ROOFTOP DEDICATED OUTDOOR AIR SYSTEMS (DOAS) INSTALLATION AND OPERATION MANUAL

Base Rooftop DOAS
650 to 12,000 CFM

Energy Recovery Wheel Rooftop DOAS
650 to 18,000 CFM

PROPRIETARY DATA NOTICE

This document, as well as all reports, illustrations, data, information, and other materials are the property of LG Electronics U.S.A., Inc., and are disclosed by LG Electronics U.S.A., Inc. only in confidence.

⃠ Do not throw away, destroy, or lose this manual.
Please read carefully and store in a safe place for future reference.
Content familiarity is required for proper installation.

The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described by the summary list of safety precautions on page 4.

For more technical materials such as submittals, catalogs, engineering manuals, and forms, visit www.lghvac.com.

TABLE OF CONTENTS

SAFETY PRECAUTIONS

The instructions below must be followed to prevent product malfunction, property damage, injury or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols below.

TABLE OF SYMBOLS

⚠ **DANGER**	*This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*
⚠ **WARNING**	*This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*
⚠ **CAUTION**	*This symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.*
Note:	*This symbol indicates situations that may result in equipment or property damage accidents only.*
⃠	*This symbol indicates an action that should not be performed.*

INSTALLATION

⚠ DANGER

⃠ **Don't use or store flammable gas or combustibles near the unit.**
There is risk of fire, explosion, and physical injury or death.

⚠ WARNING

⃠ **Do not install or remove the unit by yourself (end-user). Ask the dealer or an LG trained technician to install the unit.**
Improper installation by the user may result in water leakage, fire, explosion, electric shock, physical injury or death.

Installation, startup, and service must be performed by a qualified installer, service agency, or gas supplier.
Improper installation, adjustment, service, maintenance, or alteration can cause personal injury or loss of life.

For replacement of an installed unit, always contact a trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

Periodically check that the unit is not damaged.
There is risk of explosion, physical injury, or death.

Replace all control box and panel covers.
If cover panels are not installed securely, dust, water and animals may enter the unit, causing fire, electric shock, and physical injury or death.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Exposure to high concentration levels of refrigerant gas may lead to illness or death.

⃠ **Do not install the unit using defective hanging, attaching, or mounting hardware.**
There is risk of physical injury or death.

Wear protective gloves when handling equipment.
Sharp edges may cause personal injury.

Dispose of the packing materials safely.
- *Packing materials, such as nails and other metal or wooden parts may cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children may not play with them and risk suffocation and death.*

⃠ **Do not install the unit in any location exposed to open flame or extreme heat.** ⃠ **Do not touch the unit with wet hands.**
There is risk of fire, electric shock, explosion, and physical injury or death.

Install the unit considering the potential for earthquakes.
Improper installation may cause the unit to fall, resulting in physical injury or death.

⃠ **Do not change the settings of the protection devices.**
If the pressure switch, thermal switch, or other protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

If the unit is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

INSTALLATION – CONTINUED

⚠CAUTION

Be very careful when transporting the product.

- ⃠ *Do not attempt to carry the product without assistance.*
- *Some products use polypropylene bands for packaging.* ⃠ *Do not use polypropylene bands to lift the unit.*
- *Suspend the unit from the base at specified positions.*
- *Support the unit at a minimum of four points to avoid slippage from rigging apparatus.*
- *Failure to follow these directions may result in minor or moderate physical injury.*

Note:

Installation, startup, and service must be performed by a qualified installer, service agency, or gas supplier.
Improper installation, adjustment, service, maintenance, or alteration can cause property damage.

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as uninsulated pipe can generate condensate that may drip and cause a slippery floor condition and/or water damage to walls.

⃠ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications.**
There is risk of property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and become damaged.

⃠ **Do not install the unit in a noise sensitive area.**

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Install the unit in a safe location where no one can step on or fall onto it.
There is risk of unit and property damage.

Install the drain trap to ensure adequate drainage.
There is a risk of water leakage and property damage.

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of product failure.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Low refrigerant levels may cause product failure.

Ductwork and other installed airflow restriction devices such as filters shall not exceed the rated maximum static pressure limits of the DOAS fan assembly.
Doing so may cause product malfunction.

SAFETY PRECAUTIONS

WIRING

⚠ DANGER

High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring.
Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and National Electrical Codes.

Turn the power off at the nearest disconnect before servicing the equipment.
Electric shock can cause physical injury or death.

Properly size all circuit breakers or fuses.
There is risk of fire, electric shock, explosion, physical injury or death.

⚠ WARNING

The information contained in this manual is intended for use by an experienced, trained electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in injury or death.

Ensure the unit is connected to a dedicated power source that provides adequate power.
If the power source capacity is inadequate or the electric work is not performed properly, it may result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.
Wires that are too small may generate heat and cause a fire and physical injury or death.

Secure all field wiring connections with appropriate wire strain relief.
Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections may generate heat, cause a fire and physical injury or death.

Properly tighten all power connections.
Loose wiring may overheat at connection points, causing a fire, physical injury or death.

Note:

The information contained in this manual is intended for use by an experienced, trained electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction or property damage.

OPERATION

⚠DANGER

⃠ **Do not provide power to or operate the unit if it is flooded or submerged.**
There is risk of fire, electric shock, physical injury or death.

Use a dedicated power source for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ **Do not operate the disconnect switch with wet hands.**
There is risk of fire, electric shock, physical injury or death.

If refrigerant gas leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area and the system develops a refrigerant leak, it may cause fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ **Do not allow water, dirt, or animals to enter the unit.**
There is risk of fire, electric shock, physical injury or death.

⃠ **Do not touch refrigerant piping during or after operation.**
It can cause burns or frostbite.

⃠ **Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.**
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

Periodically check power cable and connection for damage.
Cable must be replaced by the manufacturer, its service agent, or similar qualified persons in order to avoid physical injury and / or electric shock.

Securely attach the electrical cover to the unit.
Non-secured electrical covers can result in burns or electric shock due to dust or water in the service panel.

Ensure no power is connected to the unit other than as directed in this manual. Remove power from the unit before removing or servicing the unit.
There is risk of unit failure, fire, electric shock, physical injury or death.

⚠CAUTION

To avoid physical injury, use caution when cleaning or servicing the air conditioner.

Note:

Clean up the site after installation is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ **Do not use this equipment in mission critical or special-purpose applications such as preserving foods, works of art, wine coolers or refrigeration.**

Provide power to the compressor crankcase heaters at least six (6) hours before operation begins.
Starting operation with a cold compressor sump(s) may result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

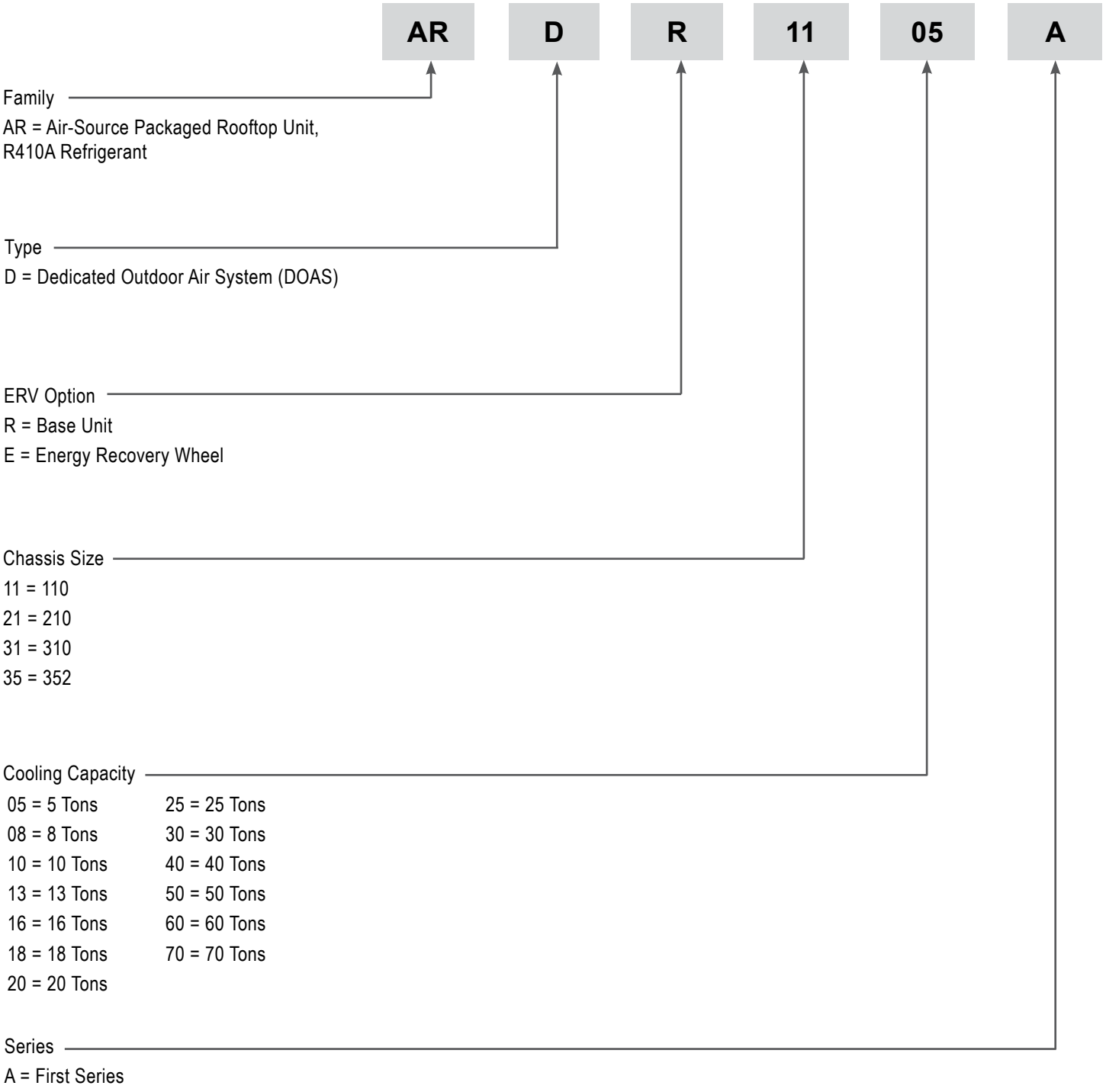
⃠ **Do not block the inlet or outlet.**
Unit may malfunction.

