YORK®	DEDICATED OUTSIDE AIR SYSTEMS (DOAS)	
INSTALLATION, OPERATION, MAINTENANCE	Supersedes: Form 100.54-NOM2 (1119)	Form 100.54-NOM2 (121)

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:
January 26, 2021

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.

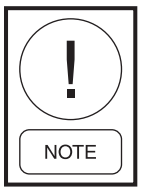
SAFETY SYMBOLS

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

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

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.

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



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

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.

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.

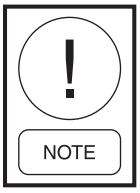
It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating/service personnel should verify whether the equipment 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

MANUAL DESCRIPTION	FORM NUMBER
Pre-Commissioning / Start-Up Checklist	100.54-CL1
Unit Controller Installation and Operation Manual	100.54-NO1
Unit Controller Quick Start-Up Guide	100.54-SU1



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:

1	2	3	4		5	6	7	8	9	10		11	12	13	14	15		16	17	18	19	20		21	22	23	24	25		26	27	28	29	30		31	32	33	34	35		36	37	38	39	40	41		42	43	44	45		46	47	48	49		50	51	25	53
J	R	O	A	–	6	6	0	H	8	A	–	4	D	A	B	J	–	A	H	1	B	4	–	1	F	J	B	0	–	H	2	7	0	0	–	0	C	0	0	0	–	0	0	0	0	B	1	–	H	1	0	0	–	A	B	D	0	–	A	L	0	0

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
048:4 ton
060:5 ton
072: 6 ton
084: 7 ton
096: 8 ton
120: 10 ton
150: 12.5 ton
180: 15 ton
210: 17.5 ton
240: 20 ton
300: 25 ton
360: 30 ton
420: 35 ton
480: 40 ton
540: 45 ton
600: 50 ton
660: 55 ton
720: 60 ton
780: 65 ton
840: 70 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: C Cab with 0 Cond Fans
G0: 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: EXL Cab with 0 Cond Fans
A1: A Cab with 1 Cond Fans
A2: A Cab with 2 Cond Fans
B1: A Cab with 1 Cond Fans
B2: A Cab with 2 Cond Fans
B4: A 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
D8: D Cab with 6 Oversized Cond Fans
H4: DXL Cab with 4 Cond Fans
H6: DXL Cab with 6 Cond Fans
H8: DXL Cab with 6 Oversized Cond Fans
E4: E Cab with 4 Cond Fans
E6: E Cab with 6 Cond Fans
E8: E Cab with 6 Oversized Cond Fans
H4: EXL Cab with 4 Cond Fans
H6: EXL Cab with 6 Cond Fans
H8: EXL Cab with 6 Oversized Cond Fans

DIGIT 10: CONTROLS
A: ALC, Standard Program, DOAS
B: ALC, Std 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, Enthalpy for Lonworks
M: Compressor Lockout Thermostat
N: ALC, Std Program, w/ Economizer, Sensible
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)
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 16: SUPPLY BLOWER OPTIONS
0: None
A: Rubber Isolation (Comefri Only)
B: Spring Isolation (Comefri Only)
F: Rigid Mount (Comefri Only)
C: Cometer (ECM Only)
D: Rubber Isolation + Piezo Ring (Comefri Only)
E: Spring Isolation + Piezo Ring (Comefri Only)
G: Rigid Mount + Piezo Ring (Comefri Only)

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
F: 7.5 HP
G: 10.0 HP
H: 15.0 HP
M: ECM

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

DIGIT 24: HEATING TYPE

0: None
A: Electric Heat
B: Natrual Gas Heat
D: LP Gas Heat
F: Hot Water Heat
G: Electric Preheat
H: B + G
J: D + G
K: F + G

DIGIT 25: 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

DIGITS 26–27: 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
G2: 150 + 150 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

DIGIT 28: 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

DIGIT 29: HEATING GAS SAFETY CONTROLS

0: None

DIGIT 30: ENERGY RECOVERY

0: None
A: ECW 244 + 2 inches 30/30 Filter
B: ECW 324 + 2 inches 30/30 Filter
C: ECW 364 + 2 inches 30/30 Filter
D: ECW 424 + 2 inches 30/30 Filter
E: ECW 484 + 2 inches 30/30 Filter
F: ECW 486 + 2 inches 30/30 Filter
G: ECW 544 + 2 inches 30/30 Filter
H: ECW 604 + 2 inches 30/30 Filter
J: ECW 606 + 2 inches 30/30 Filter
K: ECW 664 + 2 inches 30/30 Filter
L: ECW 666 + 2 inches 30/30 Filter
M: ECW 706 + 2 inches 30/30 Filter
N: ECW 724 + 2 inches 30/30 Filter
P: ECW 726 + 2 inches 30/30 Filter
Q: ECW 784 + 2 inches 30/30 Filter
R: ECW 786 + 2 inches 30/30 Filter
S: ECW 7812 + 2 inches 30/30 Filter
T: ECW 844 + 2 inches 30/30 Filter
U: ECW 846 + 2 inches 30/30 Filter
V: ECW 8412 + 2 inches 30/30 Filter

DIGIT 31: ENERGY RECOVERY OPTIONS

0: None (No ECW)
A: On/Off Defrost
B: VFD Temp Defrost
C: Bypass
D: A + C
E: B + C
F: Standard Control
G: C + F

DIGIT 32: 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)

DIGITS 33–34: 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 (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)
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 + Cometer (ECM only)
L: Actuator Damper + Cometer (ECM only)
F: Gravity Relief Damper + Rubber Isolation (Comefri only)
J: Actuator Damper + Rubber Isolation (Comefri only)
M: Gravity Relief Damper + Rubber Isolation + Piezo Ring (Comefri only)
N: Actuator Damper + Rubber Isolation + Piezo Ring (Comefri only)
G: Gravity Relief Damper + Spring Isolation (Comefri only)
K: Actuator Damper + Spring Isolation (Comefri only)
P: Gravity Relief Damper + Spring Isolation + Piezo Ring (Comefri only)
Q: Actuator Damper + Spring Isolation + Piezo Ring (Comefri only)
T: Gravity Relief Damper + Rigid Mount (Comefri only)
U: Actuator Damper + Rigid Mount (Comefri only)
V: Gravity Relief Damper + Rigid Mount + Piezo Ring (Comefri only)
W: Actuator Damper + Rigid Mount + Piezo Ring (Comefri 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 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)

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
JF: A1 + D1 + G1
JJ: 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
F: 40 Amps
G: 45 Amps
H: 50 Amps
J: 60 Amps
K: 70 Amps
L: 80 Amps
M: 90 Amps
N: 100 Amps
P: 110 Amps
Q: 125 Amps
R: 150 Amps
S: 175 Amps
T: 200 Amps
U: 225 Amps
V: 250 Amps
W: 300 Amps
Y: 350 Amps
Z: 400 Amps
1: 400+ Amps

DIGIT 43: DISCONNECT TYPE

0: None
1: Nonfused
2: Fused

DIGITS 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
BD: AA + AE
BG: AB + AE
CC: AA + AB + AE

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/ CO_2
AE: ZS Standard Zone Sensor w/ Humidity and CO_2
AF: ZS Plus Zone Sensor
AG: ZS Plus Zone Sensor w/ Humidity
AH: ZS Plus Zone Sensor w/ CO_2
AJ: ZS Plus Zone Sensor w/ Humidity and CO_2
AK: ZS Pro Zone Sensor
AL: ZS Pro Zone Sensor w/ Humidity
AM: ZS Pro Zone Sensor w/ CO_2
AN: ZS Pro Zone Sensor w/ Humidity and CO_2
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
DJ: AA + AK + AP
DK: 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" Water Source w/ Exhaust
GG: CXL Cab Roof Curb 14" Air Handler No Exhaust
GH: CXL Cab Roof Curb 14" w/ 2 Cond Fan No Exhaust
GI: CXL Cab Roof Curb 14" w/ 3 Cond Fan No Exhaust
GJ: CXL Cab Roof Curb 14" w/ 4 Cond Fan No Exhaust
GK: CXL Cab Roof Curb 14" w/ 6 Cond Fan No Exhaust
GL: CXL Cab Roof Curb 14" Water Source No Exhaust
DA: D Cab Roof Curb 14" Air Handler w/ Exhaust
DB: D Cab Roof Curb 14" w/ 4 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 No Exhaust
HH: DXL Cab Roof Curb 14" w/ 6 Cond Fan No 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

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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.

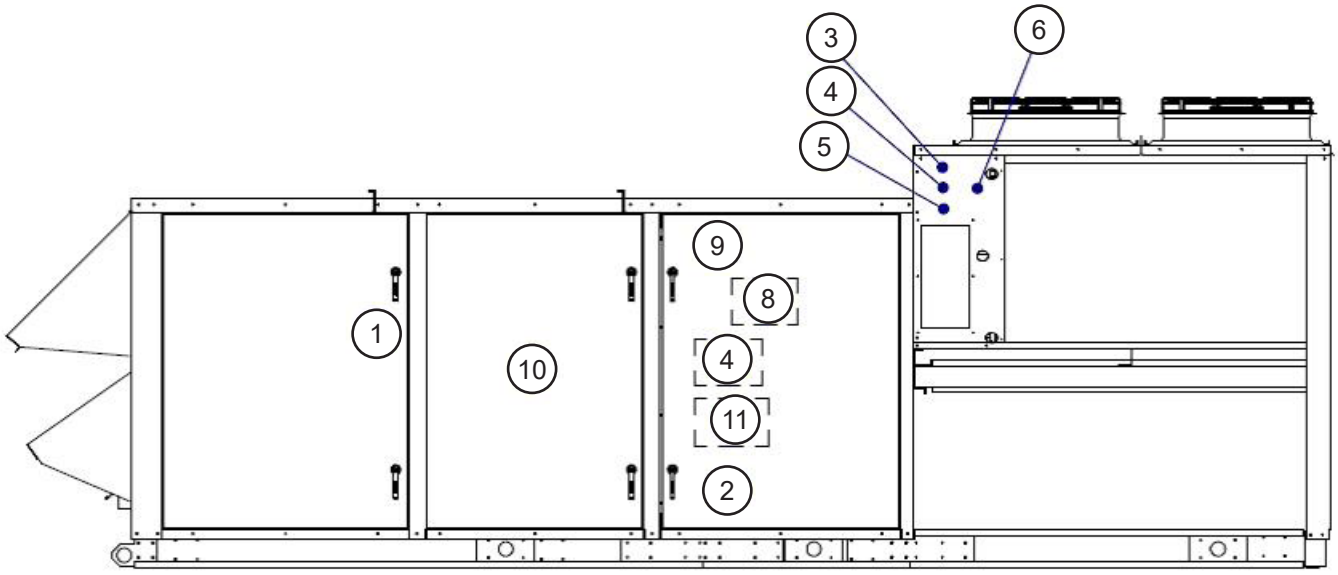
If the unit must be temporarily stored (e.g., the job site is not ready for installation of the unit), the unit should be set on 4 inches x 4 inches (10 centimeters x 10 centimeters) pieces of timber on the ground in a protected area. The unit should be covered to be protected from the environment.

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.



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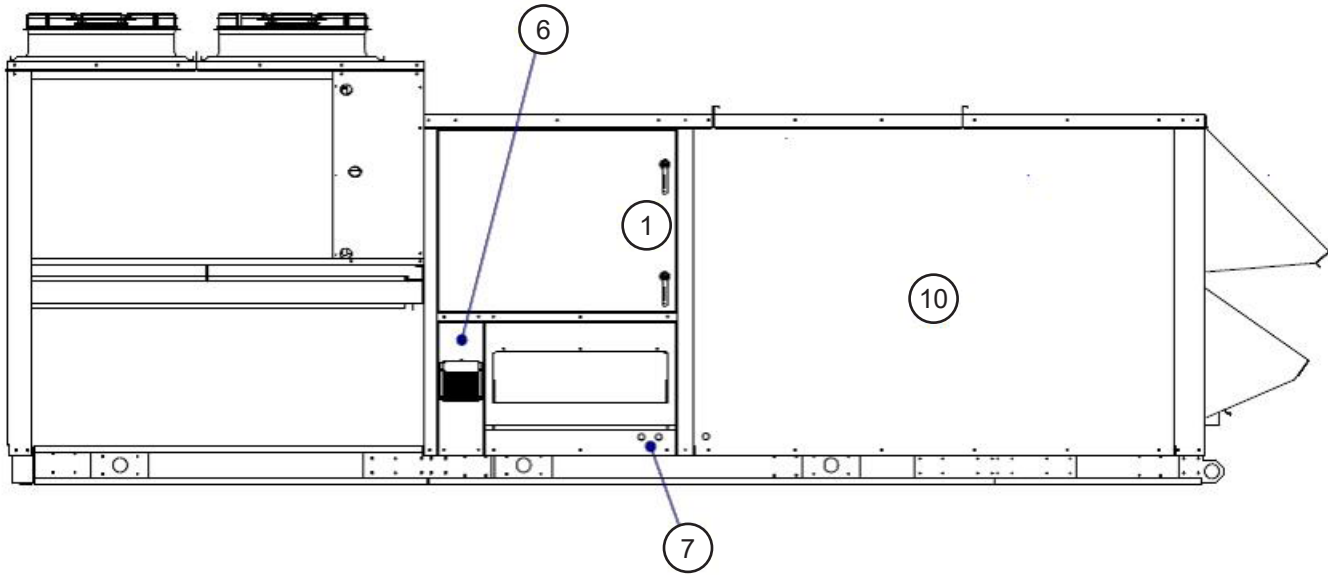

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ITEM #	PART #	DESCRIPTION
1	91070002	Warning Label
2	91031108	Door Latch Label
3	91070016	CA Cancer Warning Label
4		Manufacturer's Data Label
5	91060002	R-410A Label
6	9-21577	Hot Surface Label
7	0527N-0018	Condensate Trap Label
8	0527-0048	Copper 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

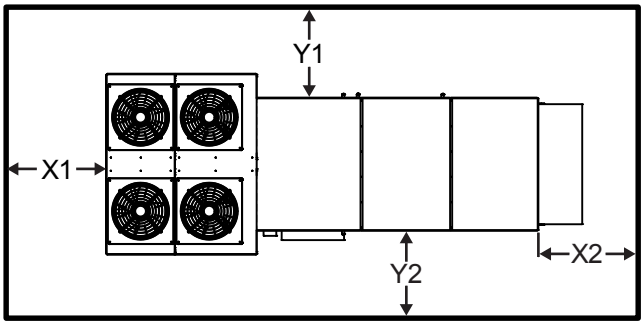
Minimum recommended service clearance is 48 in (121.9 cm) on sides of unit with access doors.

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.



