded hardware and/or loose connections</td>
<td>Check hardware</td>
</tr>
</tbody>
</table>
SECTION 6 - WARRANTY

JOHNSON CONTROLS COVERAGE

Within 12 months from date of start-up by a qualified technician or 18 months from date of shipment (whichever occurs first), replacement parts will be provided free of charge for any part of the product that fails due to a manufacturing or material defect.

Within 60 months from date of purchase by buyer, replacement parts will be provided free of charge for any part of the compressor that fails due to a manufacturing or material defect.

Within 10 years from date of purchase by buyer, replacement parts will be provided free of charge for any part of the unit gas heat exchanger that fails due to a manufacturing or material defect.

Freight charges will apply.

Johnson Controls will require the part in question to be returned to the factory. Johnson Controls will, at its sole discretion, repair or replace after determining the nature of the defect and disposition of part in question.

Parts are warranted for the 12 months from date of shipment from the factory or the remaining JR Series warranty.

NOT COVERED BY JOHNSON CONTROLS

• Service trips, service calls, and labor charges
• Shipment of replacement parts
• Claims where the total price of the goods have not been paid
• Damage due to
  • Improper installation, operation, or maintenance
  • Misuse, abuse, neglect, or modification of the JR Series in any way
  • Use of the JR Series for other than its intended purpose
  • Incorrect gas or electrical supply, accident, fire, floods, acts of God, war, terrorism, or other casualty

• Improper service, use of replacement parts, or accessories
• Failure to install or maintain the JR Series as directed in this Installation, Operation, and Maintenance Manual (100.54-NOM1)
• Relocation of the JR Series after initial installation
• Use of the JR Series in a corrosive atmosphere containing contaminants
• Use of the JR Series in the vicinity of a combustible or explosive material
• Any defect in JR Series arising from a drawing, design, or specification supplied by or on behalf of the consumer
• Damage incurred during shipment. Claim must be filed with carrier

VOIDED WARRANTY

The warranty is void under the following circumstances:

• The JR Series is not installed by a contractor qualified in the installation and service of packaged rooftop unit
• You cannot prove original purchase date and required annual maintenance history
• The data plate and/or serial number are removed, defaced, modified, or altered in any way
• The ownership of the JR Series is moved or transferred. This warranty is non-transferable
• Johnson Controls is not permitted to inspect the damaged equipment and/or component parts

CONTACTING THE COMPANY

Before completing the installation, start-up, or any maintenance on the JR Series unit, it is required for personnel to read this Installation, Operation, and Maintenance Manual (100.54-NOM1). If you have questions about your equipment, contact your installing professional. Should you need replacement parts or have additional questions, contact your local Johnson Controls representative.
Section 6 - Warranty

Johnson Controls' liability, and your exclusive remedy, under this warranty or any implied warranty (including the implied warranties of merchantability and fitness for a particular purpose) is limited to providing replacement parts during the term of this warranty. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you. There are no rights, warranties or conditions, expressed or implied, statutory or otherwise, other than those contained in this warranty.

Johnson Controls shall in no event be responsible for incidental or consequential damages or incur liability for damages in excess of the amount paid by you for the JR Series. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from jurisdiction to jurisdiction.

Johnson Controls shall not be responsible for failure to perform under the terms of this warranty if caused by circumstances out of its control, including but not limited to war, fire, flood, strike, government or court orders, acts of God, terrorism, unavailability of supplies, parts, or power. No person is authorized to assume for Johnson Controls any other warranty, obligation, or liability.
The following factors can be used to convert from English to the most common SI Metric values.

**TABLE 9 - SI METRIC CONVERSION**

<table>
<thead>
<tr>
<th>MEASUREMENT</th>
<th>MULTIPLY ENGLISH UNIT</th>
<th>BY FACTOR</th>
<th>TO OBTAIN METRIC UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Tons Refrigerant Effect (ton)</td>
<td>3.516</td>
<td>Kilowatts (kW)</td>
</tr>
<tr>
<td>Power</td>
<td>Horsepower</td>
<td>0.7457</td>
<td>Kilowatts (kW)</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>Gallons / Minute (gpm)</td>
<td>0.0631</td>
<td>Liters / Second (l/s)</td>
</tr>
<tr>
<td>Length</td>
<td>Feet (ft)</td>
<td>0.3048</td>
<td>Meters (m)</td>
</tr>
<tr>
<td></td>
<td>Inches (in)</td>
<td>25.4</td>
<td>Millimeters (mm)</td>
</tr>
<tr>
<td>Weight</td>
<td>Pounds (lbs)</td>
<td>0.4536</td>
<td>Kilograms (kg)</td>
</tr>
<tr>
<td>Velocity</td>
<td>Feet / Second (fps)</td>
<td>0.3048</td>
<td>Meters / Second (m/s)</td>
</tr>
<tr>
<td>Pressure Drop</td>
<td>Feet of Water (ft)</td>
<td>2.989</td>
<td>Kilopascals (kPa)</td>
</tr>
<tr>
<td></td>
<td>Pounds / Square Inch (psi)</td>
<td>6.895</td>
<td>Kilopascals (kPa)</td>
</tr>
</tbody>
</table>

**TEMPERATURE**

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example: \( (45.0°F - 32°) \times 0.5556 = 7.22°C \)

To convert a temperature range (i.e., a range of 10°F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example: \( 10.0°F \text{ range} \times 0.5556 = 5.6°C \text{ range} \)