Securely attach the electrical cover to the indoor unit.
Non-secured covers can result in fire due to dust or water in the service panel.

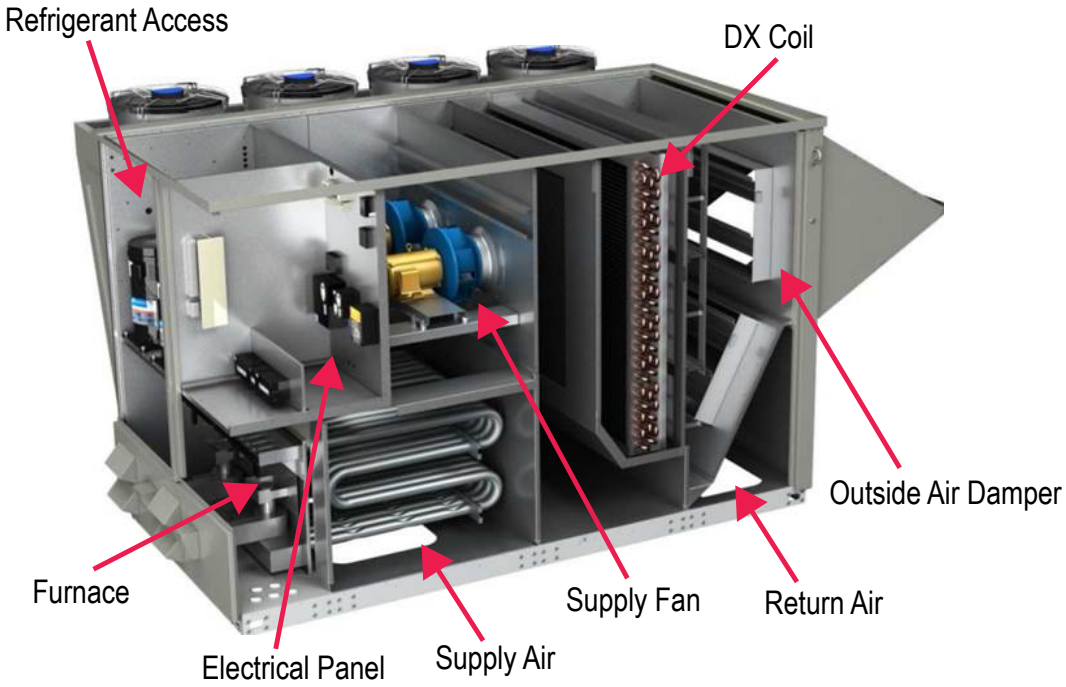
Periodically verify the equipment mounting hardware has not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

⃠ **Do not allow water, dirt, or animals to enter the unit.**
There is risk of unit failure.

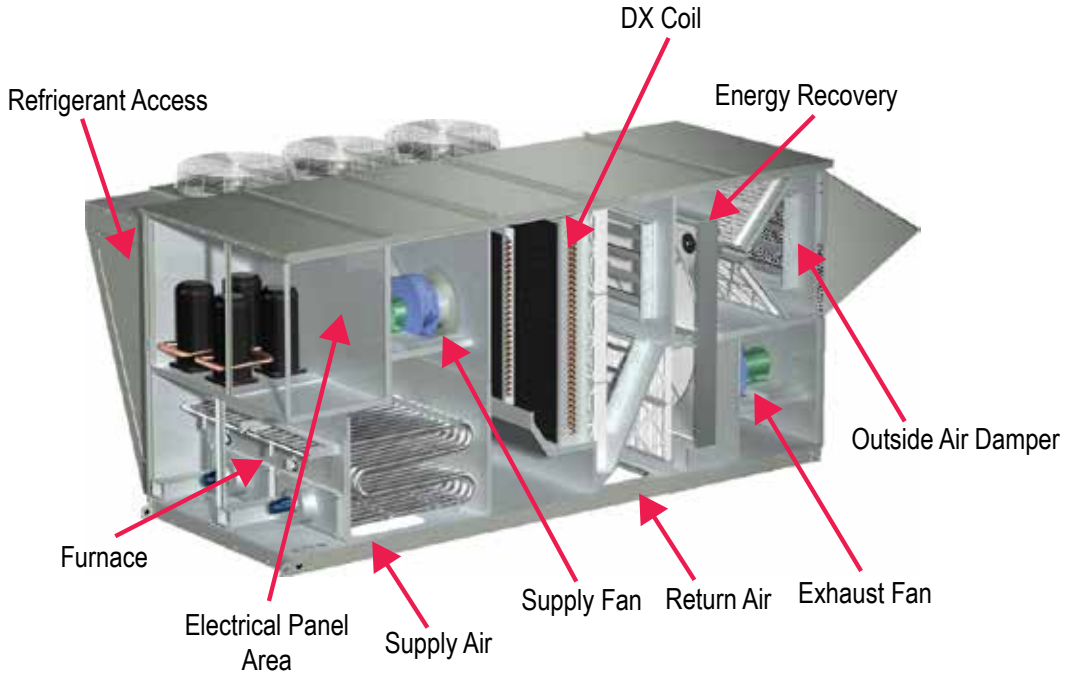
UNIT NOMENCLATURE



Base Rooftop DOAS AR-DR Models

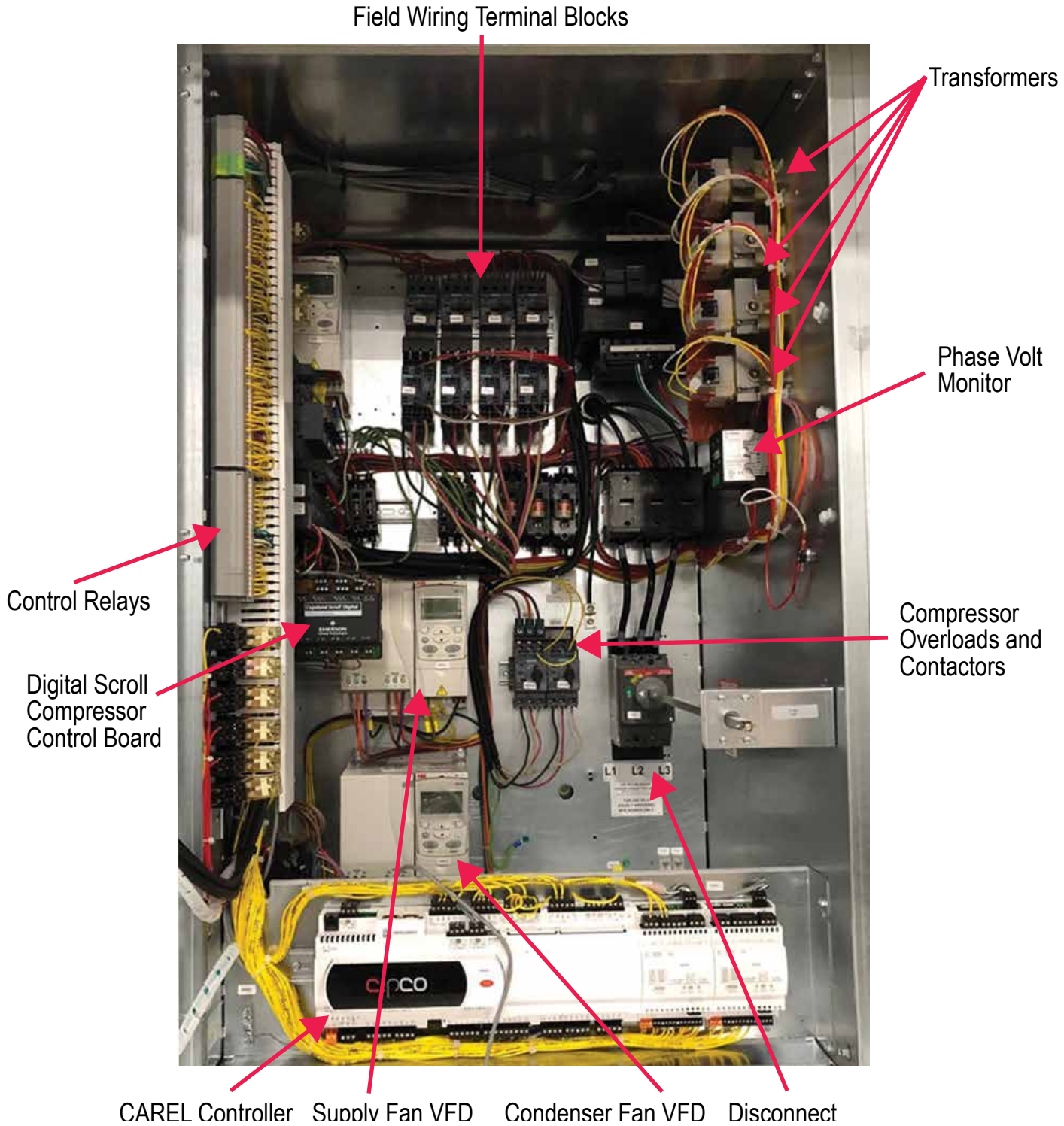


Energy Recovery Wheel Rooftop DOAS AR-DE Models



PRODUCT OVERVIEW

Electrical Panel View



Note:

Other components may be present depending on the chosen options.

Table 1: Base Rooftop DOAS.