JR C4 EXH Cabinet Shown for Reference Only

CABINET	X1	X2	Y1	Y2
A Cab	48 inches	48 inches	50 inches	41 inches
B Cab	48 inches	48 inches	56 inches	41 inches
C Cab	48 inches	48 inches	*62 inches	44 inches
D Cab	48 inches	48 inches	*80 inches	56 inches
E Cab	60 inches	48 inches	*104 inches	45 inches

***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.

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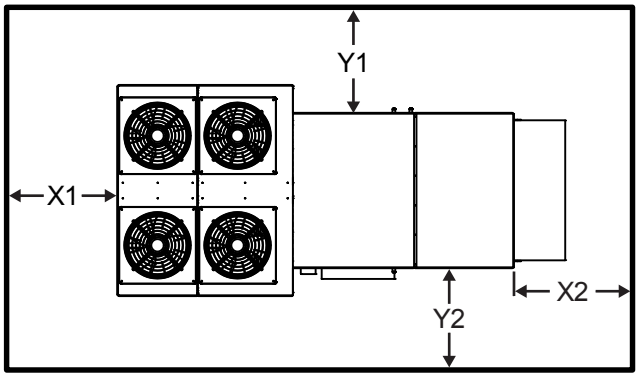
FIGURE 2 - JR SERIES UNIT WITH EXHAUST CABINET CLEARANCE



JR C4 No EXH Cabinet Shown for Reference Only

CABINET	X1	X2	Y1	Y2
A Cab	48 inches	48 inches	44 inches	41 inches
B Cab	48 inches	48 inches	48 inches	41 inches
C Cab	48 inches	48 inches	50 inches	44 inches
D Cab	48 inches	48 inches	56 inches	56 inches
E Cab	60 inches	48 inches	60 inches	45 inches

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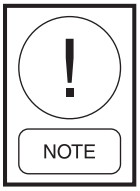
FIGURE 3 - JR SERIES UNIT WITHOUT EXHAUST CABINET CLEARANCE

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:

United States: Standard for Parking Structures NFPA 88A, latest revision or the Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A, latest revision.

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.

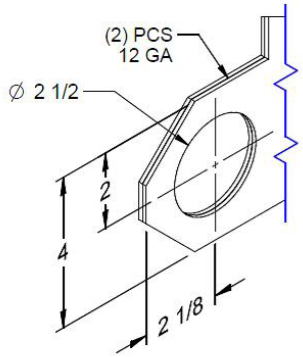
Care must be taken to keep the unit in the upright position during rigging and to prevent damage to the watertight seams in the unit casing. Avoid unnecessary jarring or rough handling.

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.

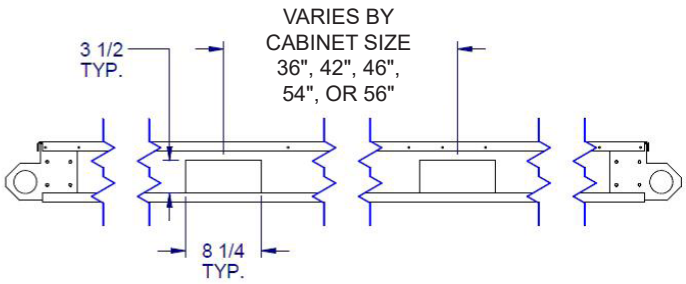
Unit weights must be referred to when selecting a crane for rigging and figuring roof weight loads. Contact your Johnson Controls representative if you have any questions regarding unit weights.

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.

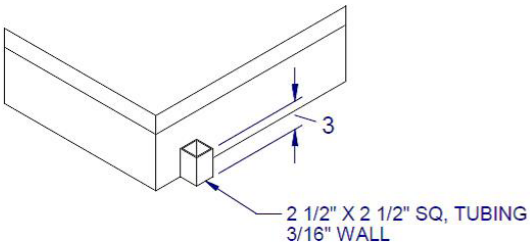
LIFTING LUGS: JR SERIES A, B, C, D NO EXHAUST, AND BXL CABINETS



FORKLIFT POCKETS (62" MINIMUM FORK LENGTH)



LIFTING LUGS: WELDED FRAME JR SERIES D AND DXL CABINETS



LIFTING LUGS: WELDED FRAME JR SERIES E AND EXL CABINETS

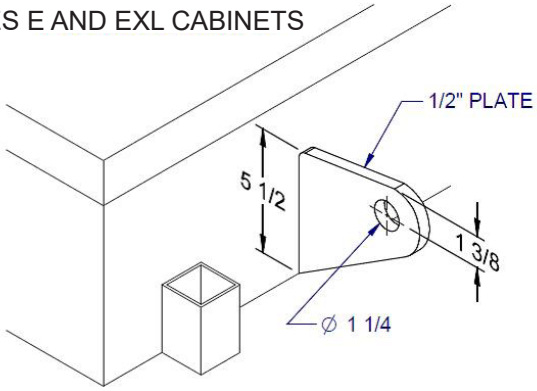


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FIGURE 4 - LIFTING LUGS

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.

NOTE

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.

NOTE

Check the installation location to ensure proper clearances to combustibles and clearance for access.

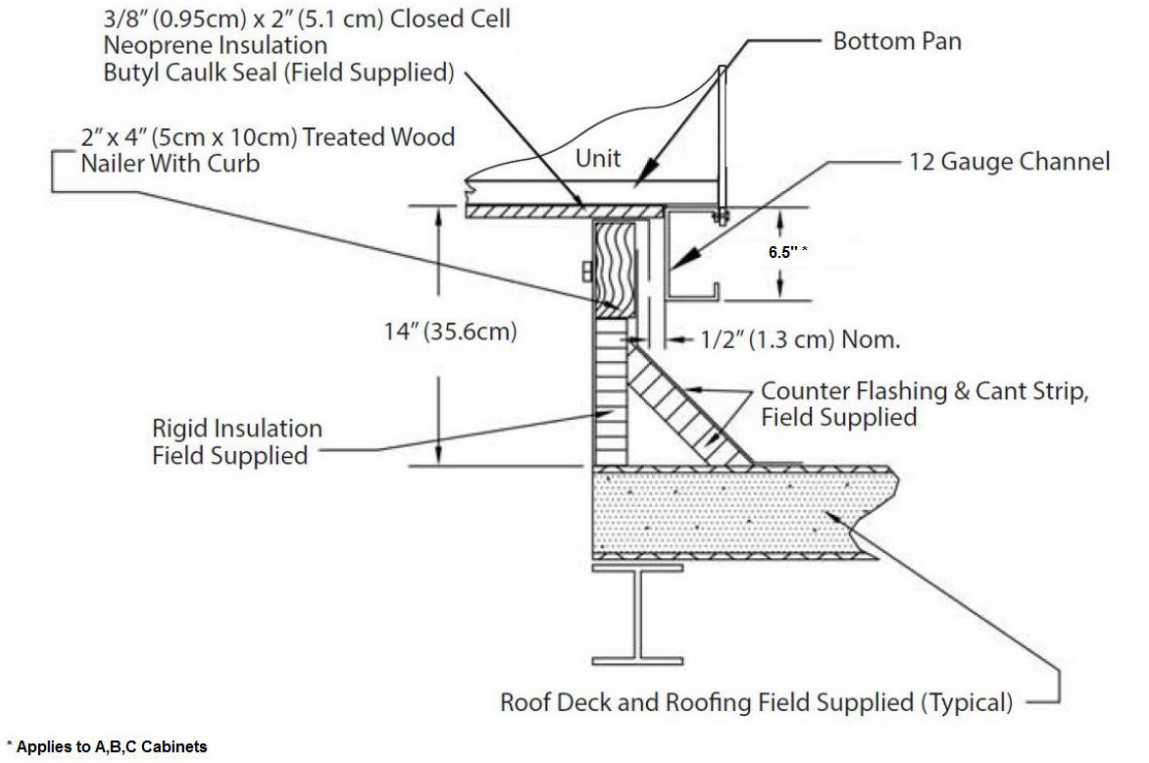

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FIGURE 5 - CURB MOUNTING

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 = (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.

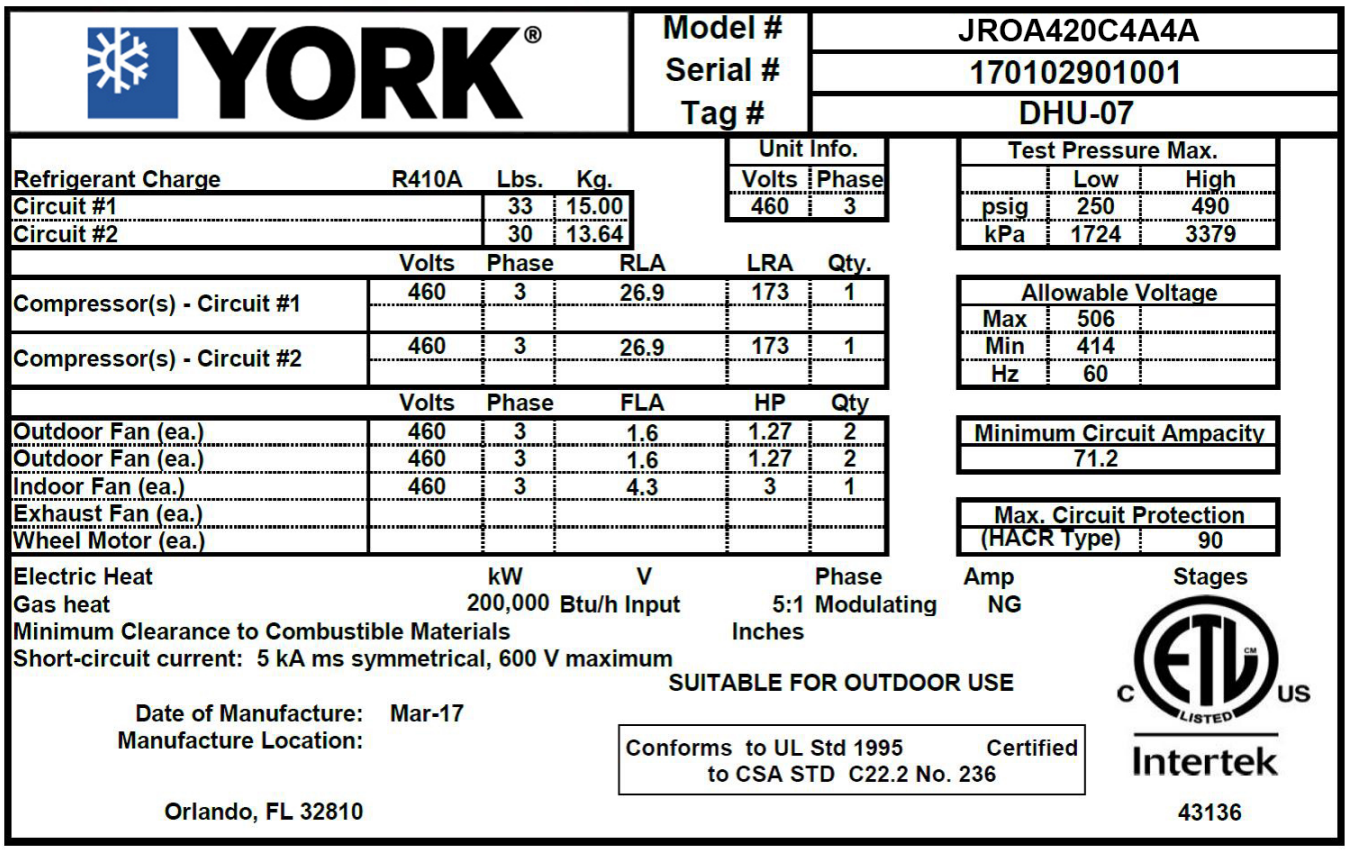
The unit has a broad application range. For optimum performance and efficiency, it may be necessary to adjust the refrigerant charge to maintain desired subcooling and superheat at design operating temperature extremes. The performance and efficiency of the system is very dependent upon having the correct 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.



YORK®

Model #	JROA420C4A4A
Serial #	170102901001
Tag #	DHU-07

Refrigerant Charge	R410A	Lbs.	Kg.
Circuit #1		33	15.00
Circuit #2		30	13.64

Unit Info.	
Volts	Phase
460	3

Test Pressure Max.		
	Low	High
psig	250	490
kPa	1724	3379

	Volts	Phase	RLA	LRA	Qty.
Compressor(s) - Circuit #1	460	3	26.9	173	1
Compressor(s) - Circuit #2	460	3	26.9	173	1

Allowable Voltage	
Max	506
Min	414
Hz	60

	Volts	Phase	FLA	HP	Qty
Outdoor Fan (ea.)	460	3	1.6	1.27	2
Outdoor Fan (ea.)	460	3	1.6	1.27	2
Indoor Fan (ea.)	460	3	4.3	3	1
Exhaust Fan (ea.)					
Wheel Motor (ea.)					

Minimum Circuit Ampacity
71.2

Max. Circuit Protection	
(HACR Type)	90

Electric Heat kW V Phase Amp Stages
Gas heat 200,000 Btu/h Input 5:1 Modulating NG
Minimum Clearance to Combustible Materials Inches
Short-circuit current: 5 kA ms symmetrical, 600 V maximum

SUITABLE FOR OUTDOOR USE

Date of Manufacture: Mar-17
Manufacture Location:

Orlando, FL 32810

Conforms to UL Std 1995 Certified
to CSA STD C22.2 No. 236

C ETL LISTED US
Intertek
43136

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FIGURE 6 - MANUFACTURER'S DATA TAG

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

100% OUTSIDE AIR & COMB UNIT SUBCOOL AND SUPERHEAT

AMBIENT AIR TEMP	95.0°F	85.0°F	75.0°F	65.0°F	55.0°F	45.0°F
Subcool	10.0–12.0°F No Reheat circuit in unit				In Heating mode	
Subcool	12.0–15.0°F No Reheat circuit in unit				In Heating mode	
Superheat	13.0–16.0°F No Reheat circuit in unit				In Heating mode	

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)

RECIRCULATING UNIT SUBCOOL AND SUPERHEAT

AMBIENT AIR TEMP	95.0°F	85.0°F	75.0°F	65.0°F	55.0°F	45.0°F
Subcool	12.0–15.0°F				15.0–18.0°F	
Superheat	10.0–12.0°F		8.0–10.0°F			

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

AMBIENT AIR TEMP	95.0°F	85.0°F	75.0°F	65.0°F	55.0°F	45.0°F
Subcool	8.0–10.0°F				In Heating mode	
Superheat	10.0–18.0°F				In Heating mode	

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 installed in an insulated compartment accessible through hinged access doors isolated from the treated air stream
- Line voltage controls, operating controls, refrigerant circuit access points, refrigerant flow control devices, and compressors are accessible from a single location behind left- and right-hinged access doors for ease of service
- 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