Model No.	AR-DR11-05A	AR-DR11-08A	AR-DR11-10A	AR-DR21-10A	AR-DR21-13A	AR-DR21-16A	AR-DR21-18A	AR-DR21-20A
Design Airflow (CFM)	1,000	1,400	1,800	2,000	2,400	2,900	3,300	3,700
ESP (in. wg)	1.9	2	2	2	2	2	2	2
Entering Air Summer DB / WB (°F)	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75
Entering Air Winter DB (°F)	0	0	0	0	0	0	0	0
Cooling Performance								
Coil LAT DB / WB (°F)	55.4 / 55.1	54.8 / 54.5	54.8/54.5	55.8 / 55.5	55.2 / 55.0	55.4 / 55.1	55.3 / 55.0	54.7 / 54.3
Unit LAT DB / WB (°F)	77.5 / 63.4	78.8 / 63.5	75 / 62.1	77.7 / 63.7	78 / 63.5	77.9 / 63.5	78.4 / 63.6	77.4 / 62.9
Total Cooling Capacity (MBH)	70.3	100.9	129.8	138.1	169.5	203.9	232.9	267.8
Sensible Cooling Capacity (MBH)	43.6	62	79.7	86.4	105.2	126.5	144.2	164.1
Hot Gas Reheat Coil Capacity (MBH)	21	32	34.9	41.7	50.6	62.2	73.8	82.3
Evaporator Coil Depth(Rows)	6	6	6	6	6	6	6	6
No. of Compressors	1	1	1	2	2	2	2	2
Compressor Type(s)	Digital Scroll	Digital Scroll	Digital scroll	Digital Scroll / Fixed Speed	Digital Scroll / Fixed Speed	Digital Scroll / Fixed Speed	Digital Scroll / Fixed Speed	Digital Scroll / Fixed Speed
Refrigerant Charge (lbs.)	10.7	15.6	20.2	17.8	23.9	29.9	33.2	36.4
Heating								
Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Capacity Input (MBH)	100	150	200	200	250	300	300	350
Capacity Output (MBH)	80	120	160	160	200	240	240	280
LAT (°F)	73.7	79	81.9	73.7	76.8	76.3	67	69.7
Turndown Type	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Turndown Ratio	4:1	4:1	4:1	4:1	4:1	4:1	4:1	4:1
Supply Fan Data								
Fan Quantity	1	1	1	1	1	1	1	1
Wheel Diameter (in.)	12	14	16	16	18	18	18	18
Wheel Speed (RPM)	2,343	2,095	2,880	1,942	1,707	1,746	1,810	1,850
Motor HP	1	1.5	1.5	2	3	3	3	3
Configuration								
Outdoor Air Intake	End	End	End	End	End	End	End	End
Supply Air Discharge	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Weight (lbs.)	1,771	1,832	1,969	2,414	2,546	2,708	2,801	2,955
Filtration								
Hood	None	None	None	None	None	None	None	None
Supply	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8

Note:

- *Capacity data above will change if entering air temperatures, leaving air temperatures (LAT), or airflow rates are varied.*
- *Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.*

GENERAL DATA

Base Rooftop DOAS

Table 2: Base Rooftop DOAS, continued.

Model No.	AR-DR21-25A	AR-DR31-25A	AR-DR31-30A	AR-DR31-35A	AR-DR31-40A	AR-DR35-30A	AR-DR35-40A	AR-DR35-50A	AR-DR35-60A	AR-DR35-70A
Design Airflow (CFM)	4,200	4,500	5,300	5,600	7,000	5,200	6,700	8,500	9,800	12,000
ESP (in. wg)	2	2	2	2	2.5	2.5	2	2	2	3
Entering Air Summer DB/WB (°F)	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75
Entering Air Winter DB (°F)	0	0	0	0	0	0	0	0	0	0
Cooling Performance										
Coil LAT DB / WB (°F)	54.5 / 54.2	55.3 / 54.9	54.9 / 54.5	54.3 / 54.1	54.8 / 54.5	54.8 / 54.4	54.9 / 54.5	54.8 / 54.4	54.7 / 54.5	54.2 / 53.9
Unit LAT DB / WB (°F)	76.6 / 62.6	76.6 / 63.0	76.5 / 62.7	77.1 / 62.7	77.2 / 63	82.1 / 64.6	78.6 / 63.5	76.3 / 62.6	74.6 / 62.1	72.8 / 61.1
Total Cooling Capacity (MBH)	305.3	318.2	381.3	409.3	503.1	375	482	612.9	705.1	882.5
Sensible Cooling Capacity (MBH)	187.2	196.8	234.1	251.1	310.1	229.9	295.8	375.8	434.6	538.6
Hot Gas Reheat Coil Capacity (MBH)	86.4	92	107.3	121.2	141.9	136.7	155.1	171.5	182.8	199.9
Evaporator Coil Depth (Rows)	6	6	6	6	6	6	6	6	6	6
No. of Compressors	2	4	4	4	4	4	4	4	4	4
Compressor Type(s)	Digital Scroll/ Fixed Speed	2 Digital Scroll / 2 Fixed Speed								
Refrigerant Charge (lbs.)	39.7	43.9	50.2	56.5	58.2	75.3	90.5	104.1	111.5	116.8
Heating										
Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Capacity Input (MBH)	400	400	500	500	700	600	600	800	1,000	1,200
Capacity Output (MBH)	320	320	400	400	560	480	480	640	800	960
LAT (°F)	70.2	65.5	69.6	65.8	73.7	85.1	66	69.4	75.2	73.7
Turndown Type	Standard	Standard	Standard	Standard	Standard	High	High	High	High	High
Turndown Ratio	4:1	4:1	4:1	4:1	4:1	10:1	10:1	10:1	10:1	10:1
Supply Fan Data										
Fan Quantity	1	2	2	2	2	2	2	3	2	2
Wheel Dia.(in.)	18	16	18	18	18	15	16	15	18	20
Wheel Speed (RPM)	1,952	1,959	1,692	1,728	2,560	2,345	2,083	2,299	2,012	2,002
Motor HP	5	2	3	3	5	5	3	3	5	7.5
Configuration										
Outdoor Air Intake	End	End	End	End	End	End	End	End	End	End
Supply Air Discharge	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Weight (lbs.)	3,148	3,746	4,039	4,225	4,432	6,817	7,168	7,805	8,077	8,267
Filtration										
Hood	None	None	None	None	None	None	None	None	None	None
Supply	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8

Note:

- *Capacity data above will change if entering air temperatures, leaving air temperatures (LAT), or airflow rates are varied.*
- *Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.*

Table 3: Energy Recovery Wheel Rooftop DOAS.

Model No.	AR-DE11-05A	AR-DE11-08A	AR-DE11-10A	AR-DE21-10A	AR-DE21-13A	AR-DE21-16A	AR-DE21-18A	AR-DE21-20A	AR-DE21-25A
Design Airflow (CFM)	1,900	2,400	3,000	3,600	4,200	4,900	5,500	6,000	6,600
ESP (in. wg)	1	2	1.8	2	1.6	1.6	1.6	1.6	1.5
Entering Air Summer DB / WB (°F)	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75
Entering Air Winter DB (°F)	0	0	0	0	0	0	0	0	0
Cooling Performance									
Coil EAT DB / WB (°F)	79.6 / 66.1	80.5 / 66.7	81.6 / 67.3	79.5 / 66	80 / 66.4	80.6 / 66.8	81.1 / 67.1	81.6 / 67.3	82.1 / 67.7
Coil LAT DB / WB (°F)	55.2 / 54.6	54.2 / 53.7	54.5 / 53.9	54.6 / 54.2	54.4 / 53.9	54.5 / 54	54.6 / 54.1	54.1 / 53.5	53.9 / 53.4
Unit LAT DB / WB (°F)	70.6 / 60.7	74.5 / 61.6	71.5 / 60.7	71.3 / 60.7	70.9 / 60.4	73.9 / 61.6	72.9 / 61.3	73.5 / 61.2	71.9 / 60.6
Total Cooling Capacity (MBH)	68.8	98.4	127.3	133.3	164.5	198.3	227.3	261.5	299
Sensible Cooling Capacity (MBH)	50.8	69.4	89.2	98.3	118.2	140.4	159.9	181.1	204.5
Hot Gas Reheat Coil Capacity (MBH)	25.8	38.7	41.1	51	61	74.7	88.2	97.5	100.8
Evaporator Coil Depth (Rows)	6	6	6	6	6	6	6	6	6
Number of Compressors	1	1	1	2	2	2	2	2	2
Compressor Type(s)	Digital Scroll			Digital Scroll / Fixed Speed					
Refrigerant Charge (lbs.)	10.7	15.6	20.2	17.8	23.9	29.9	33.2	36.4	39.7
Heating									
Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Capacity Input (MBH)	100	100	100	200	200	200	200	200	200
Capacity Output (MBH)	80	80	80	160	160	160	160	160	160
LAT (°F)	92.9	81.4	71.1	95.6	87.7	80.4	75.1	71.3	67
Turndown Type	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Turndown Ratio	4:1	4:1	4:1	4:1	4:1	4:1	4:1	4:1	4:1
Fan Data									
Supply Fan Quantity	1	1	1	1	1	2	1	2	1
Supply Fan Wheel Diameter (in.)	14	16	18	18	18	16	18	18	20
Supply Fan Wheel Speed (RPM)	2,383	2,366	2,140	2,163	2,195	2,386	2,366	2,145	2,119
Supply Fan Motor HP	2	5	5	5	5	5	7.5	5	10
Exhaust Fan Quantity	1	1	1	1	2	2	2	2	2
Exhaust Fan Wheel Diameter (in.)	14	18	18	18	16	16	18	18	18
Exhaust Fan Wheel Speed (RPM)	1,852	1,695	1,757	1,781	1,796	1,900	1,669	1,726	1,775
Exhaust Fan Motor HP	1	3	3	3	1.5	2	3	3	3
Configuration									
Outdoor Air Intake	End	End	End	End	End	End	End	End	End
Supply Air Discharge	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Return Air Opening	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Weight (lbs.)	2,618	2,618	2,746	3,447	3,623	3,919	3,986	4,133	4,247
Filtration									
Hood	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum
Supply	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8

Note:

- *Capacity data above will change if entering air temperatures, leaving air temperatures (LAT), or airflow rates are varied.*
- *Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.*

GENERAL DATA

Energy Recovery Wheel Rooftop DOAS

Table 4: Energy Recovery Wheel Rooftop DOAS, continued.