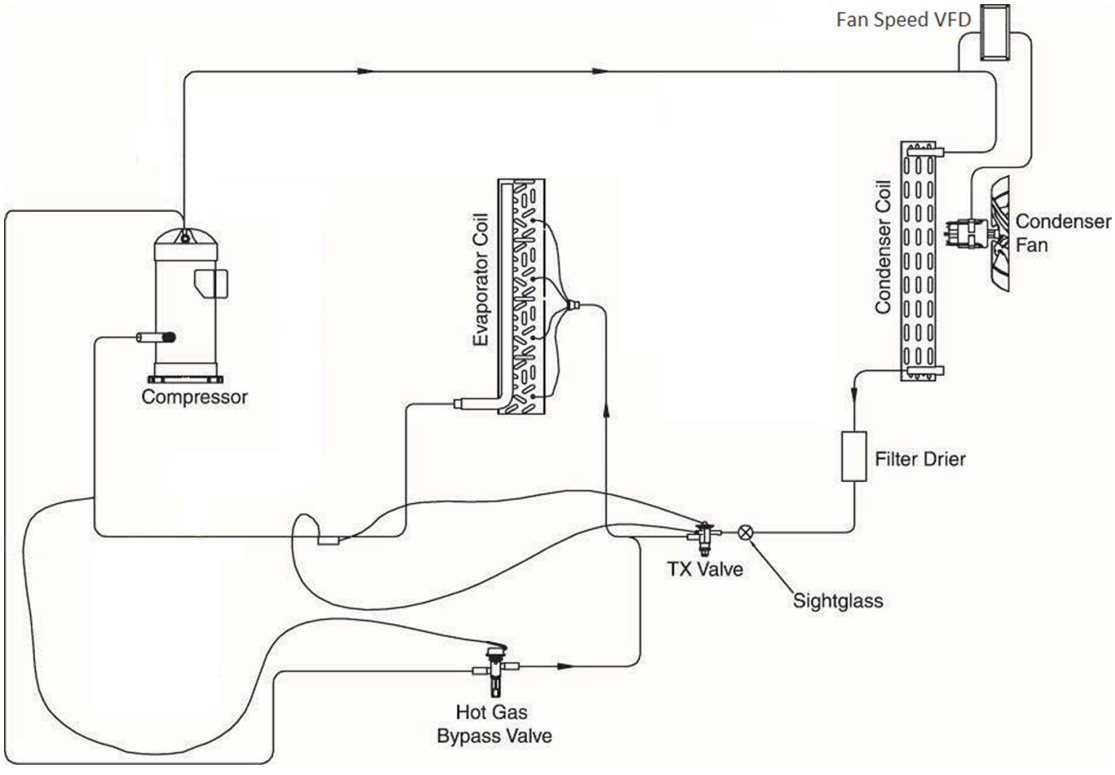

FIGURE 7 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR AND HOT GAS BYPASS W/ NO HOT GAS REHEAT

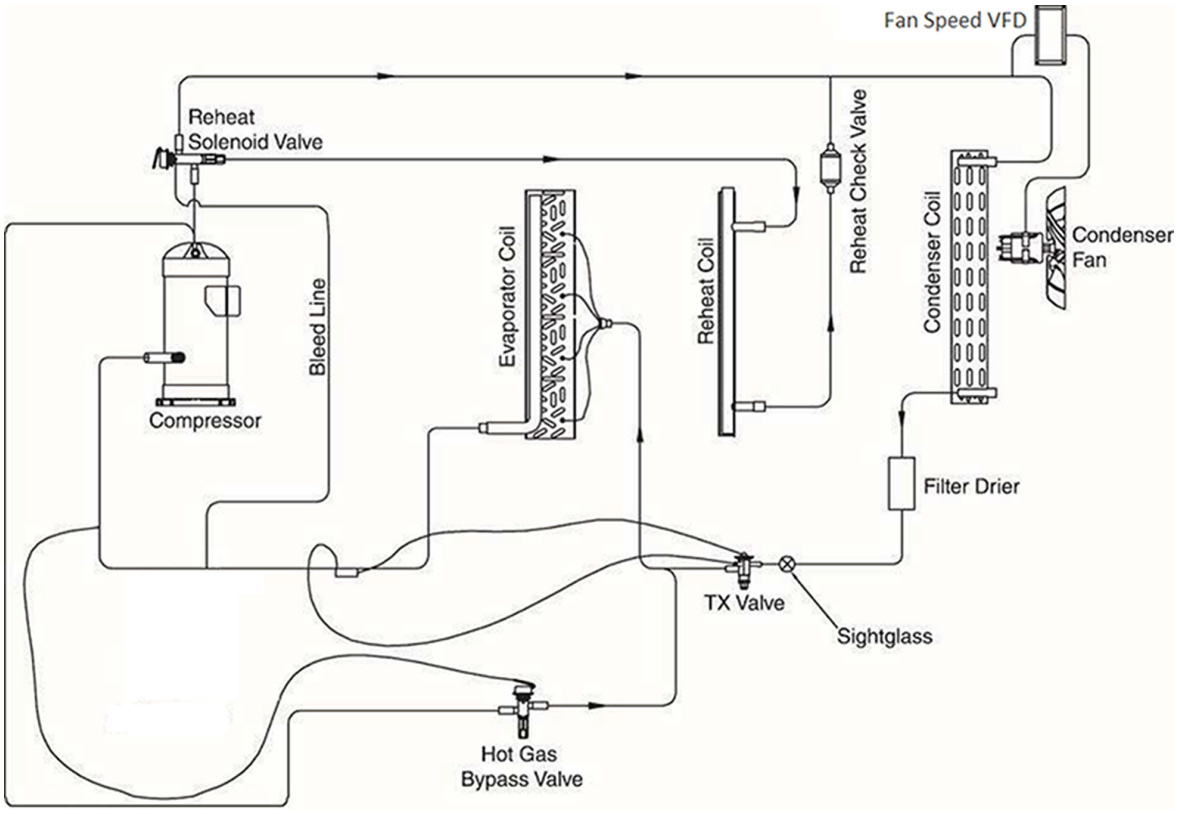

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FIGURE 8 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND STANDARD HOT GAS REHEAT

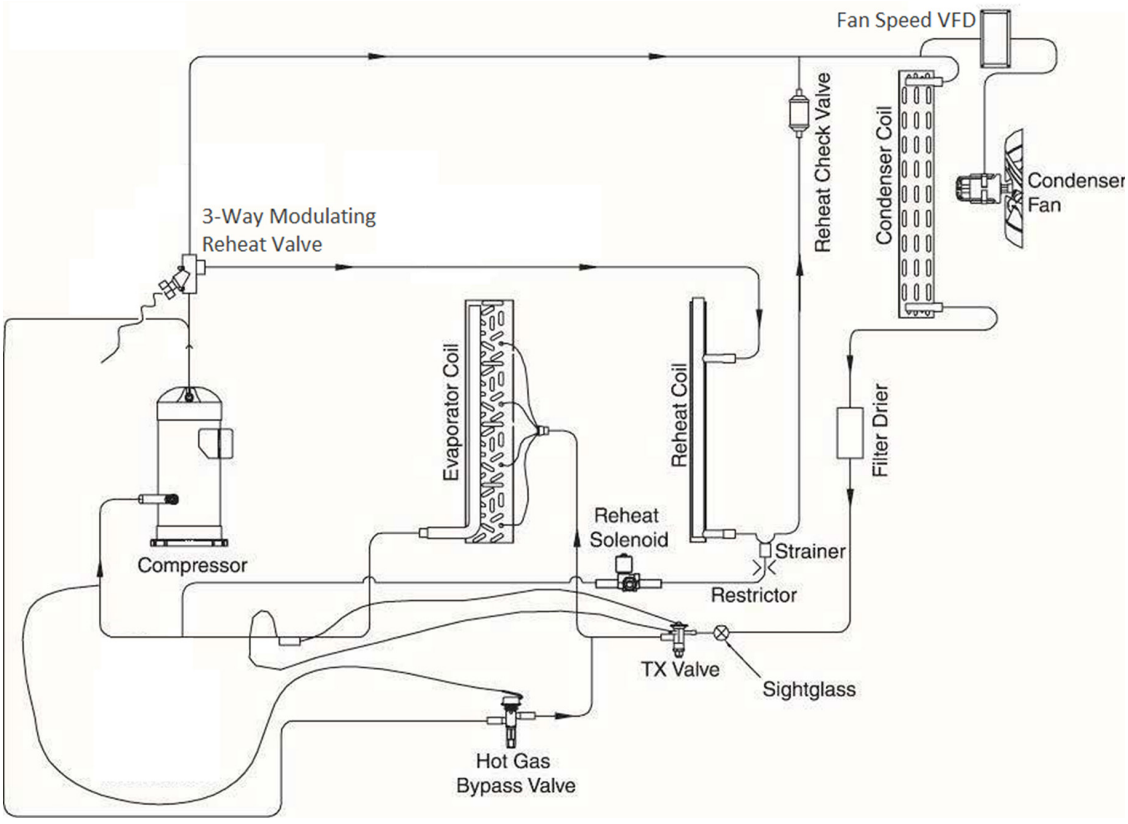

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FIGURE 9 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND MODULATING HOT GAS REHEAT

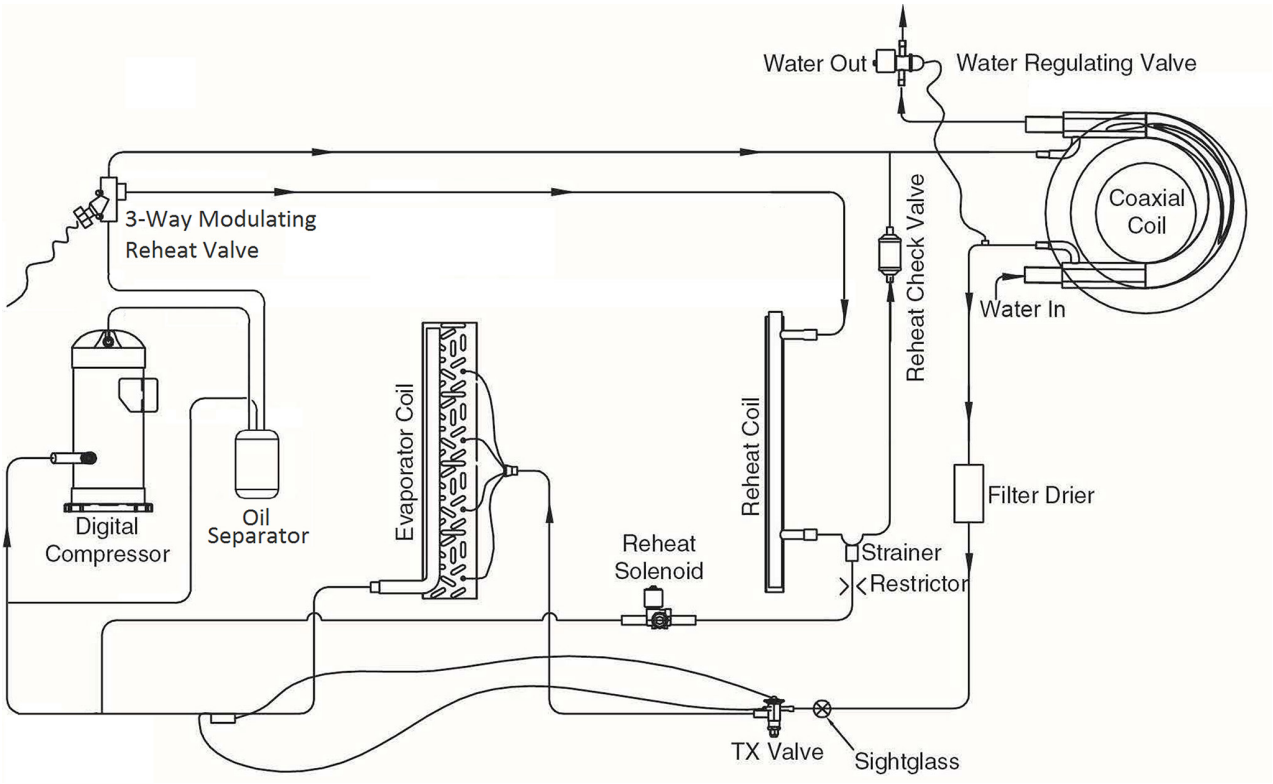

Figure 10 - CIRCUIT DIAGRAM FOR DIGITAL COMPRESSOR AND MODULATING HOT GAS REHEAT

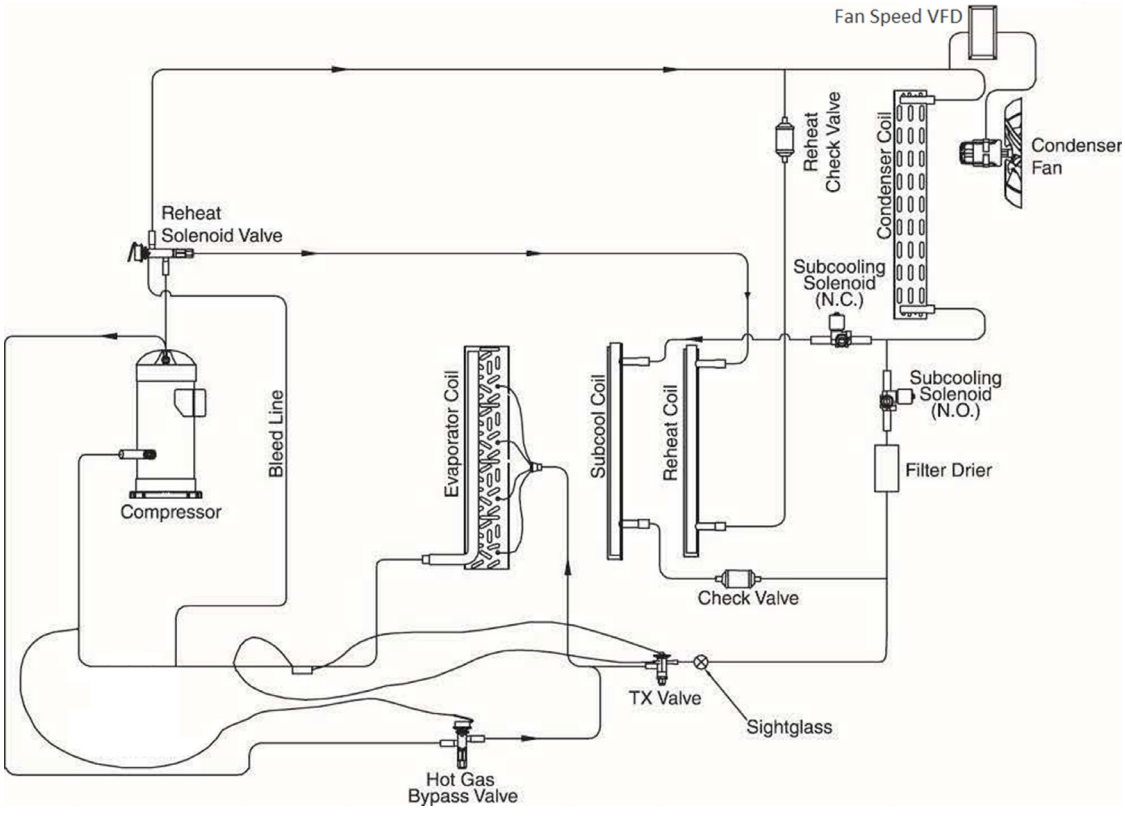

FIGURE 11 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND STANDARD HOT GAS REHEAT AND SUBCOOLING

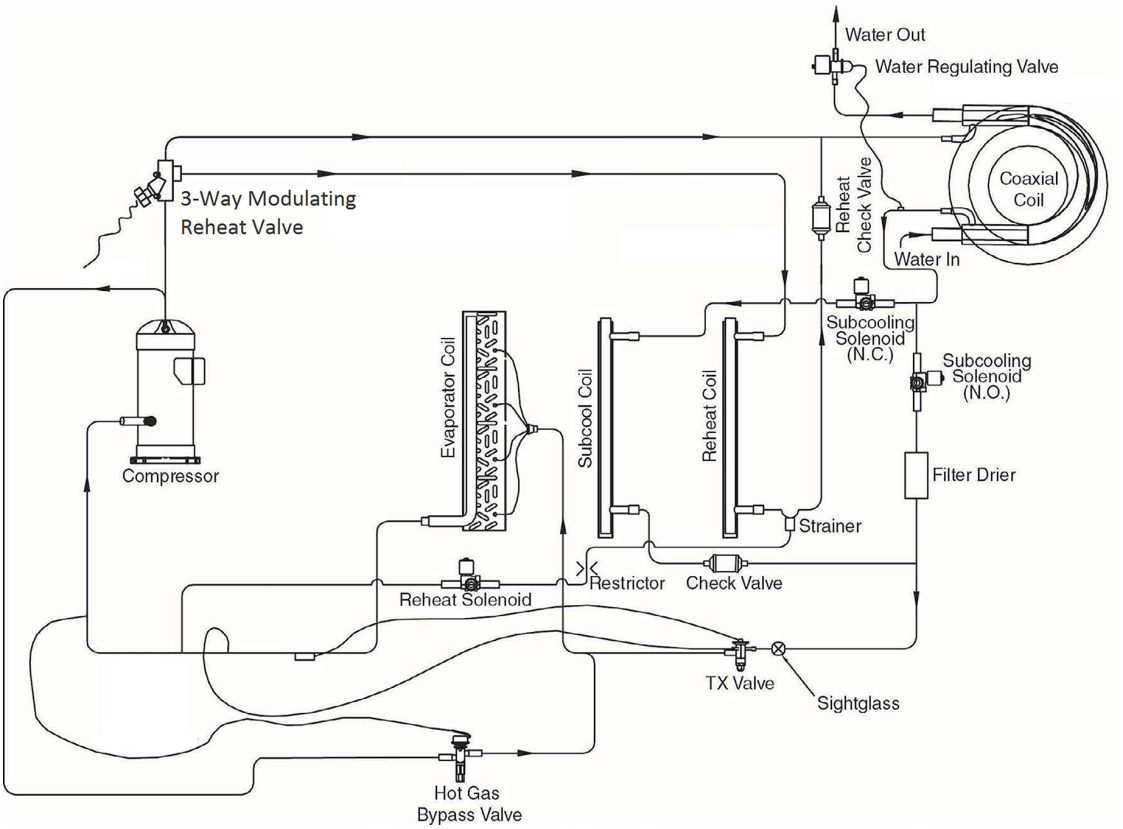

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FIGURE 12 - CIRCUIT DIAGRAM FOR STANDARD COMPRESSOR, HOT GAS BYPASS, AND MODULATING HOT GAS REHEAT AND SUBCOOLING