Model No.	AR-DE31-25A	AR-DE31-30A	AR-DE31-35A	AR-DE31-40A	AR-DE35-30A	AR-DE35-40A	AR-DE35-50A	AR-DE35-60A	AR-DE35-70A
Design Airflow (CFM)	7,500	8,500	9,200	10,000	9,400	11,600	13,500	16,000	18,000
ESP (in. wg)	2	2	2	2	1.4	1.4	1.4	3	3
Entering Air Summer DB/WB (°F)	95 / 75	95 / 75	95/75	95/75	95 / 75	95 / 75	95 / 75	95 / 75	95 / 75
Entering Air Winter DB (°F)	0	0	0	0	0	0	0	0	0
Cooling Performance									
Coil EAT DB/WB (°F)	81.8 / 67.5	82.5 / 67.9	83/68.2	83.6/68.6	79.9 / 66.3	80.8 / 66.9	81.5 / 67.3	82.4 / 67.9	83.1 / 68.3
Coil LAT DB/WB (°F)	55.1 / 54.5	54.7 / 54.1	54.9/54.5	53.7/53.3	54.6 / 53.8	54.7 / 54	53.9 / 53.3	54.8 / 54.3	53.7 / 53.2
Unit LAT DB/WB (°F)	72 / 61.1	72.8 / 61.2	73.2/61.6	72.5/60.7	74.4 / 61.7	73.2 / 61.3	70.8 / 60.1	72 / 61.1	69.8 / 59.7
Total Cooling Capacity (MBH)	312.4	375.2	406.5	489.7	367.2	473.1	596.9	696.2	866.2
Sensible Cooling Capacity (MBH)	220.1	259.2	284.1	328.6	261.4	332.7	409.1	485.6	581.3
Hot Gas Reheat Coil Capacity (MBH)	108.8	125.1	141.4	162.1	173.7	191.7	205.9	217.1	231.4
Evaporator Coil Depth (Rows)	6	6	6	6	6	6	6	6	6
No. of Compressors	4	4	4	4	4	4	4	4	4
Compressor Type(s)	2 Digital Scroll / 2 Fixed Speed								
Refrig. Charge (lbs.)	43.9	50.2	56.5	58.2	75.3	90.5	104.1	111.5	116.8
Heating									
Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Capacity Input (MBH)	400	400	400	400	600	600	600	600	800
Capacity Output (MBH)	320	320	320	320	480	480	480	480	640
LAT (°F)	85.1	77.8	73.4	68.6	99.9	87.8	79.8	71.2	73.6
Turndown Type	Standard	Standard	Standard	Standard	High	High	High	High	High
Turndown Ratio	4:1	4:1	4:1	4:1	10:1	10:1	10:1	10:1	10:1
Fan Data									
Supply Fan Qty.	2	1	1	1	2	2	2	2	2
Supply Fan Wheel Diameter (in.)	18	24	24	24	18	18	20	24	24
Supply Fan Wheel Speed (RPM)	2,203	1,669	1,805	1,869	2,094	2,366	2,038	1,937	1,915
Supply Fan Motor HP	5	15	5	15	5	7.5	7.5	15	15
Exhaust Fan Qty.	2	2	2	2	2	3	2	2	2
Exhaust Fan Wheel Diameter (in.)	18	18	18	18	18	18	20	24	24
Exhaust Fan Wheel Speed (RPM)	1,895	2,009	2,197	2,308	1,812	1,735	1,791	1,545	1,651
Exhaust Fan Motor HP	5	5	5	5	3	3	2	10	10
Configuration									
Outdoor Air Intake	End	End	End	End	End	End	End	End	End
Supply Air Discharge	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Return Air Opening	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Weight (lbs.)	5,204	5,421	5,687	5,724	9,339	9,857	10,180	10,670	10,772
Filtration									
Hood None	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	1" Aluminum	None	None
Supply	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8

Note:

- *Capacity data above will change if entering air temperatures, leaving air temperatures (LAT), or airflow rates are varied.*
- *Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.*

REFRIGERANT SAFETY

⚠WARNING

Installation, startup, and service must be performed by a qualified installer, service agency, or gas supplier.
Improper installation, adjustment, service, maintenance, or alteration can cause personal injury or loss of life.

Note:

Installation, startup, and service must be performed by a qualified installer, service agency, or gas supplier.
Improper installation, adjustment, service, maintenance, or alteration can cause property damage.

The customer must provide proper equipment and fully trained installers to follow local safety requirements when receiving, installing, or servicing equipment. Consult all local building, electrical, occupational safety, and gas codes.

Lock out all power supplies before servicing the unit to prevent accidental startup. All fan blades should be secured to prevent wind rotation. Remove any restrictive device before restoring power.

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

ASHRAE Standards 15-2101 and 34-2010 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration of refrigerant is twenty-six (26) lbs. per 1,000 cubic feet of an occupied space. Institutional buildings allow half of that concentration.

ASHRAE Standards 15 and 34 assume that if a system develops a leak, its entire refrigerant charge will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, calculate the refrigerant concentration that may occur in the smallest room volume on the system, and compare the results to the maximum allowable concentration number. Also, consult state and local codes in regards to refrigerant safety.

⚠WARNING

Verify the maximum refrigerant concentration level for spaces served by DOAS meets the concentration limit for the application.

INSTALLATION

Lifting Guidelines

Lifting Guidelines

- Crane lift only.
- Preparation of curb and roof openings must be completed before lifting the unit to the roof.
- Units have integral U-bolt lifting lugs located on the exterior at the top. ALL lifting lugs must be used during lifting.
- The cables or chains must be at least double the length of the unit to prevent stress on the structure.
- Spreader bars are required for lifting the unit to prevent damage to the cabinet.
- Chain angle at point of lug connection must never exceed 20° from vertical in any direction.
- Always test-lift the unit to check for proper balance and rigging before hoisting to desired location.
- ⃠ Do not use belt-type slings.
- ⃠ Do not twist the lines holding the unit while it is being lifted.

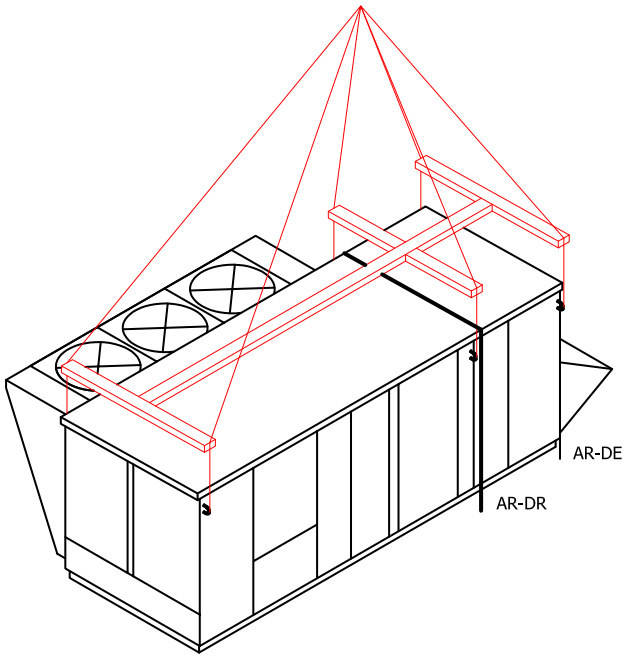
⚠ WARNING

- *Failure to follow proper instructions could result in serious injury or death.*
- *Use the appropriate crane equipment to transport each unit; ensure the crane is capable of supporting the weights listed in the specification tables. If the crane is not properly secured, it may result in an accident that causes physical injury or death.*
- ⃠ *Never lift the units in windy conditions.*
- *Wear protective gloves when handling equipment. Sharp edges may cause personal injury.*
- *Tear apart and throw away plastic packaging so that children may not play with them and risk suffocation and death.*

Note:

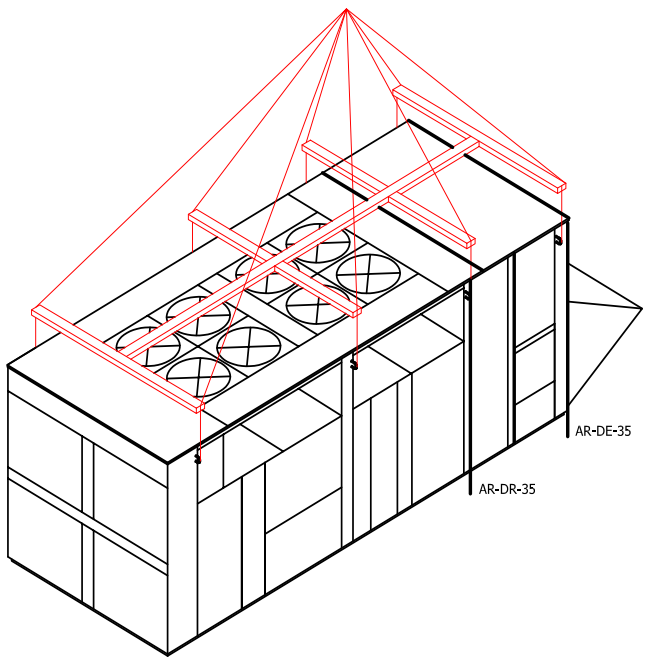
Failure to follow proper instructions could result in property damage.

Figure 1: Rigging for Rooftop DOAS Units with DR and DE11-XX, 21-XX, 31-XX Chassis.



For DR and DE11-XX, 21-XX, 31-XX Chassis, AR-DR models have four (4) lugs; AR-DE models have six (6) lugs.

Figure 2: Rigging for Rooftop DOAS Units with DR and DE35-XX Chassis.



For DR and DE35-XX Chassis, AR-DR models have six (6) lugs, AR-DE models have eight (8) lugs.

Clearances

The minimum allowable clearances around each unit are as follows.

Note:

Failure to abide by these minimum clearances will prevent serviceability or affect unit performance.

Figure 3: AR-DR Models (11-XX, 21-XX, 31-XX Chassis) – 36" Clearance on All Sides.

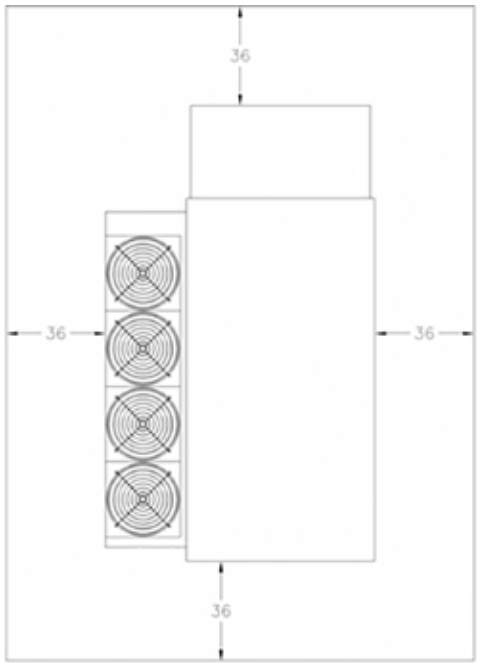


Figure 4: AR-DR Models (35-XX Chassis) – 48" Clearance on All Sides.