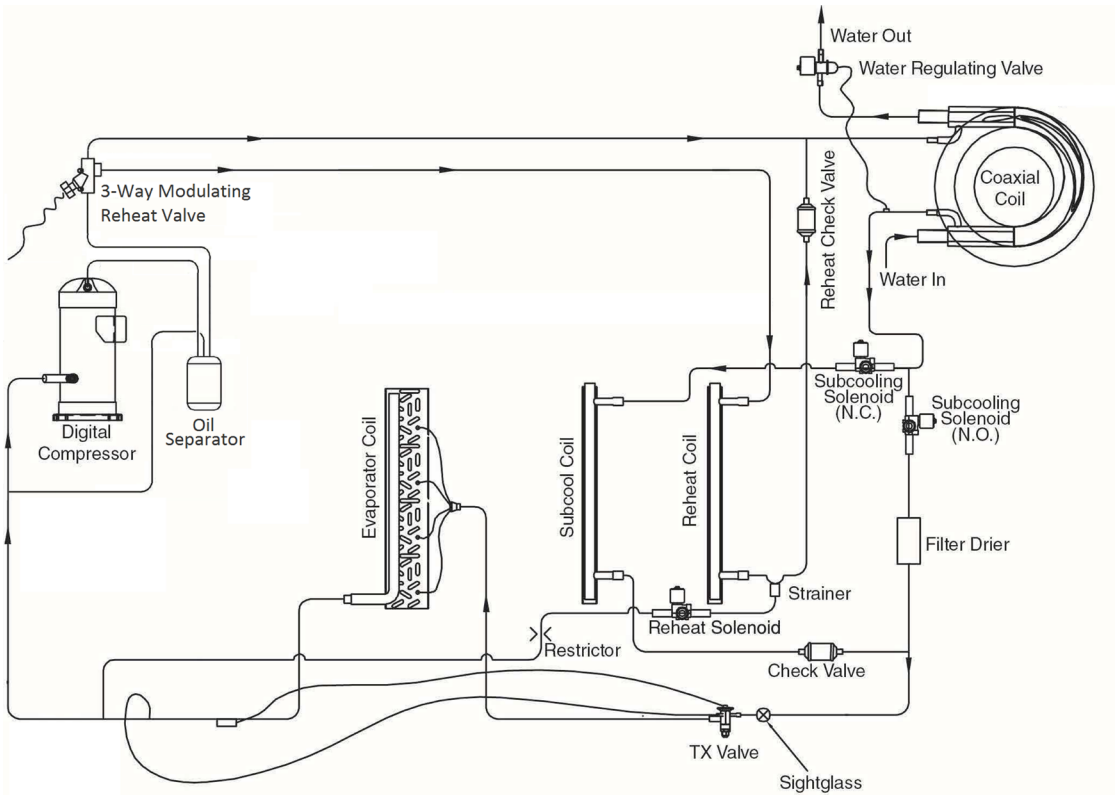

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FIGURE 13 - CIRCUIT DIAGRAM FOR DIGITAL COMPRESSOR, MODULATING HOT GAS REHEAT AND SUBCOOLING

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

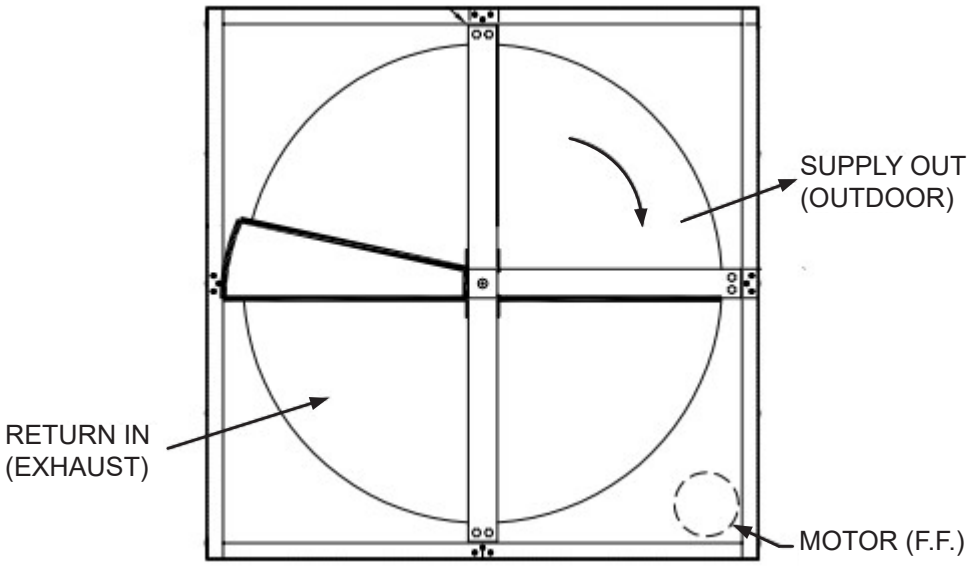

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FIGURE 14 - ENERGY CONSERVATION WHEEL (ECW)

TABLE 2 - ENERGY CONSERVATION WHEEL (ECW) SPECIFICATIONS

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

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 carryover 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.

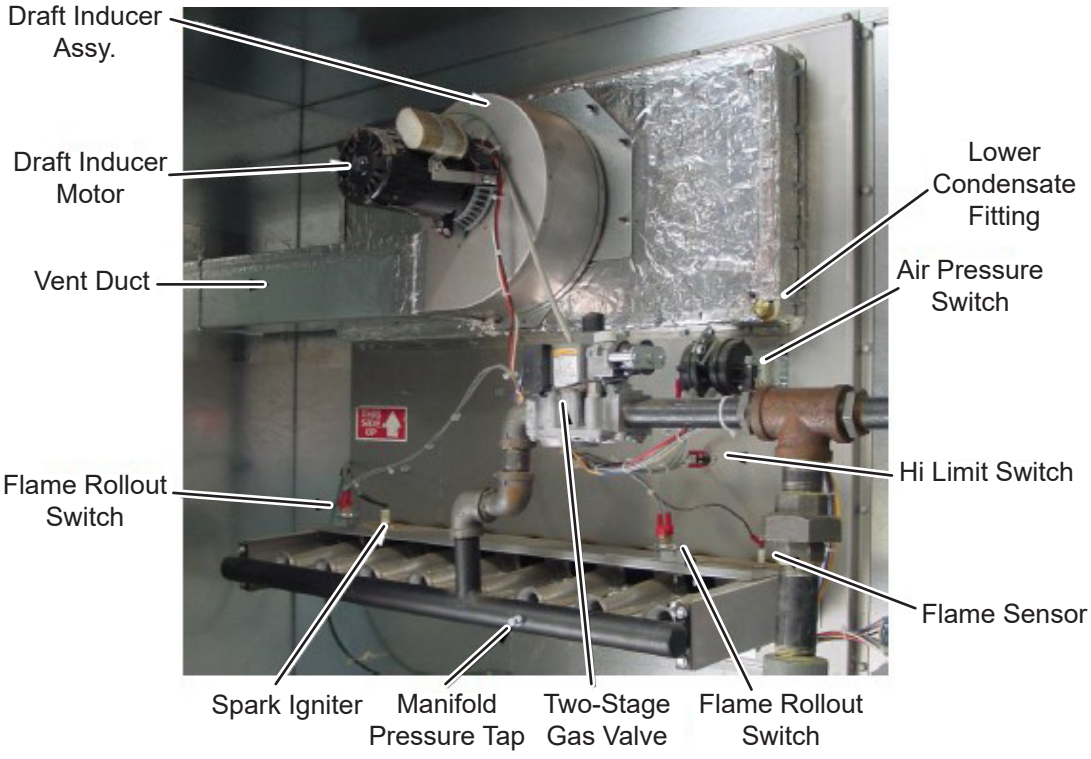

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FIGURE 15 - GAS FURNACE COMPONENT LOCATION

TABLE 3 - GAS FURNACE SPECIFICATIONS

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

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

MIN HEAT INPUT	GAS NPT CONNECTION	MIN INLET GAS PRESSURE - NG	MIN INLET GAS PRESSURE - LPG
Btu/h (kW)	Inch	Inches W.C. (mbar)	Inches W.C. (mbar)
< 400,000 (117.2)	0.75	5.0 (12.5)	11.0 (27.4)
> 400,000 (117.2)	1.00	6.0 (14.9)	12.0 (29.9)

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.

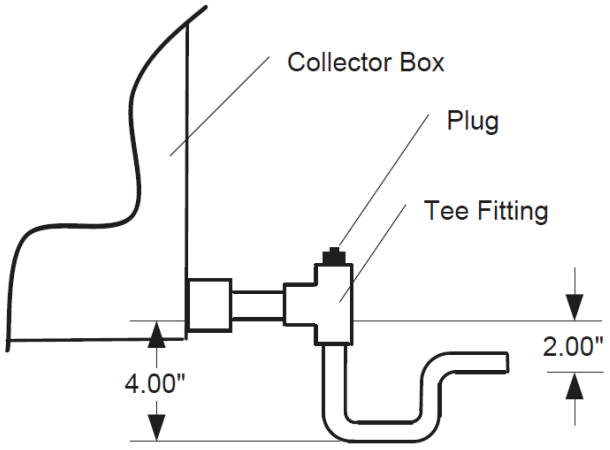
Two 1/8-inch NPT pressure test ports for measuring manifold inlet pressure are located on the gas valve.

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.



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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.

FIGURE 16 - TEE FITTING ON P-TRAP

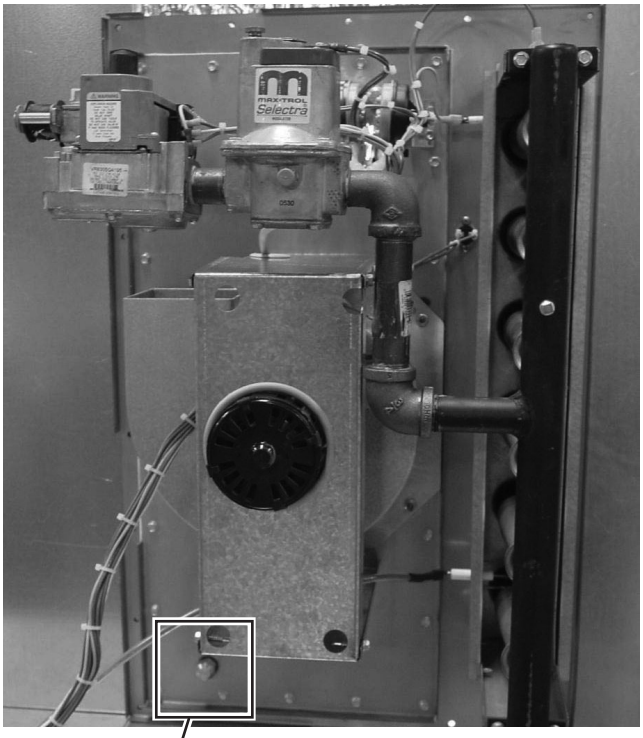

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FIGURE 17 - CONDENSATE DRAIN FITTING ON FURNACE MODULE

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.

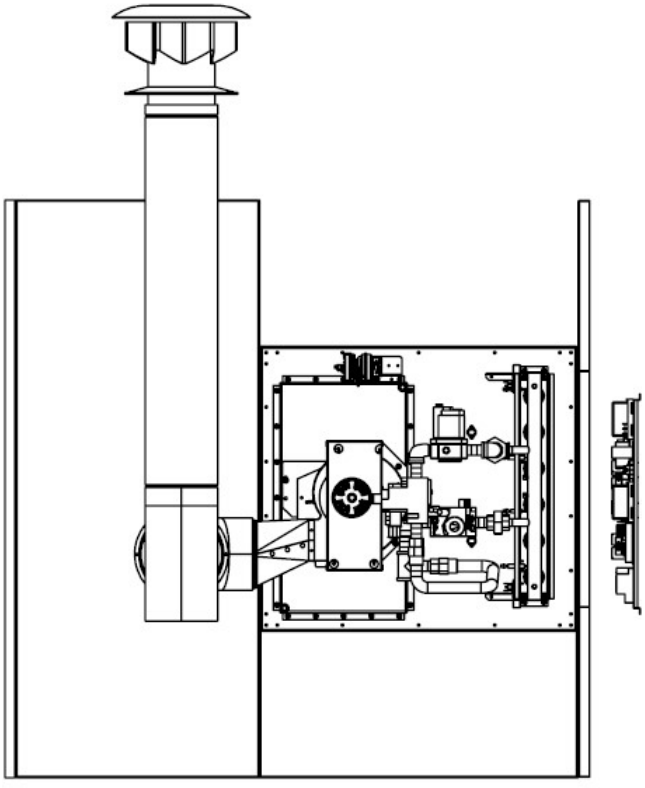

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FIGURE 18 - VERTICAL FLUE GAS DISCHARGE

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 Heaters

Principle of Operation

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

- Power distribution
- Safety circuits
- Control circuit
- Heating elements

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 safeties. 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.