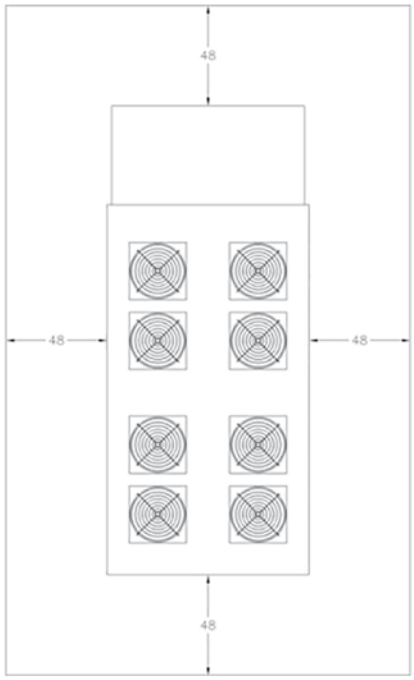


Figure 5: AR-DE Models (11-XX, 21-XX, 31-XX Chassis) Clearance.

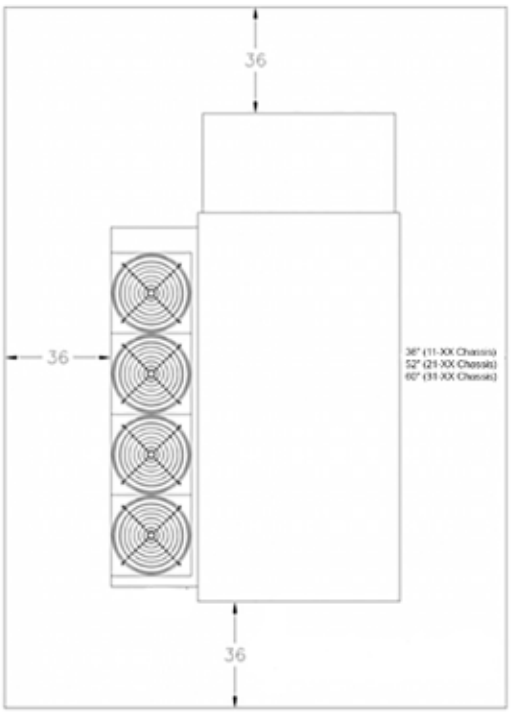
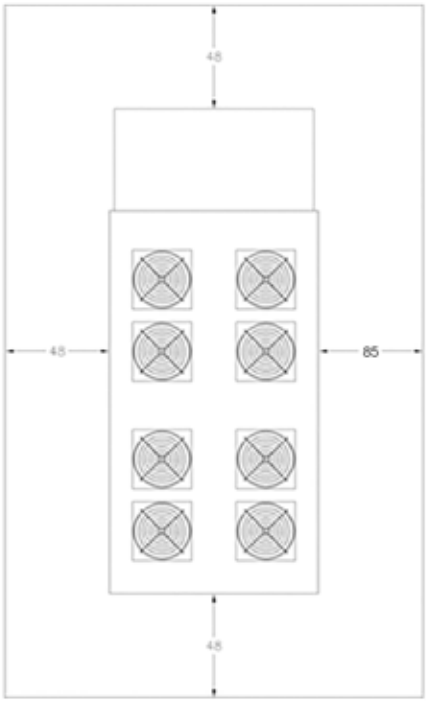


Figure 6: AR-DE Models (35-XX Chassis) Clearance.



INSTALLATION

Installation Location

Installation Location

Receiving and Inspection

Visually inspect the unit before unloading and note any damage in writing on the delivery receipt. If the unit is damaged during shipping, the customer shall immediately file a claim with the shipping company and notify LG. Photograph the damage if possible. Verify that all pieces listed on the bill of lading have been received.

Note:

Access door handles are locked when shipped from factory. An Allen wrench is required to unlock the door handles.

Storage

Any unit stored outdoors prior to installation should be covered. ⃠ Do not store other equipment on top of or inside the unit.

Temporary Use

This equipment must not be used as:

- Temporary heating or cooling.
- Construction heating.

The units must not be operated until construction is complete and the units have properly undergone the pre-startup and startup routines.

Note:

The bottom of the unit must be field-insulated if outdoor air can contact the bottom of the unit. To avoid leakage, ⃠ do not drill or punch holes in the floor of the unit.

Hanging Installation

⃠ DO NOT permanently suspend the unit from the lifting lugs. If the unit is to be hung, additional supports are required under the unit. Hang the unit from the supports, making sure the unit is level. Failure to keep the unit level will result in operational problems.

Pad Installation

- Check to make sure the pad is level. Failure to provide a level surface will result in operational problems.
- Check for correct orientation of the unit.
- Lift unit per the lifting instructions.
- Secure the unit to the pad in accordance with all applicable building codes.
- Tighten door handles.

Curb Installation

Note:

Gasket material must be applied to all surfaces of the curb which contact the unit to create proper seal between the unit and the curb.

- Ensure that the roof curb is level. Failure to level the curb will result in operational problems.
- Lift unit per the lifting instructions.
- Ensure a neoprene gasket is installed on the top flange of the perimeter and cross members of the curb.
- Check for correct orientation of the unit on the curb.
- Check the seal between the roof curb and the unit. Apply additional caulking as required. Failure to provide an adequate seal can result in air and water leakage into the building.
- Secure the unit to the curb in accordance with all applicable building codes.
- Tighten door handles.

Specifications

Factory-supplied roof curbs shall be constructed of 16 gauge G-90 galvanized steel and fully assembled at the factory. A 1.5” wood nailer shall be provided around the entire perimeter of the curb. Curb shall be fully insulated through 1.5” fiberglass insulation. Cross-member supports shall be provided for connecting ductwork prior to the unit being set on the roof.

Duct Connections to Curb

When the supply air discharge opening and/or the return air intake opening are located on the bottom of a unit, the ductwork must be connected to the curb directly. The actual opening sizes in the floor of the unit are not specified as they are slightly undersized from the duct dimensions shown on the following curb drawings.

Curb and Ductwork Dimensions — AR-DR Models (11-XX, 21-XX, and 31-XX Chassis)

Only AR-DR 11-XX chassis have two cross members (Dimension B; see dimensional drawing below). The supply air ductwork on AR-DR 21-XX and AR-DR 31-XX chassis is mounted directly to the exterior rail of the curb.

Figure 7: Curb and Ductwork Dimensions Diagram for AR-DR Models 11-XX, 21-XX, 31-XX Chassis.

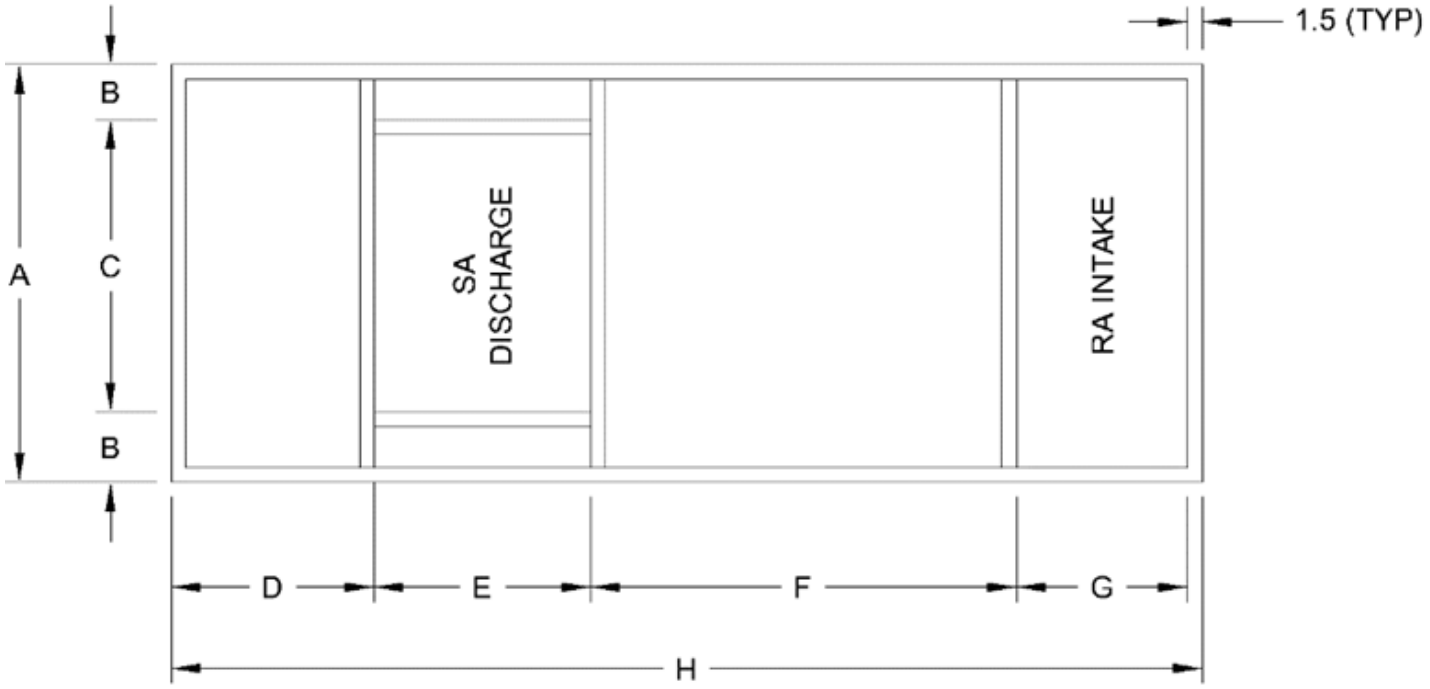


Table 5: Curb and Ductwork Dimensions Table for AR-DR Models 11-XX, 21-XX, 31-XX Chassis.

Chassis	A	B	C	D	E	F	G	H
AR-DR-11-XX	42.5 in.	7.13 in.	28.25 in.	20.63 in.	22 in.	43.25 in.	17.38 in.	104.75 in.
AR-DR-21-XX	54.75 in.	1.5 in.	51.75 in.	23.75 in.	22 in.	43.13 in.	24.38 in.	114.75 in.
AR-DR-31-XX	61.5 in.	1.5 in.	58.5 in.	20.75 in.	26 in.	50.5 in.	26 in.	124.75 in.