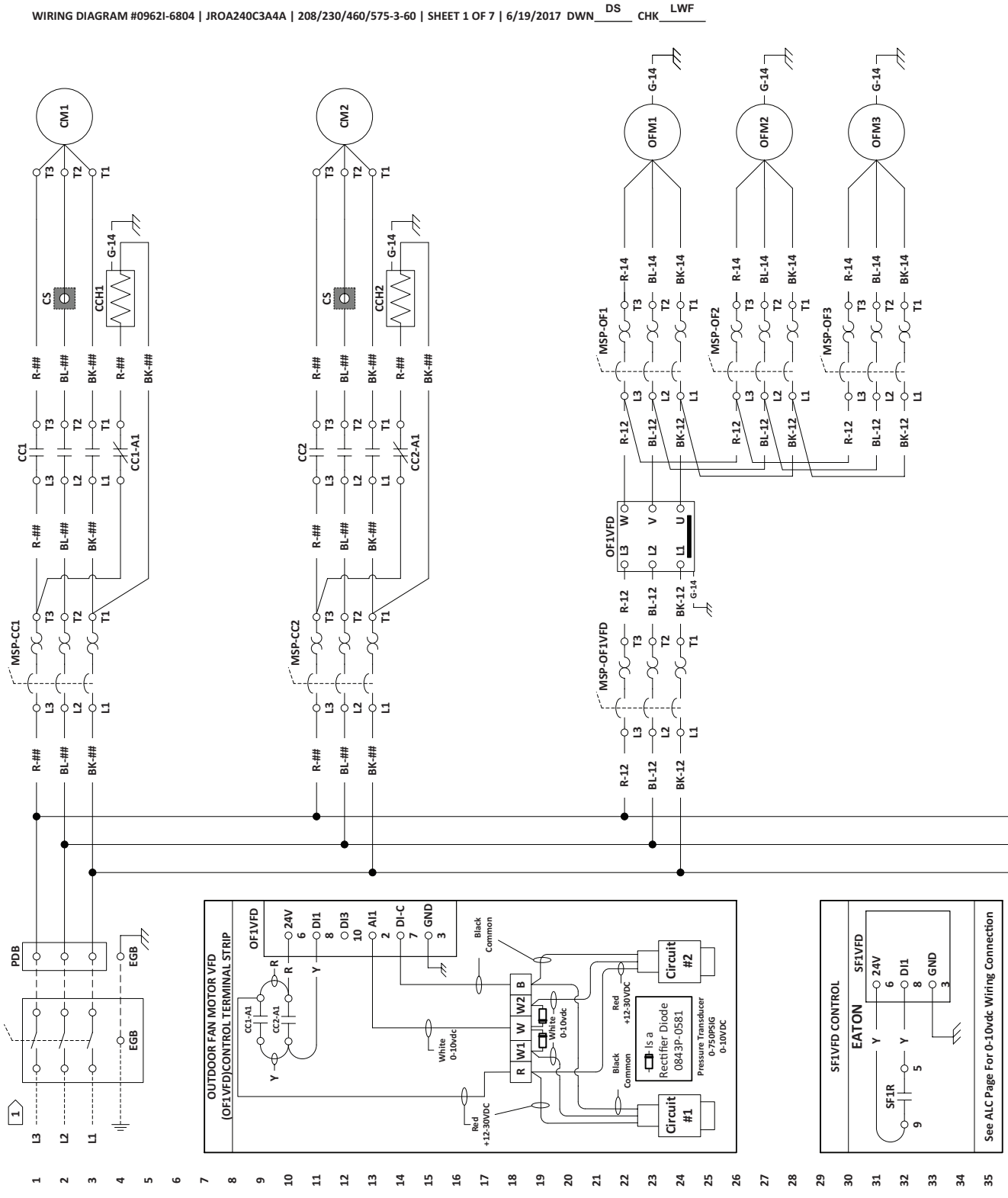
Safety systems are required for proper performance of the electric heater. The electric heater shall not be permitted to operate with any safety system disabled. If a fault is found in any of the safety systems, then the system shall be repaired only by a contractor qualified in the installation and 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.

TABLE 5 - ELECTRIC HEATER DATA

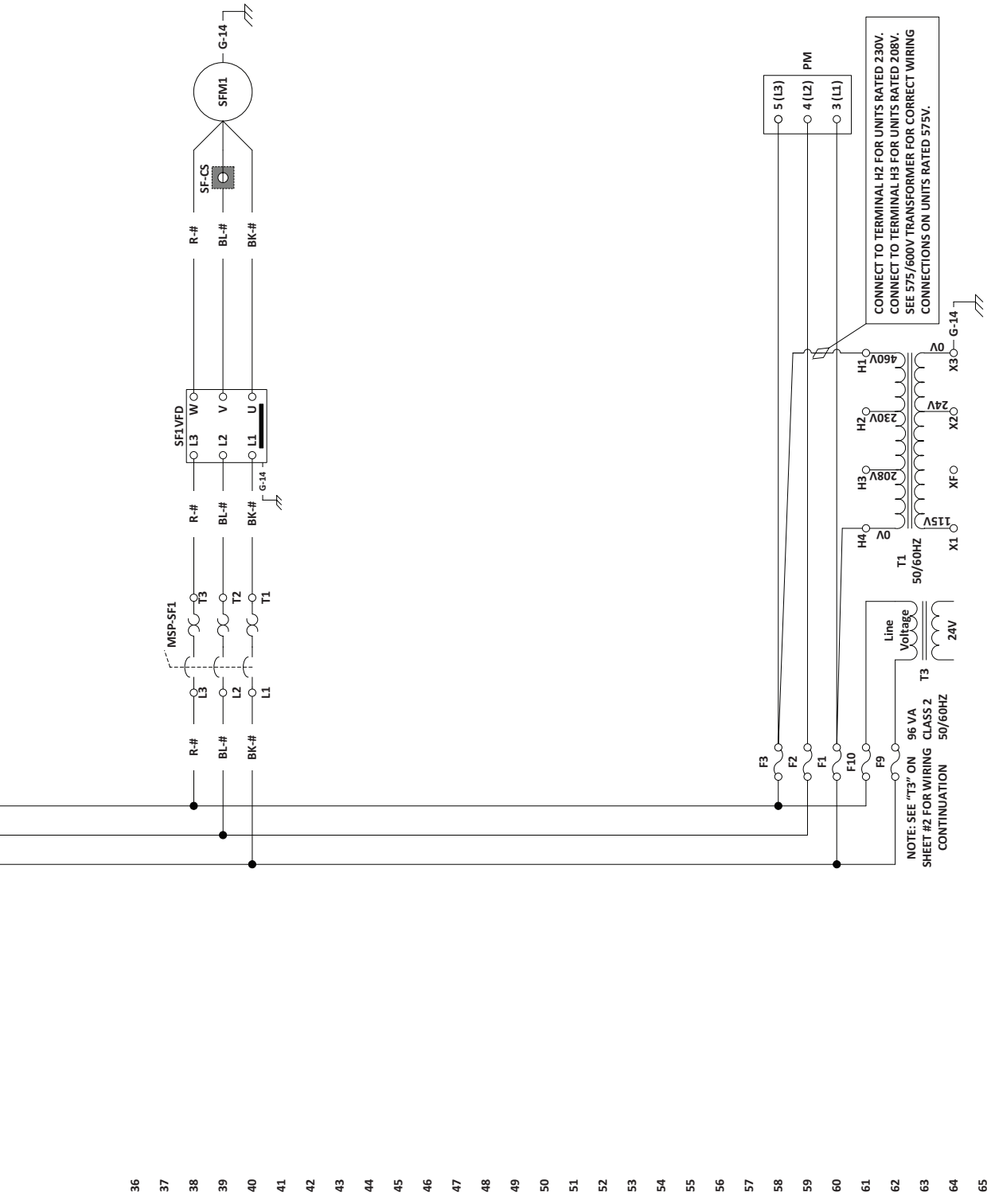
208 V kW	280/480/575 V kW	208 V 3 PHASE AMPS	240 V 3 PHASE AMPS	480 V 3 PHASE AMPS	575 V 3 PHASE AMPS
3.65	5	10	12	6	5
7.5	10	21	24	12	10
11.25	15	31	36	18	15
15	20	42	48	24	20
18.75	25	52	60	30	25
22.5	30	63	72	36	30
26.25	35	73	84	42	35
30	40	83	96	48	40
37.5	50	104	120	60	50
45	60	125	144	72	60
52.5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

Wiring Diagrams



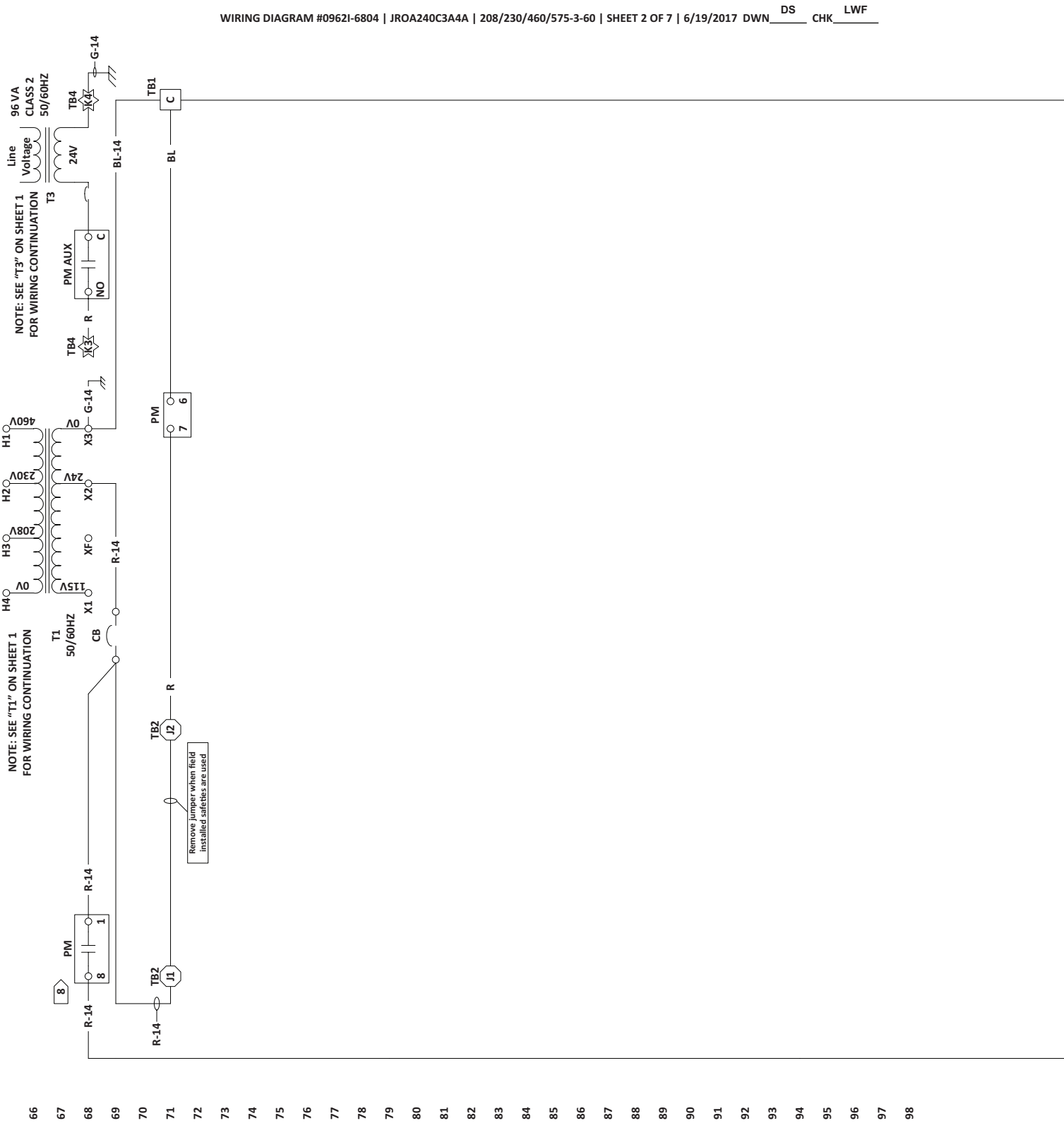
LD22581

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM



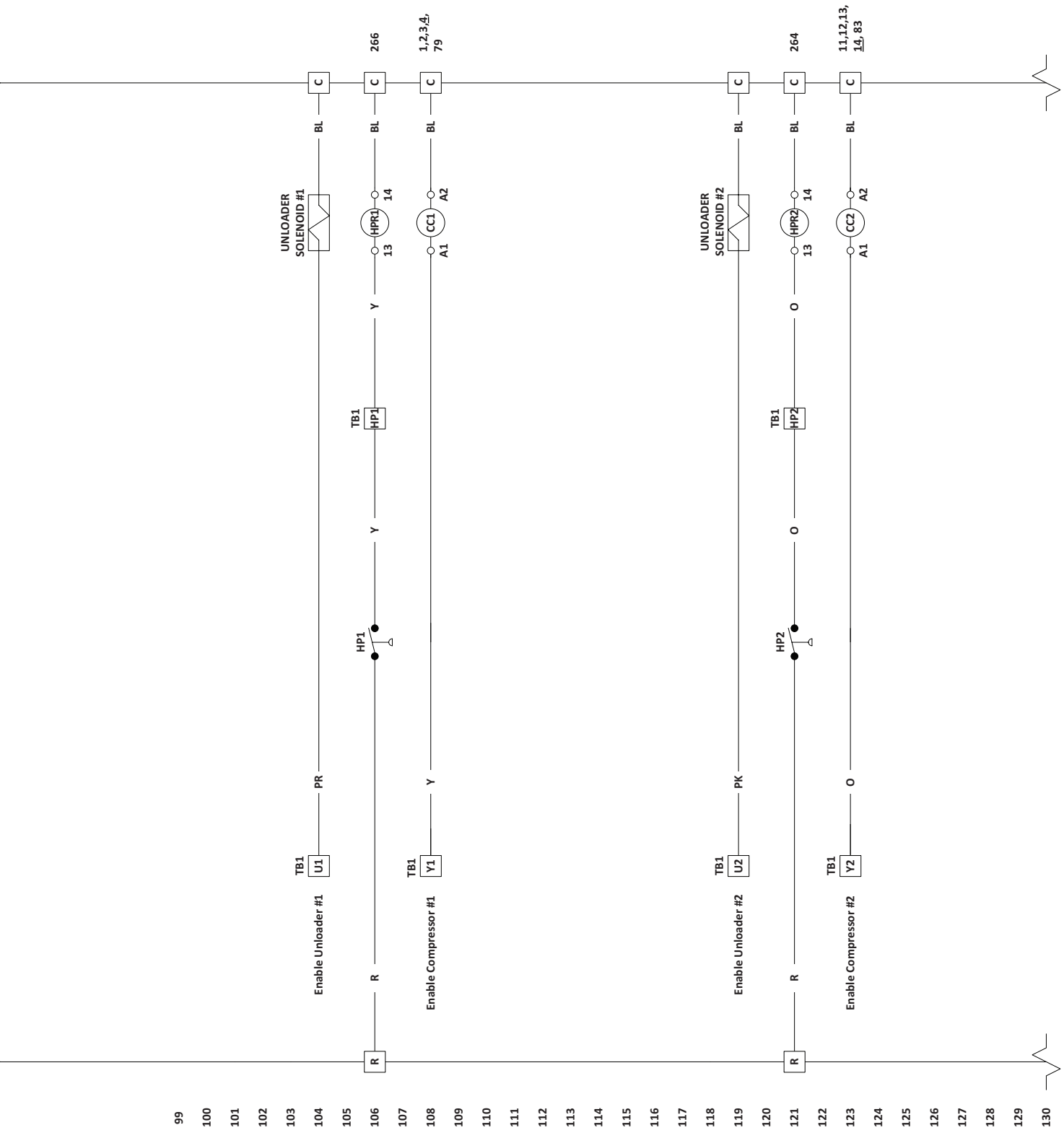
LD22582

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)