INSTALLATION

Installation Location

Figure 8: Curb and Ductwork Dimensions Diagram for AR-DR Model 35-XX Chassis.

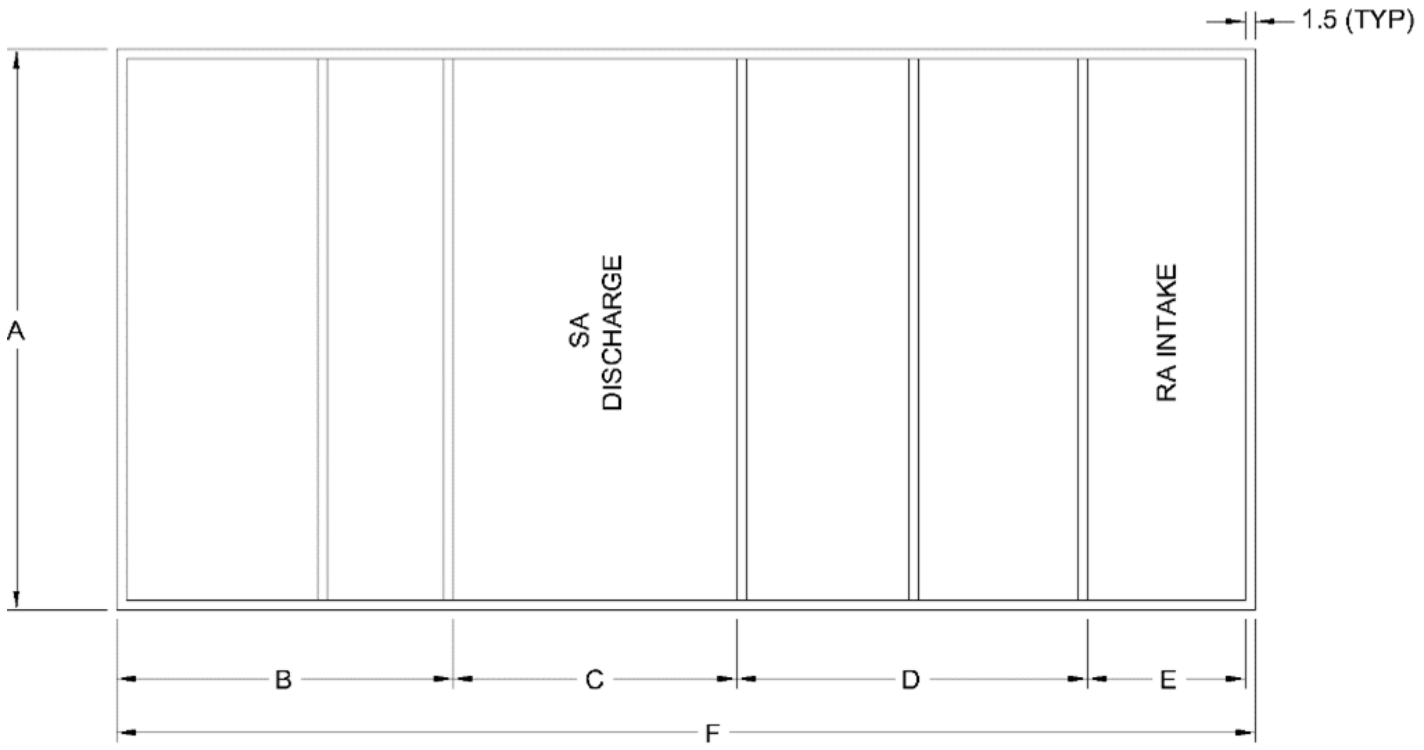


Table 6: Curb and Ductwork Dimensions Table for AR-DR Model 35-XX Chassis.

Chassis	A	B	C	D	E	F
AR-DR-35-XX	86.5 in.	52 in.	43.75 in.	54 in.	24.5 in.	175.75 in.

Curb and Ductwork Dimensions — AR-DE Models (11-XX, 21-XX, and 31-XX Chassis)

AR-DE chassis (11-XX, 21-XX, 31-XX) are constructed with a cross member in the base that requires one of the following when curb mounted:

- Partial-perimeter curb plus secondary support rails (standard factory offering).
- Partial-perimeter curb plus equipment support.
- Single curb with 6" x 6" notch(es) to accommodate cross members in one (1) to two (2) locations depending on unit configuration.

Figure 9: Curb and Ductwork Dimensions Diagram for AR-DE Models 11-XX, 21-XX, 31-XX Chassis.

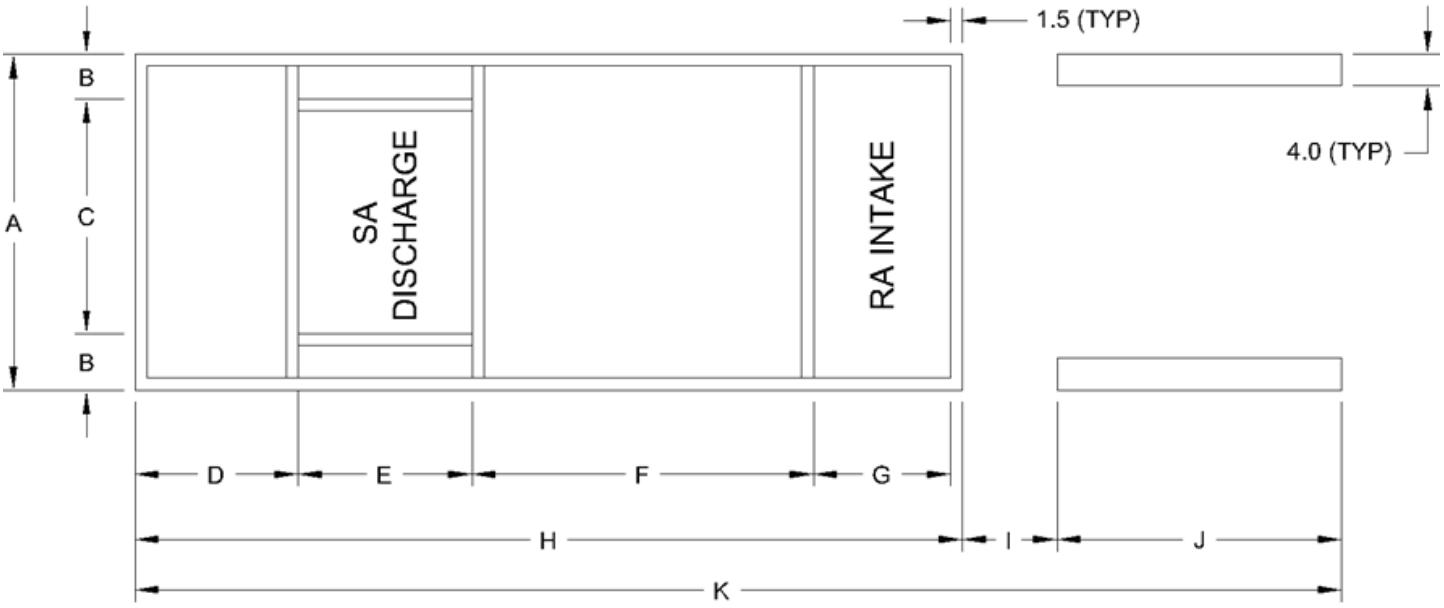


Table 7: Curb and Ductwork Dimensions Table for AR-DE Models 11-XX, 21-XX, 31-XX Chassis.

Chassis	A	B	C	D	E	F	G	H	I		J	K	
									Bottom Return Air	Side Return Air		Bottom Return Air	Side Return Air
AR-DE-11-XX	42.5 in.	7.13 in.	28.25 in.	20.63 in.	22 in.	43.25 in.	17.38 in.	104.75 in.	12 in.	39 in.	36 in.	152.75 in.	179.75 in.
AR-DE-21-XX	54.75 in.	1.5 in.	51.75 in.	23.75 in.	22 in.	43.13 in.	24.38 in.	114.75 in.	12 in.	39 in.	36 in.	162.75 in.	189.75 in.
AR-DE-31-XX	61.5 in.	1.5 in.	58.5 in.	20.75 in.	26 in.	50.5 in.	26 in.	124.75 in.	12 in.	39 in.	36 in.	172.75 in.	199.75 in.

INSTALLATION

Installation Location

Figure 10: Curb and Ductwork Dimensions Diagram for AR-DE Model 35-XX Chassis.

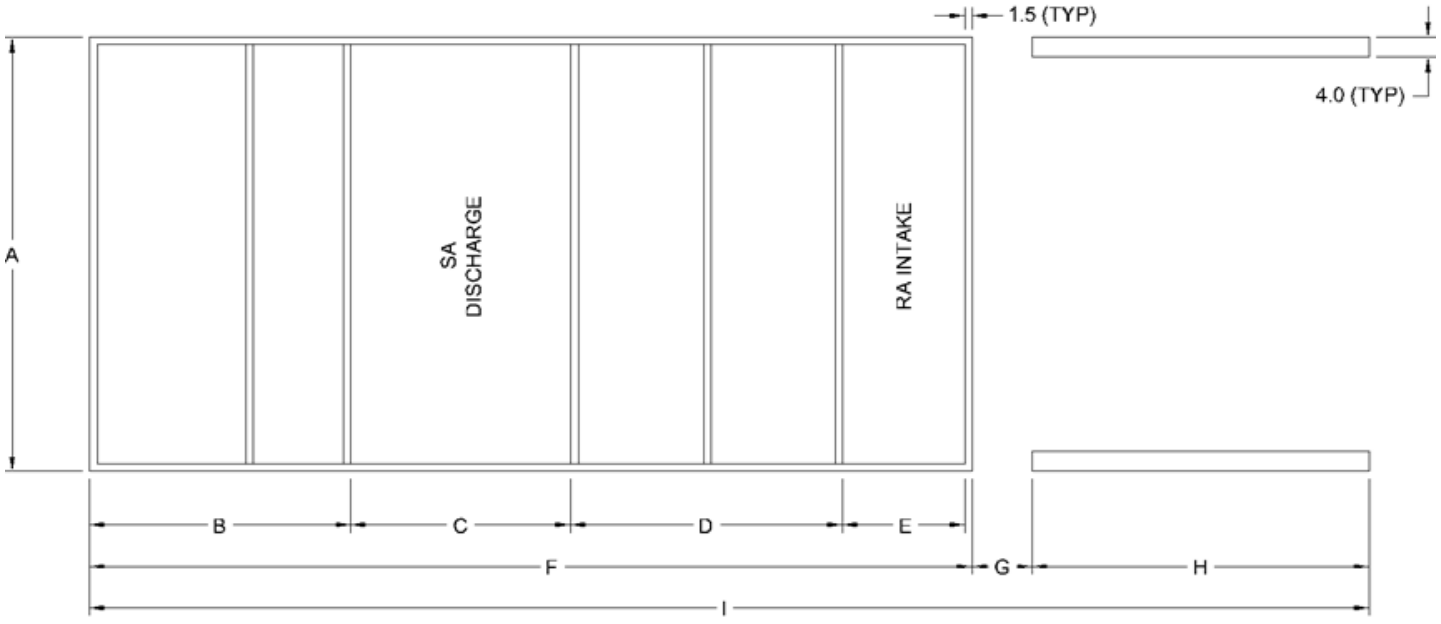


Table 8: Curb and Ductwork Dimensions Table for AR-DE Model 35-XX Chassis.