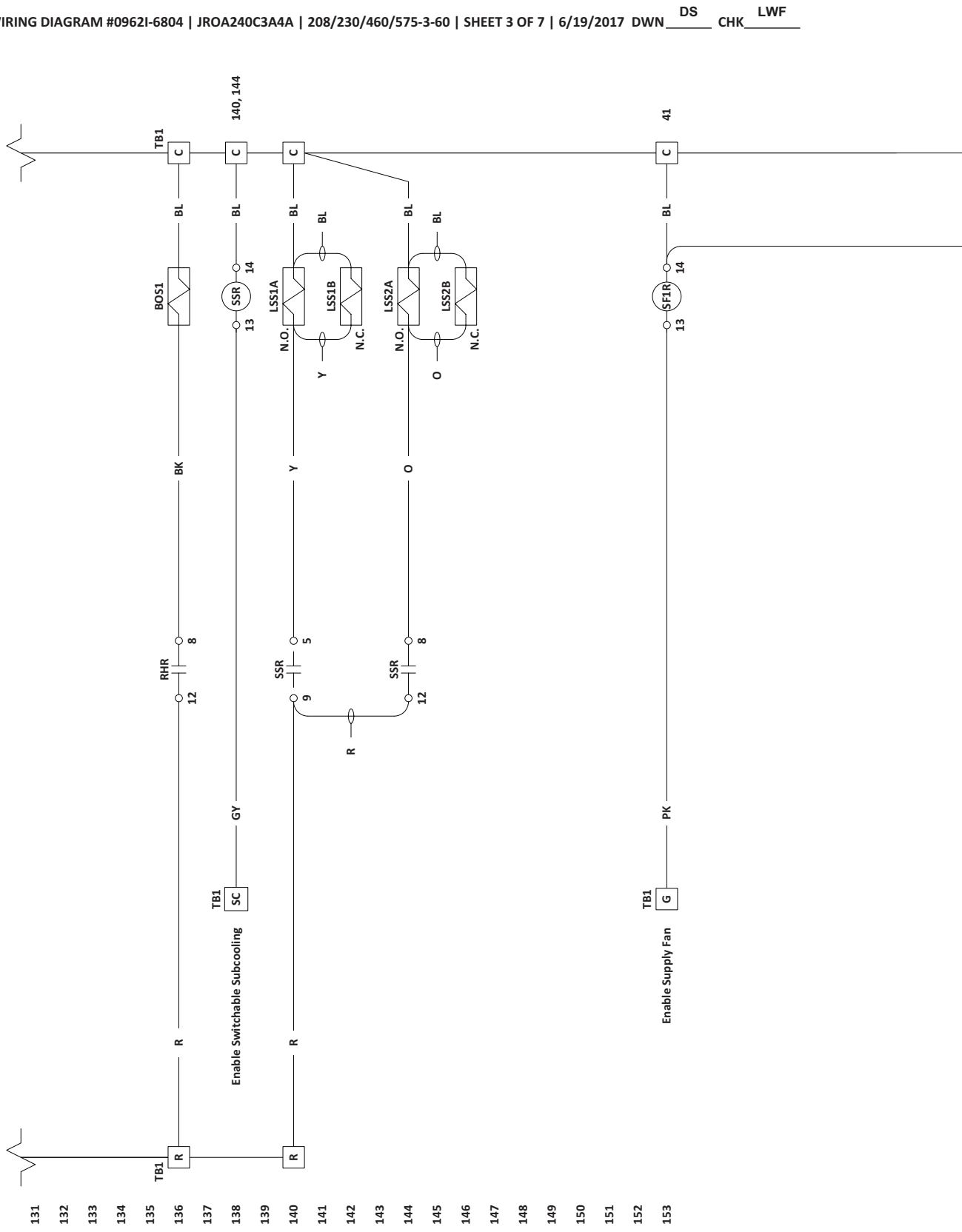
LD22583

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)



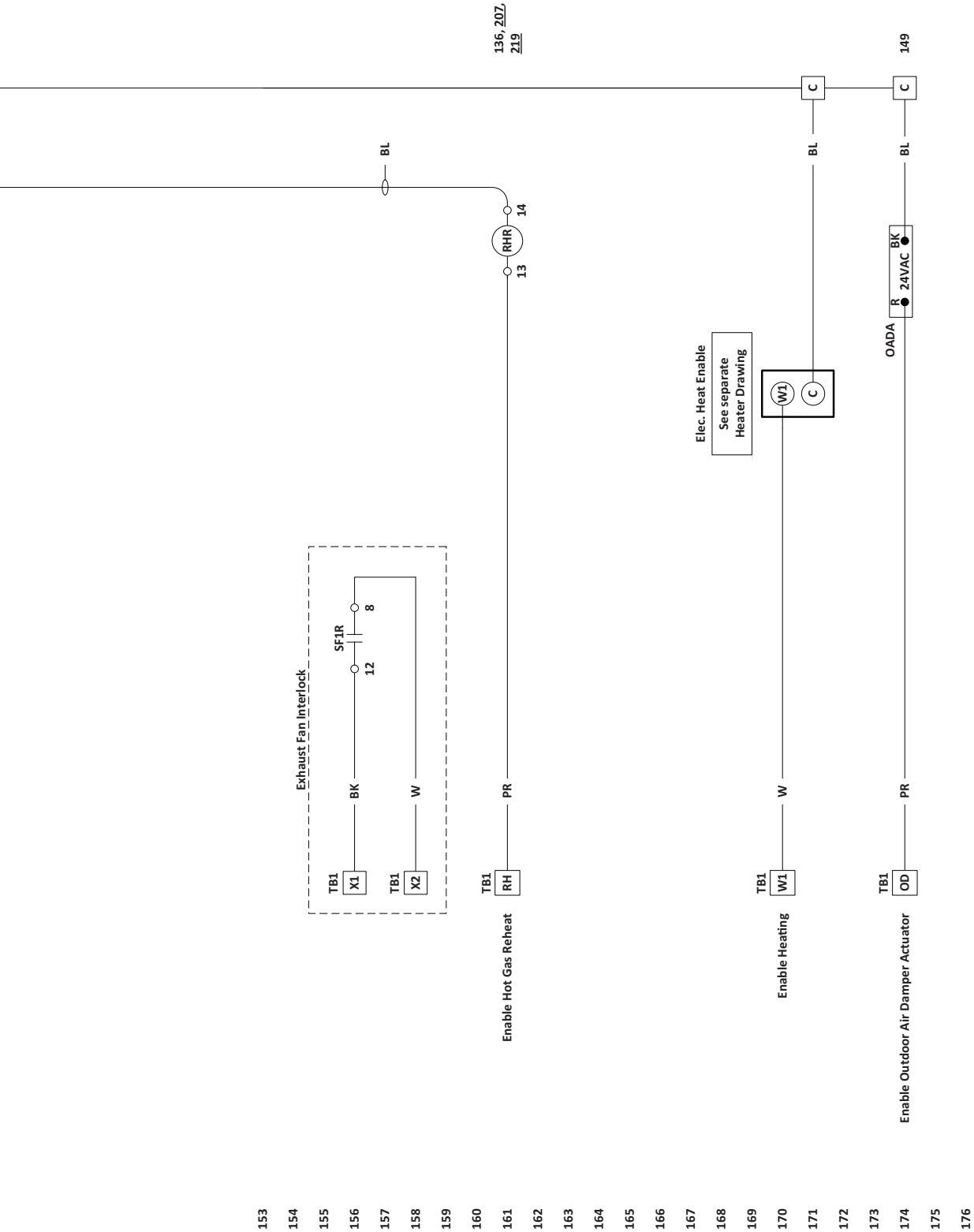
LD22584

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)



LD22585

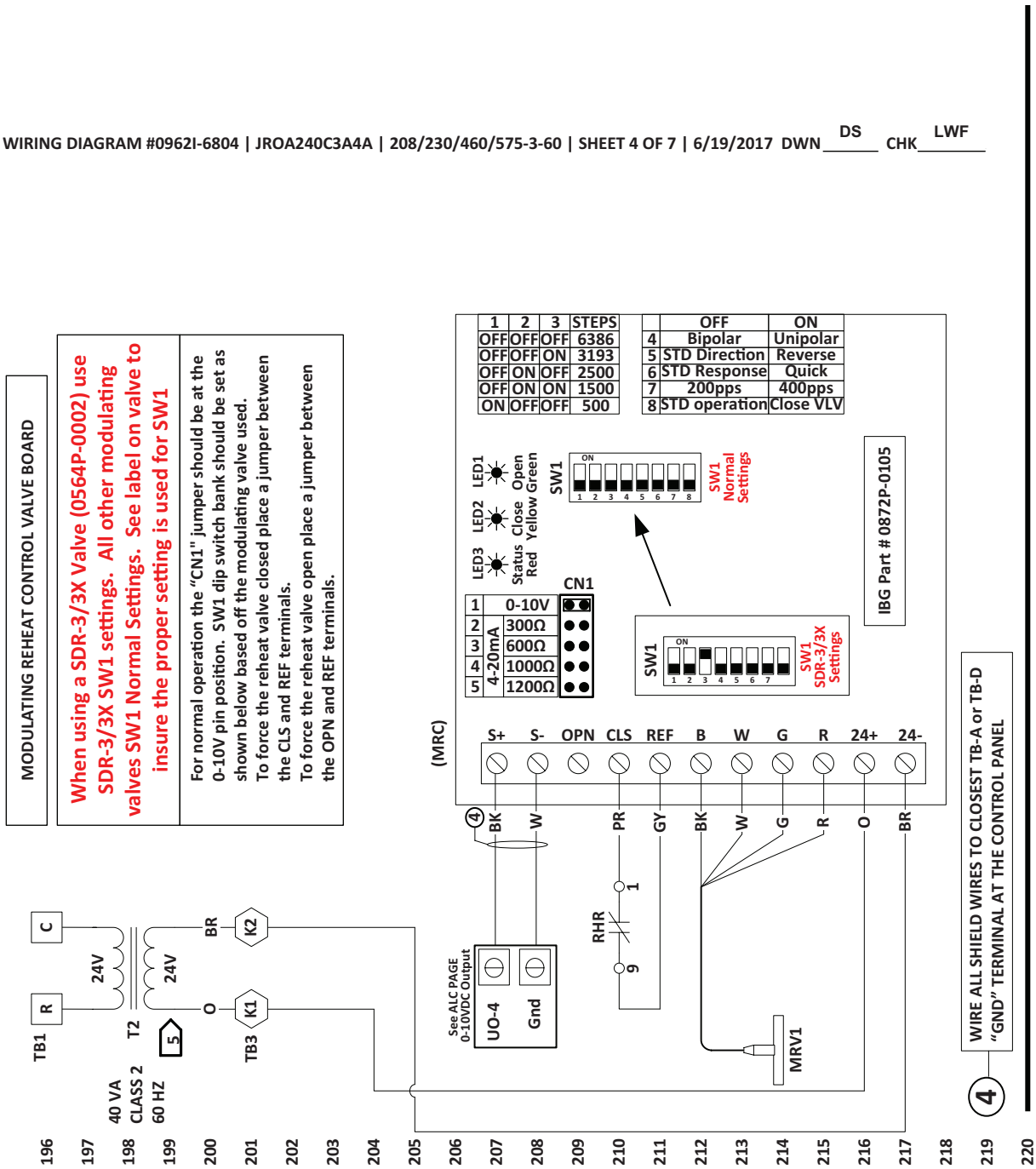
FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)



LD22586

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)

WIRING DIAGRAM #0962I-6804 | JROA240C3A4A | 208/230/460/575-3-60 | SHEET 4 OF 7 | 6/19/2017 DWN DS CHK LWF



LD22587

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)

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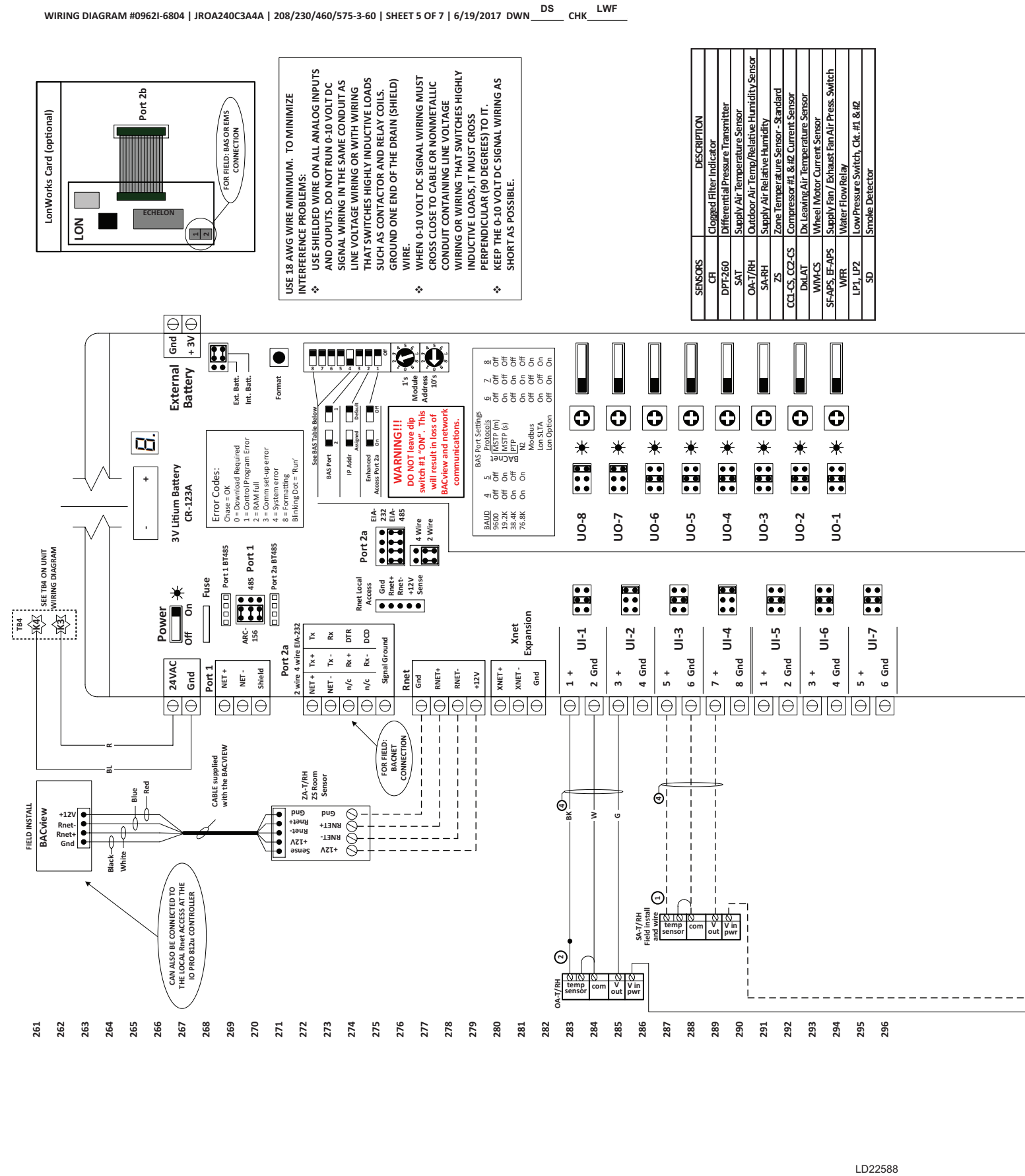
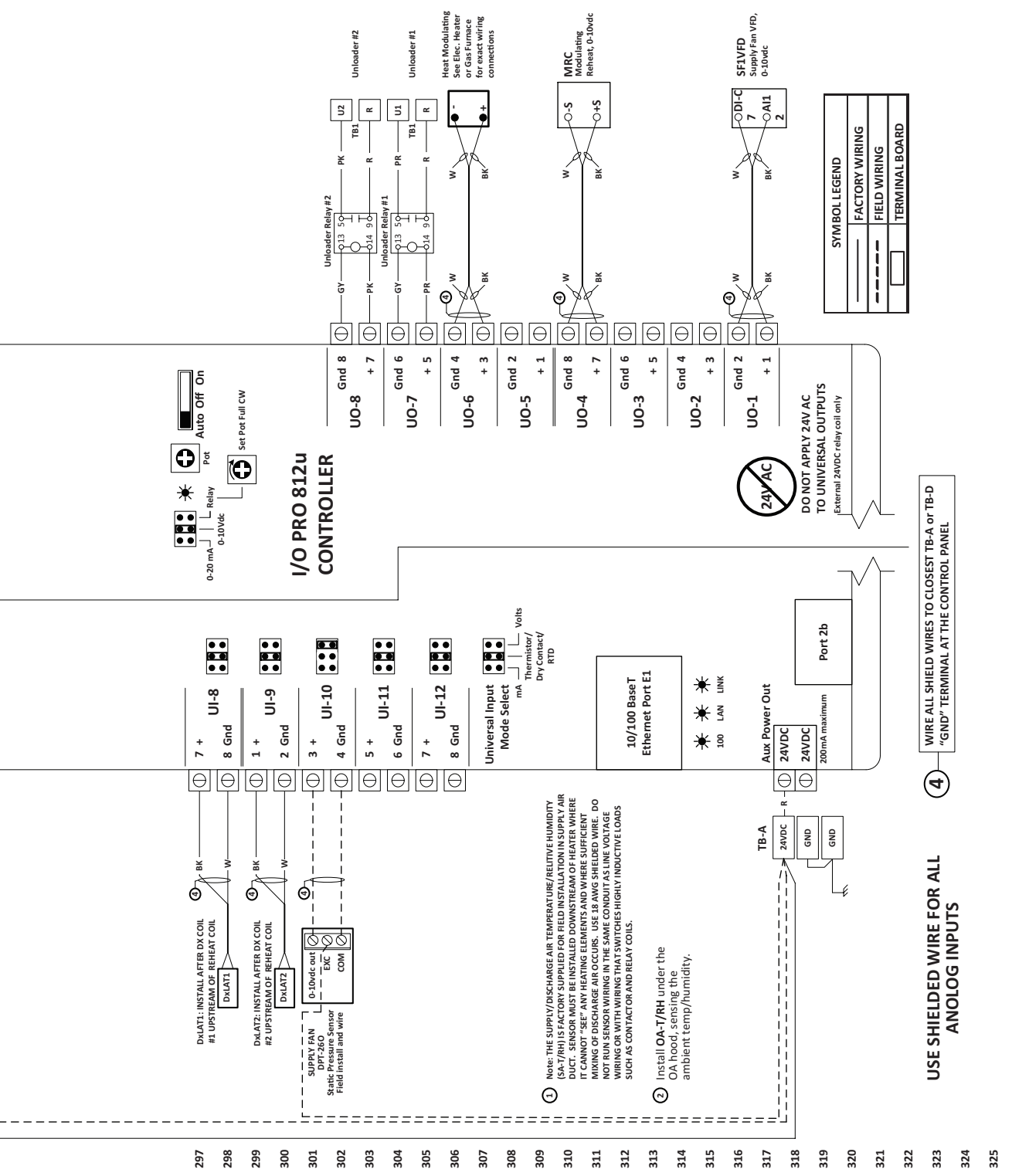


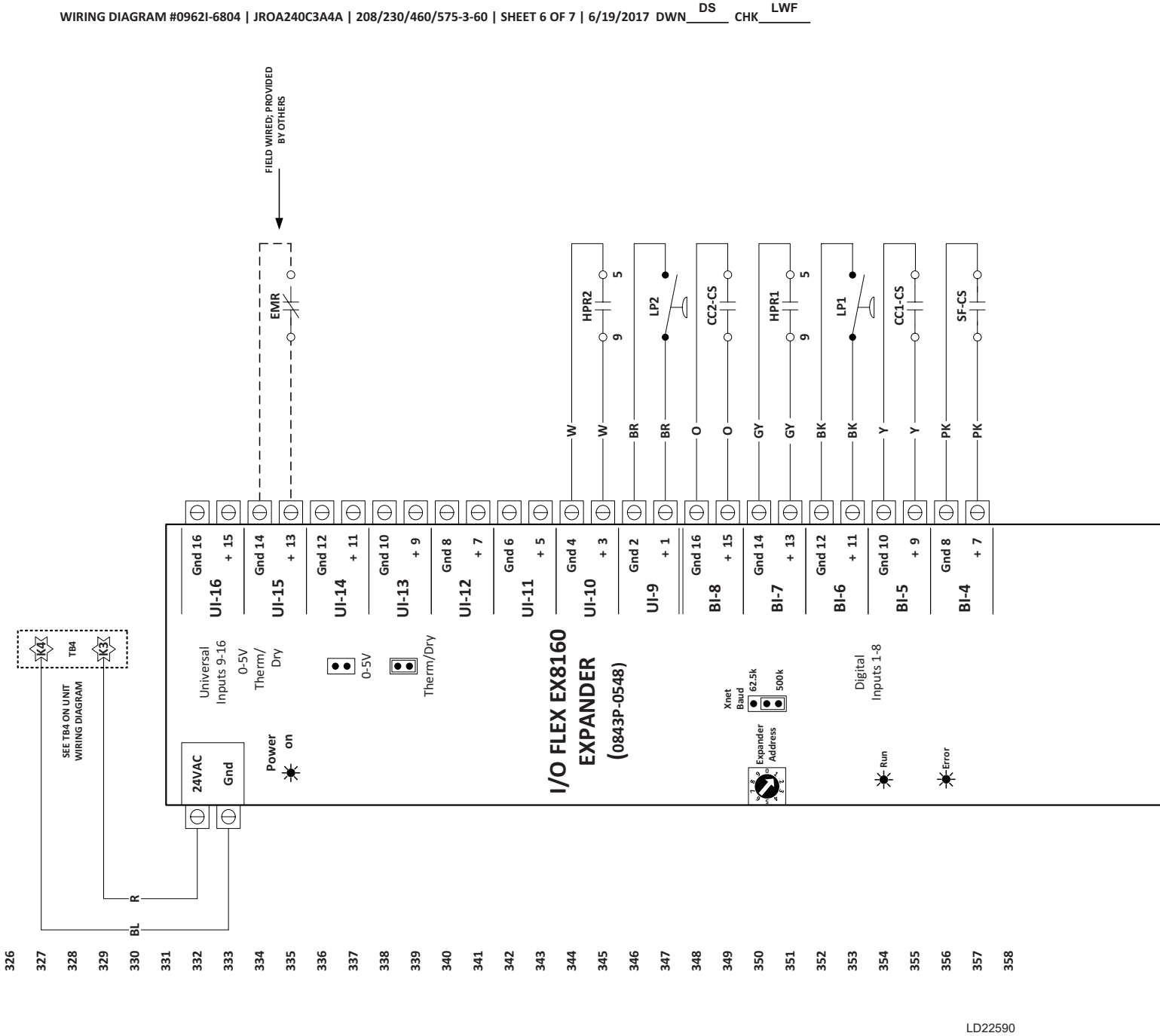
LD22588

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)



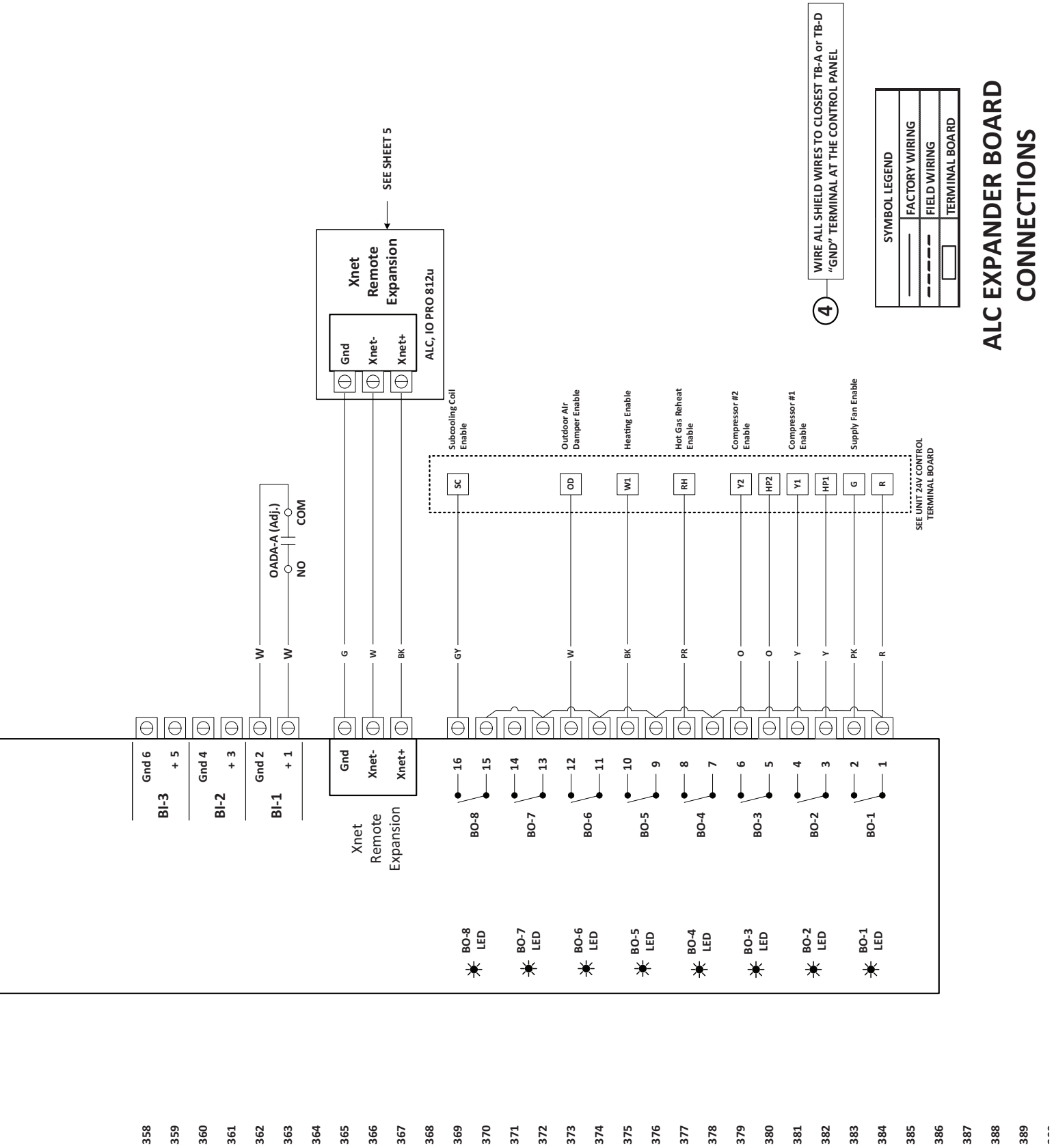
LD22589

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)



LD22590

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)

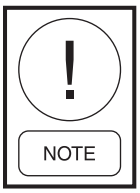


LD22591

FIGURE 19 - 208/230/460/575-3-60 WIRING DIAGRAM (CONT'D)

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:

Voltage Imbalance = 100 x (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: (221+230+227)/3 = 226 average voltage. Then, 100*(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.

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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	**Severe Injury Hazard**
Disconnect electric before service. More than one disconnect switch may be required to disconnect electric from equipment. Equipment must be properly grounded.	Do not enter equipment while in operation. Equipment may start automatically. 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	**Falling Hazard**	**Burn 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.	Use proper safety equipment and practices to avoid falling. Do not use any part of equipment as support.	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.		

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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.

Printed in USA

P/N ADPRSFNA, Rev. Orig 05/14

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GENERAL INFORMATION

Cust Name:		Project Name:	
Address:		Contr Name:	
City/State/Zip:		Unit Model No:	
Phone/Fax:		Unit Serial No:	

APPLICATION INFORMATION

Outdoor Air Temp:		db		wb	Supply Air Temp:		db		wb
Return Air Temp:		db		wb	Otdr Fn Disch Temp:		db		wb
Design CFM:					Design Duct ESP:				

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:

Electric Char: ____ V/ ____ Ph/ ____ Hz Amperage: ____

Supply Voltage: L1-L2 ____ L2-L3 ____ L1-L3 ____

COOLING CHECKS:

Cooling Type: ☐ Chilled Water ☐ Mechanical No. of Circuits: ____ Control Valve: ____

If Mechanical: If Chilled Water:

Refrig Type: ____ GPM: ____ WPD: ____ Glycol ____

Charge: ____ Water Temp In: ____ Water Temp Out: ____

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START-UP FORM: JR-SERIES UNITS

COMPRESSOR CHECKS:

Manufacturer:

#1: Model No.: Serial No.:

#2: Model No.: Serial No.:

#3: Model No.: Serial No.:

#4: Model No.: Serial No.:

	FLA:	T1-T2 Vlt:	T2-T3 Vlt:	T1-T3 Vlt:	1Ph Amp:	2Ph Amp:	3Ph Amp:
#1:							
#2:							
#3:							
#4:							

LEAD CIRCUIT CHECKS:

Suct Press: Superheat Temp:

Suct Line Temp:

To calculate Superheat temperature, convert suction pressure to saturation temperature. Then subtract suction line temperature.

Lqd Ln Hd Press: Subcool Temp:

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: Superheat Temp:

Suct Line Temp:

To calculate Superheat temperature, convert suction pressure to saturation temperature. Then subtract suction line temperature.

Lqd Ln Hd Press: Subcool Temp:

Liq Line Temp:

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

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SUPPLY FAN AND FAN MOTOR CHECKS:

Fan Mfg:

Fan Serial No.:

Motor Mfg:

Motor Seriai No.:

VFD Mfg:

☐ Set screws tight.

☐ Fan wheel rotates freely.

☐ Vibration isolators adjusted.

HP: RPM:

Voltage: Amperage:

VFD Setting (Hz):

FILTER CHECKS:

Item	Quantity	Type
Pre-Filters		
Final Filters		

SETPOINT CHECKS:

	High Pressure Switch	Low Pressure Switch	Pumpdwn Low Pressure	Oil Failure Control	Cyl. Unloading Switch
Cut-In					
Cut-Out					

CONDENSER FAN AND FAN MOTOR CHECKS (IF APPLICABLE):

Fan Mfg:

Fan Serial No.:

Motor Mfg:

Motor Serial No.:

☐ Set screws tight.

☐ Fan spins freely.

HP:

FLA:

#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:

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START-UP FORM: JR-SERIES UNITS

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: _____

☐ Unit safeties operate properly.

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 ☐ Safeties operate properly.

If yes: No. of Stages: _____ Setpoints: #1 _____ #2 _____ ☐ 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 _____ db/_____ wb

Entering Air Temperature: Before the Wheel _____ db/_____ wb After the Wheel _____ db/_____ wb

Pressure Drop Across the Wheel: Supply Air: _____ Exhaust Air: _____

☐ Set screws tight. HP: _____ Voltage: _____

☐ Sheaves tight and adjusted. RPM: _____ Amperage: _____

☐ Belt tension adjusted.

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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:

_____

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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.