Chassis	A	B	C	D	E	F	G	H		I	
								Bottom Return Air	Side Return Air	Bottom Return Air	Side Return Air
AR-DE-35-XX	86.5 in.	52 in.	43.75 in.	54 in.	24.5 in.	175.75 in.	12 in.	67 in.	110 in.	254.75 in.	297.75 in.

Outdoor Air Hood Assembly

Each unit comes with a factory-supplied outdoor air intake hood that must be assembled prior to startup. The outdoor air intake hood is available in two options:

- Standard hood with bird screen.
- Hood with optional 1" aluminum filters.

The individual parts of the intake hood are located between the outdoor air intake damper and the intake hood top piece (Item No. 6 for AR-DR and AR-DE 11-XX, 21-XX, 31-XX chassis; Items Nos. 7 and 8 for AR-DR and AR-DE 35-XX chassis), which is secured flush with the end of the unit during shipment. The 1" aluminum filters are located in the intake compartment behind the outdoor air intake damper. The outdoor air intake end of the unit is opposite access to controls and compressors.

Tools Needed

1. Power tool with 5/16” socket drive
2. Phillips power bit No. 2.
3. Sheet metal bending hand tool.
4. Silicone caulk.

Standard Intake Hood with Bird Screen Assembly

Figure 11: Standard Intake Hood with Bird Screen Assembly Parts Diagram.

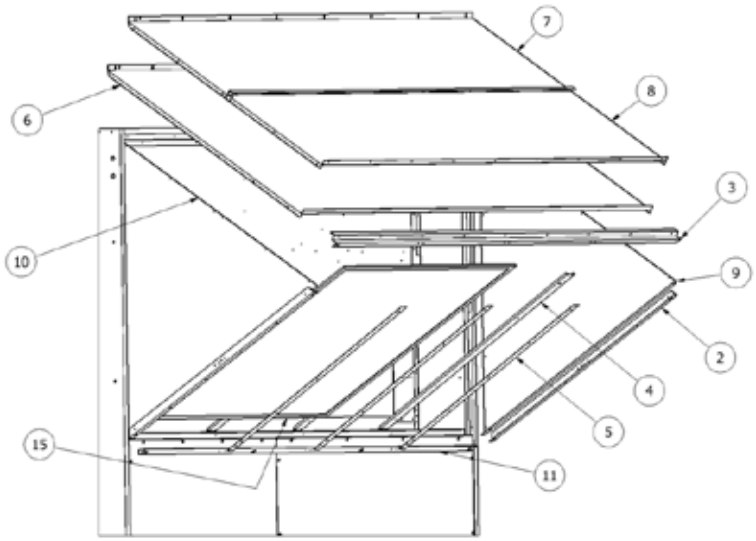


Table 9: Standard Intake Hood with Bird Screen Parts Description Table.

Item No.	Description		Part Number (Quantity)				
			For AR-DR / AR-DE 11-XX Chassis	For AR-DR / AR-DE 21-XX Chassis	For AR-DR / AR-DE 31-XX Chassis	For AR-DE 35-XX Chassis	For AR-DR 35-XX Chassis
2*	Screen Side Support		2501 (2)	2506 (2)	2511 (2)	2035 (2)	4615 (2)
3	Hood End		2502 (1)	2507 (1)	2512 (1)	2038 (1)	4619 (1)
4	Screen Center Support		2503 (1)	2508 (1)	2513 (1)	2036 (3)	4894 (3)
5	Screen Support Flashing		2504 (1)	2509 (1)	2514 (1)	2498 (3)	4895 (3)
6	Hood Top-A		2500 (1)	2505 (1)	2510 (1)	N/A	N/A
7	Hood Top-B		N / A	N / A	N / A	2032 (1)	4612 (1)
8	Hood Top-C		N / A	N / A	N / A	2037 (1)	4616 (1)
9	Right Side Triangle		1317 (1)	4087 (1)	8087 (1)	2033 (1)	4613 (1)
10	Left Side Triangle		1318 (1)	4088 (1)	8088 (1)	2034 (1)	4614 (1)
11	Bottom Flashing		1229 (1)	4297 (1)	8297 (1)	2039 (1)	4617 (1)
15	Framed	Dimensions	25.50 x 45.50 in.	28.00 x 57.75 in.	39.38 x 64.63 in.	46.50 x 52.75 in.	46.50 x 57.75 in.
—	Bird Screen	Part No. / Qty.	1009801 (1)	1009802 (1)	1009803 (1)	1009804 (2)	1015153 (2)

Note:

The sheet metal screws are included with the hood parts.

OUTDOOR AIR HOOD ASSEMBLY

Standard Intake Hood with Bird Screen Assembly

Standard Intake Hood with Bird Screen Assembly Installation

1. Remove the shipping brackets used to secure the Standard Intake Hood with Bird Screen in transit. The brackets (shown below) are typically fabricated of galvanized steel and may be discarded. Retain the sheet metal screws for use in assembling the standard intake hood with bird screen.

Figure 12: Locating the Shipping Brackets (Step 1).

2. Remove the row of screws holding the top of the hood to the unit. Set aside the top of the hood and the screws (these will be used in a later step).

Figure 13: Remove and Discard the Shipping Foam (Step 3).

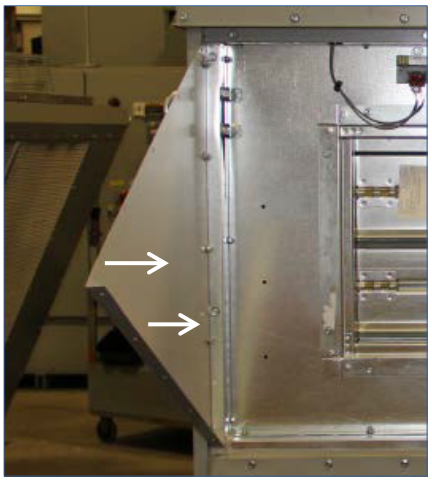
3. Remove and discard the shipping foam or tape. ⃠ Do not remove the adhesive-backed gray gasket from the unit.

Figure 14: Location of Lug Channel Screws to Remove (Step 5).

4. Remove and take inventory of parts shipped in the sill of the opening.

5. Remove the lug channel screw on each side of the unit if not already removed.

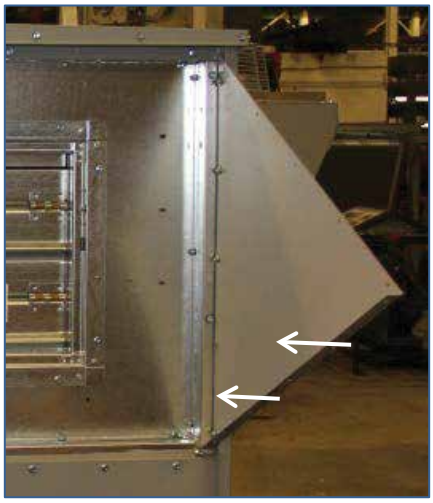
Figure 15: Install Left Support Triangle with Flange Facing In (Step 6).



6. Install the Left Side Triangle support by aligning the pre-punched holes with the dimples inside the outdoor air intake sill. Fasten with 5/16" hex-head screws. The flanged side of the triangle should be on the bottom of the hood and facing in to the center of the unit, as shown.

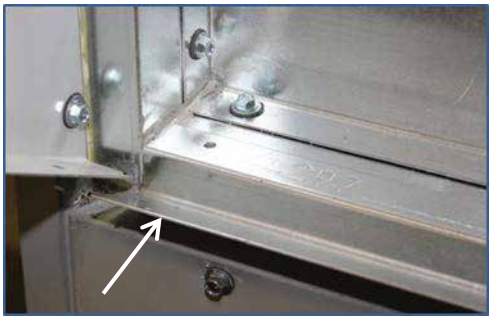
7. Install the Right Side Triangle support the same way, with the flange on the bottom and facing in, as shown.

Figure 16: Install Right Support Triangle with Flange Facing In (Step 7).



8. Install the “S” rail Bottom Flashing on the bottom of the intake sill as shown. Align the pre-punched holes with the dimples provided on the top edge of the sill. Fasten with the provided 5/16" hex-head screws.

Figure 17: Install Bottom Flashing. (Step 8).

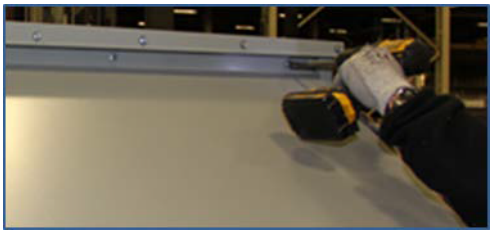


9. Place the Hood Top on top of the Triangle Side supports, as shown. Fasten the top edge of the hood to the unit using the 5/16" x 1.5" screws removed previously from the shipping brackets.

⚠ WARNING

Assistance is required to perform this step for the larger hoods on the 31-XX and 35-XX chassis. There is a risk of the product falling and causing physical injury or death.

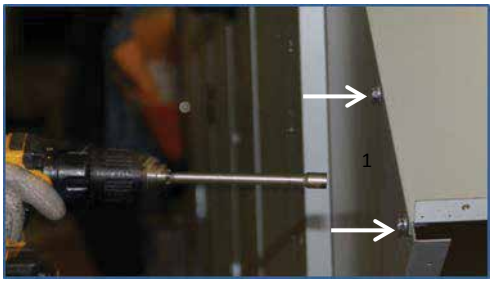
Figure 19: Install the Hood Top and Fasten with Screws (Step 9).