General Inspection	Completed	See Notes
Unit inspected for shipping, storage, or rigging damage	☐	☐
Unit installed with proper clearances	☐	☐
Unit installed with slope limitations	☐	☐
Refrigeration system checked for gross leaks (presence of oil)	☐	☐
Terminal screws and wiring connections checked for tightness	☐	☐
Filters installed correctly and clean	☐	☐
Outside air hoods installed in operating position	☐	☐
Damper linkage tight	☐	☐
Gas heat vent hood installed	☐	☐
SENSORS installed properly 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.	☐	☐
Condensate drain trapped properly	☐	☐
Ductwork complete and clear of obstructions	☐	☐
Water flow and clarity on Water Cooled units verified	☐	☐
Gas piping properly connected and installed on Gas Furnace units	☐	☐
Site is closed in and ready for equipment operation	☐	☐
All field wiring (power and control) complete (matching the nameplate)	☐	☐

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: _____

INSTALLATION 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

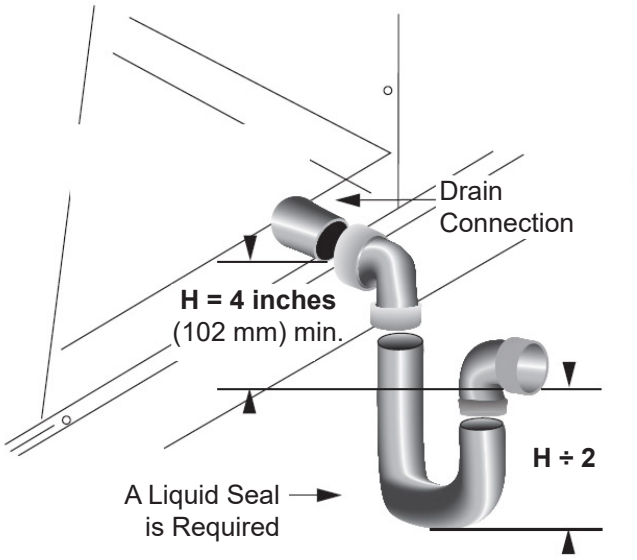
Ductwork and Electrical Connections

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.



LD27655

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.
9. Bump the motor.
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.
13. Draft inducer will run for a 15–30 second pre-purge period.
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 6 - GAS FURNACE INLET AND MANIFOLD PRESSURES

	NG	LPG
Minimum Inlet (50–400 MBH heaters) ("W.C.)	5.0	11.0
Minimum Inlet (500–600 MBH heaters) ("W.C.)	6.0	12.0
Maximum Inlet ("W.C.)	13.5	13.5
Manifold ("W.C.)	3.4–3.5	10.0

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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

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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 7 - MOTOR LUBRICATION INTERVALS

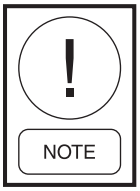
NEMA FRAME SIZE (MOTOR HP)	RATED AT 1800 RPM (HRS)
Up to 210 (3–5)	6,000
210–280 (7.5–20)	4,750
280–360 (25–30)	3,700

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.



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

CABINET DESCRIPTION	A-B CAB	A-B CAB	A-B CAB	B-C CAB	B-C CAB	C-D CAB	D CAB	D CAB	E CAB	E CAB
DX DESCRIPTION	20x20 COIL	20x34 COIL	24x42 COIL	32x45 COIL	36x48 COIL	48x48 COIL	64x65 COIL	64x68 COIL	37.5x80 COIL	42.5x80 COIL
Evaporator Face Area	2.78 sq ft	4.72 sq ft	7.0 sq ft	10.0 sq ft	12.0 sq ft	16.0 sq ft	28.89 sq ft	30.2 sq ft	41.67 sq ft	47.22 sq ft
2" Pleated Surface, Farr 30/30 (MERV 8)	20x24x2	20x20x2 16x20x2	2 - 24x24x2	4 - 25x16x2	2 - 25x16x2 2 - 20x25x2	4 - 24x24x2	2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x2 3 - 25x25x2	6 - 20x25x2 9 - 20x20x2 1 - 25x25x2
2" Metal Mesh	20x24x2	20x20x2 16x20x2	2 - 24x24x2	4 - 25x16x2	2 - 25x16x2 2 - 20x25x2	4 - 24x24x2	2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x2 3 - 25x25x2	6 - 20x25x2 9 - 20x20x2 1 - 25x25x2
4" Pleated Surface, 30/30 (MERV 8)	20x24x4	20x20x4 16x20x4	2 - 24x24x4	4 - 25x16x4	2 - 25x16x4 2 - 20x25x4	4 - 24x24x4	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4	9 - 20x25x4 3 - 25x25x4	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4
4" Pleated Surface, 65% (MERV 11)	20x24x4	20x20x4 16x20x4	2 - 24x24x4	4 - 25x16x4	2 - 25x16x4 2 - 20x25x4	4 - 24x24x4	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4	9 - 20x25x4 3 - 25x25x4	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4

TABLE 8 - JR SERIES FILTER OPTIONS (CONT'D)

CABINET DESCRIPTION	A-B CAB	A-B CAB	A-B CAB	B-C CAB	B-C CAB	C-D CAB	D CAB	D CAB	E CAB	E CAB
DX DESCRIPTION	**20x20 COIL**	**20x34 COIL**	**24x42 COIL**	**32x45 COIL**	**36x48 COIL**	**48x48 COIL**	**64x65 COIL**	**64x68 COIL**	**37.5x80 COIL**	**42.5x80 COIL**
Evaporator Face Area	2.78 sq ft	4.72 sq ft	7.0 sq ft	10.0 sq ft	12.0 sq ft	16.0 sq ft	28.89 sq ft	30.2 sq ft	41.67 sq ft	47.22 sq ft
4" Pleated Surface, 95% (MERV 14)	20x24x4	20x20x4 16x20x4	2 - 24x24x4	4 - 25x16x4	2 - 25x16x4 2 - 20x25x4	4 - 24x24x4	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4	9 - 20x25x4 3 - 25x25x4	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4
2" FAR 30/30 (MERV 8) + 4IN 30/30 (MERV 8)	20x24x2 20x24x4	2 - 20x20x4 2 -16x20x4 2 - 20x20x2 2 -16x20x2	2 - 24x24x2 2 - 24x24x4	4-25x16x4 4 -25x16x2	2 - 25x16x4 2 - 20x25x4 2 - 25x16x2 2 - 20x25x2	4 - 24x24x4 4 - 24x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x4 3 - 25x25x4 9 - 20x25x2 3 - 25x25x2	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4 6 - 20x25x2 9 - 20x20x2 1 - 25x25x2
2" FAR 30/30 (MERV 8) + 4IN 65% (MERV 11)	20x24x2 20x24x4	2 - 20x20x4 2 -16x20x4 2 - 20x20x2 2 -16x20x2	2 - 24x24x2 2 - 24x24x4	4-25x16x4 4 -25x16x2	2 - 25x16x4 2 - 20x25x4 2 - 25x16x2 2 - 20x25x2	4 - 24x24x4 4 - 24x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x4 3 - 25x25x4 9 - 20x25x2 3 - 25x25x2	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4 6 - 20x25x2 9 - 20x20x2 1 - 25x25x2
2" FAR 30/30 (MERV 8)+ 4IN 95% (MERV 14)	20x24x2 20x24x4	2 - 20x20x4 2 -16x20x4 2 - 20x20x2 2 -16x20x2	2 - 24x24x2 2 - 24x24x4	4-25x16x4 4 -25x16x2	2 - 25x16x4 2 - 20x25x4 2 - 25x16x2 2 - 20x25x2	4 - 24x24x4 4 - 24x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x4 3 - 25x25x4 9 - 20x25x2 3 - 25x25x2	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4 6 - 20x25x2 9 - 20x20x2 1 - 25x25x2

TABLE 8 - JR SERIES FILTER OPTIONS (CONT'D)

CABINET DESCRIPTION	A-B CAB	A-B CAB	A-B CAB	B-C CAB	B-C CAB	C-D CAB	D CAB	D CAB	E CAB	E CAB
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Evaporator Face Area	2.78 sq ft	4.72 sq ft	7.0 sq ft	10.0 sq ft	12.0 sq ft	16.0 sq ft	28.89 sq ft	30.2 sq ft	41.67 sq ft	47.22 sq ft
2" Metal Mesh + 4IN 30/30 (MERV 8)	20x24x2 20x24x4	2 - 20x20x4 2 -16x20x4 2 - 20x20x2 2 -16x20x2	2 - 24x24x2 2 - 24x24x4	4-25x16x4 4 -25x16x2	2 - 25x16x4 2 - 20x25x4 2 - 25x16x2 2 - 20x25x2	4 - 24x24x4 4 - 24x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x4 3 - 25x25x4 9 - 20x25x2 3 - 25x25x2	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4 6 - 20x25x2 9 - 20x20x2 1 - 25x25x2
2" Metal Mesh + 4IN 65% (MERV 11)	20x24x2 20x24x4	2 - 20x20x4 2 -16x20x4 2 - 20x20x2 2 -16x20x2	2 - 24x24x2 2 - 24x24x4	4-25x16x4 4 -25x16x2	2 - 25x16x4 2 - 20x25x4 2 - 25x16x2 2 - 20x25x2	4 - 24x24x4 4 - 24x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x4 3 - 25x25x4 9 - 20x25x2 3 - 25x25x2	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4 6 - 20x25x2 9 - 20x20x2 1 - 25x25x2
2" Metal Mesh+ 4IN 95% (MERV 14)	20x24x2 20x24x4	2 - 20x20x4 2 -16x20x4 2 - 20x20x2 2 -16x20x2	2 - 24x24x2 2 - 24x24x4	4-25x16x4 4 -25x16x2	2 - 25x16x4 2 - 20x25x4 2 - 25x16x2 2 - 20x25x2	4 - 24x24x4 4 - 24x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	2 - 24x24x4 2 - 20x20x4 5 - 20x24x4 2 - 24x24x2 2 - 20x20x2 5 - 20x24x2	9 - 20x25x4 3 - 25x25x4 9 - 20x25x2 3 - 25x25x2	6 - 20x25x4 9 - 20x20x4 1 - 25x25x4 6 - 20x25x2 9 - 20x20x2 1 - 25x25x2

REPLACEMENT PARTS

Before ordering replacement parts, please contact 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

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

COMPRESSOR

PROBLEM	POSSIBLE CAUSE	SOLUTION
Compressor will not start	Power off, loose electrical connections or fuse open	Check disconnect switch, fuses and wiring
	Compressor contactor not closing	Check voltage to contactor coil, transformer subordinate relay, thermostat
	Internal compressor thermal overload open	If compressor is hot, allow 2 hours to cool – see below
	Compressor defective	Check compressor for electrical failure Compressor may be seized, check for L.R.A.
	High or low pressure switch open or defective	Check calibration of high or low pressure switch
	Oil pressure control open or defective	Check oil failure control -– see below
Compressor starts but cuts out on low pressure switch	Low on refrigerant	Check sight glass and check pressures
	Airflow restricted	Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator, VFD settings, check motor amps, duct design
	Restriction in liquid line	Check head pressure, check and adjust TXV if not functioning properly, check pressure drop across filter drier
	Defective low pressure switch	Check calibration of switch

PROBLEM	POSSIBLE CAUSE	SOLUTION
Compressor starts but cuts out on high pressure switch	Refrigerant overcharged	Check pressures, charge by subcooling
	Condenser fan control has incorrect setting	Check calibration of the low ambient control
	Fan motor defective	Check fan motor
	Condenser coil inlet obstructed or dirty	Check coil and inlet clearances and for possible air recirculation
	Air or non-condensables in system	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 be charging
	Defective high pressure switch	Replace switch
	Restriction in discharge or liquid line.	Check discharge and liquid line pressures, check TXV
Compressor cuts out on thermal overload	Low voltage	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
	Sustained high discharge pressure	Check running amperage and conditions described under high discharge pressure
	High suction and discharge pressures	Check TXV setting, check for air in system
	Defective compressor overload	Allow compressor to cool for two hours if compressor is hot. Recheck for open circuit
	Defective run capacitor	Check run capacitor for compressor and fan motor
	Improper refrigerant charge	Check subcooling
	Bearings or pistons too tight	Check for low oil level
	Allow time for compressor to cool	Check dome temperature of compressor
Noisy compressor	Scroll compressors are rotation sensitive	Reverse wiring at disconnect switch may require blower be rechecked for rotation
	Refrigerant overcharged	Check pressures and subcooling
	Excess or insufficient oil in compressor crankcase	Check oil level on hermetic compressors, check total equivalent feet of piping, add oil as recommended
	Liquid floodback	Check TXV setting. Refrigerant overcharge refrigerant circuit problem
	Tubing rattle	Dampen by taping or clamping, bend tubing away from contact where possible
	Compressor defective	Replace compressor

REFRIGERATION CIRCUIT

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

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

VARIABLE SPEED HEAD PRESSURE CONTROL

PROBLEM	POSSIBLE CAUSE	SOLUTION
No fan operation	No 24V control voltage	Check for 24 VAC at control
	No input pressure to control	Check alignment of capillary fitting. Schrader valve depressor must depress Schrader valve enough to allow pressure into capillary
	Bad fan motor	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
	Pressure transducer problem	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
Fan stops when pressure reached the high end of the operating range	Control is not wired correctly	See wiring diagrams
No fan modulation (on-off operation)	Control is not wired correctly	See wiring diagrams
Fan starts at full speed	Control is not wired correctly	See wiring diagrams
Erratic fan operation	Control is not wired correctly	See wiring diagrams
	Dirty or blocked condenser coil	Clean condenser coil
Fan motor is cycling on thermal overload	Dirty or blocked condenser coil	Clean condenser coil
	Wrong motor for fan speed control application	Replace with motor approved for fan speed control application
Erratic pressure control	Defective regulator	Replace defective part
	Dirt causing regulator to bind	Disassemble regulator and clean internal parts. Install strainer
	Power source to hot gas solenoid or operation of the solenoid is intermittent	Determine if problem is caused by supply voltage, solenoid or excessive MOPD. Make changes necessary to correct problem
Regulator leakage	Dirt in regulator causing seat to remain open	Clean regulator. Install strainer
	Worn or eroded seating surface on regulator	Replace defective part
Regulator hunting (chattering) with large fluctuations in controlled pressures	Regulator is oversized	Contact a certified technician for correctly sized regulator
	Regulator and liquid injection thermovalve have control interaction	Increase superheat setting. Dampen bulb response by repositioning
	Regulator and cylinder unloaders have control interaction	Increase differential between the controls by lowering the regulator's setpoint

PROBLEM	POSSIBLE CAUSE	SOLUTION
Regulator will provide pressure control	Regulator seat is restricted	Locate and remove stoppage. Install strainer
	Pressure adjusting stem is set at a point so high that suction pressure never reaches the setpoint	Re-adjust the regulator
	Strainer clogged at the regulator inlet	Locate and remove stoppage
	MOPD exceeded across the solenoid or loss of source voltage	Replace solenoid or troubleshoot the electrical problem
	Solenoid coil burned out	Replace coil
	Wrong type of distributor for hot gas bypass to the evaporator	Install proper venture-flo type distributor for low pressure drop
Regulator fails to close	Dirt under seat of regulator	Locate and remove stoppage. Install strainer or filter drier
	Diaphragm failure (leakage around the adjusting stem)	Replace defective parts
	Pressure adjusting stem is set at a point so high that suction never reaches the setpoint	Re-adjust the regulator
	Blocked external equalizer passage	Locate and remove stoppage. Install strainer
	Worn or eroded regulator seat	Replace defective part

ENERGY WHEEL CONSERVATION

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

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.

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

ELECTRIC HEATER

PROBLEM	POSSIBLE CAUSE	SOLUTION
No heat	No call for heat	Check that the controls are set to call for heating
	No power and control voltage to heater	Check that heater has power and control voltage
	Faulty component	Check components with continuity meter. Replace as necessary
Not enough heat	Faulty component	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
	Heat anticipator current draw too low, causing short cycling	Check current draw
Heater cycling on automatic limit	Improper airflow	Check for obstructions to return air, loose or broken fan belt, and clogged filters and/or evaporator coils
	Faulty temperature limit switch	Test and, if necessary, replace
Open secondary protective device	Stuck contactor	Check contactor
Contractor chatter	Improper wiring	Check wiring
	Insufficient transformer capacity	Check transformer
Element failure	Corroded hardware and/or loose connections	Check hardware

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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 12 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.

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

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

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°) x 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 range x 0.5556 = 5.6°C range