10. Attach the left and right edges of the top of the hood to the triangular supports using the provided 5/16" hex-head screws.

11. Align the pre-punched holes in the Hood End piece with the leading edge of the hood top. Secure in place with the provided 5/16" hex-head screws.

Figure 18: Fasten the Left and Right Triangles to the Top with Screws (Step 10).



12. Caulk the top and side seams where the hood meets the unit and at the ends of the flanges on both sides, as shown.

13. Install Hood End.

OUTDOOR AIR HOOD ASSEMBLY

Standard Intake Hood with Bird Screen Assembly

14. Position the Screen Center Support so that the pre-punched holes in the Bottom Flashing and Hood End are aligned. Fasten with No. 8-18" x 1/2" Phillips flat-head sheet metal screws, as shown. For the 35-XX chassis, repeat this step for each of the two (2) additional Screen Center Supports, spanning the width of the hood.

15. Install Right Side screen support, slide screen in channel between Right Side Triangle and Side Screen Support, then install Left Side Screen Support while inserting the screen in slot between Left Side Triangle and Left side screen support.

16. Fasten the perimeter of the Framed Bird Screen(s) to the hood assembly using 5/16" sheet metal screws spaced at 12" centers, as shown.

17. Position the Screen Support Flashing on top of the screen, aligning it over the Screen Center Support. Secure in place with 5/16" sheet metal screws. For 35-XX chassis, secure each of the two (2) additional screen support flashings over the other two (2) screen supports.

Figure 20: Install the Hood End by Lining up the Pre-punched Holes (Steps 11 and 13).

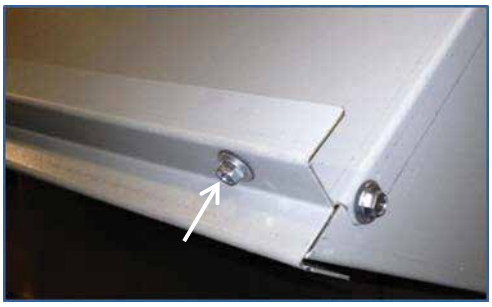


Figure 21: Caulk Top and Side Seams (Step 12).

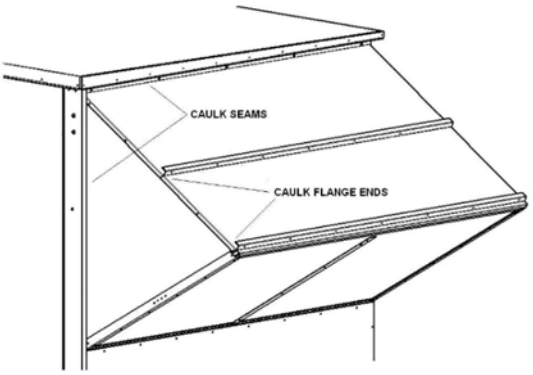


Figure 22: Install Screen Center Support (Step 13).

Figure 23: Install Perimeter Screws at 12" Centers (Step 15).

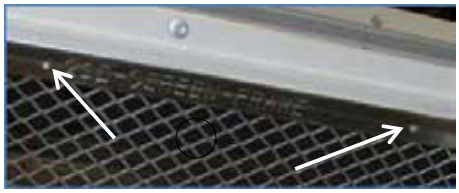
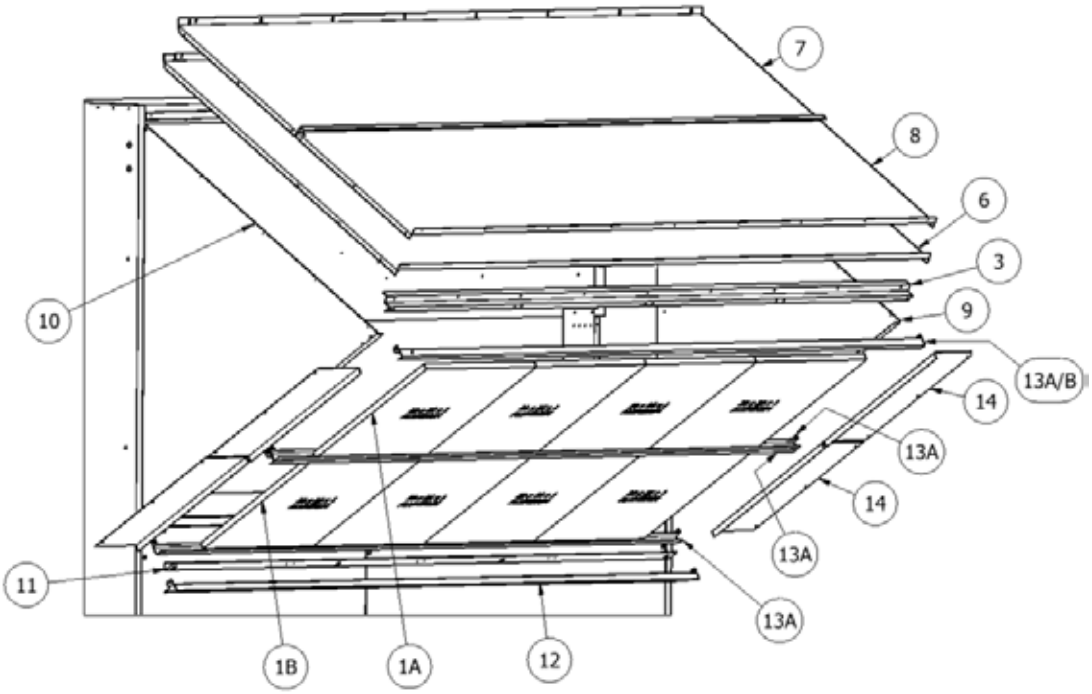


Figure 24: Install Screen Support Flashing (Step 16).

Intake Hood with Aluminum Filter Assembly

Figure 25: Intake Hood with Aluminum Filter Assembly Parts Diagram.



- Model AR-DR 11-XX and 21-XX chassis only have one (1) row of aluminum filters.
- Model AR-DR 35-XX chassis has three (3) rows of aluminum filters.
- Model AR-DR 21-XX and 35-XX chassis have two (2) different filter sizes.
- Model AR-DR 31-XX chassis has a special aluminum filter rail top.

Table 10: Intake Hood with Aluminum Filter Assembly Parts Description Table.

Item No.	Description	Part Number (Quantity)				
		For AR-DR / AR-DE 11-XX Chassis	For AR-DR / AR-DE 21-XX Chassis	For AR-DR / AR-DE 31-XX Chassis	For AR-DE 35-XX Chassis	For AR-DR 35-XX Chassis
1A	Aluminum Filter A	20 x 25 x 1 in. (2)	20 x 25 x 1 in. (2)	16 x 20 x 1 in. (8)	20 x 25 x 1 in. (8)	16 x 20 x 1 in. (8)
1B	Aluminum Filter B	N / A	16 x 25 x 1 in. (1)	N / A	N / A	20 x 25 x 1 in. (4)
3	Hood End	2502 (1)	2507 (1)	2512 (1)	2038 (1)	4619 (1)
6	Hood Top A	2500 (1)	2505 (1)	2510 (1)	N / A	N / A
7	Hood Top B	N / A	N / A	N / A	2032 (1)	4612 (1)
8	Hood Top C	N / A	N / A	N / A	2037 (1)	4616 (1)
9	Right Side Triangle	1317 (1)	4087 (1)	8087 (1)	2033 (1)	4613 (1)
10	Left Side Triangle	1318 (1)	4088 (1)	8088 (1)	2034 (1)	4614 (1)
11	Bottom Flashing	1229 (1)	4297 (1)	8297 (1)	2039 (1)	4617 (1)
12	Aluminum Filter Bottom	N / A	4431 (1)	N / A	2308 (1)	4865 (1)
13A	Aluminum Filter Rail	1352 (2)	4429 (2)	8424 (3)	2309 (4)	2309 (4)
13B	Aluminum Filter Top Rail	N / A	N / A	8436 (1)	N / A	N / A
14	Aluminum Filter Side Spacer	1353 (2)	4430 (2)	8425 (4)	2310 (4)	2310 (2) and 4864 (4)

OUTDOOR AIR HOOD ASSEMBLY

Intake Hood with Aluminum Filter Assembly

Intake Hood with Aluminum Filter Assembly Installation

1. Follow Steps 1 through 12 as detailed in “Standard Intake Hood with Bird Screen Assembly Installation”.

2. On the Aluminum Filter Bottom, Aluminum Filter Rail, and Aluminum Filter Top Rail, bend the end tabs 90° with sheet metal bending tool (The Aluminum Filter Top Rail is only shipped with the 31-XX chassis).

3. Attach the Aluminum Filter Bottom (if applicable) by aligning the bottom tab holes with the dimples on both Triangles, as shown. Fasten with the provided 5/16" hex-head screws.

4. **For 11-XX and 21-XX Chassis:** Attach the top and bottom Aluminum Filter Rails to the side Hood Triangles by aligning the Aluminum Filter Rail tab holes with the dimples on both Triangles. Fasten with the provided 5/16" hex-head screws (see figures).

   For 31-XX Chassis: Install an Aluminum Filter Top Rail as the top filter rail. Install one (1) Aluminum Filter Rail as the bottom filter rail.

   For 31-XX and 35-XX Chassis: Install the additional Aluminum Filter Rails at the midpoint of the Hood Triangles. Align the Aluminum Filter Rail tab holes with dimples on both Triangles. The top middle rail must face up, and the bottom middle rail must face down.

5. Install the Aluminum Filters A and B. Verify airflow arrow is facing into the unit.

6. Fasten the Aluminum Filter Side Spacers to the bottom flange of both Triangles to secure the filters.

Figure 26: Bending the Tab (Step 2).

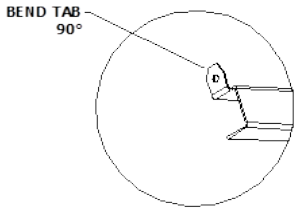


Figure 27: Install Aluminum Filter Bottom, if Applicable (Step 3).

Figure 28: Location of Top Filter Rail (Step 4A).

Figure 29: Location of Bottom Filter Rail (Step 4B).

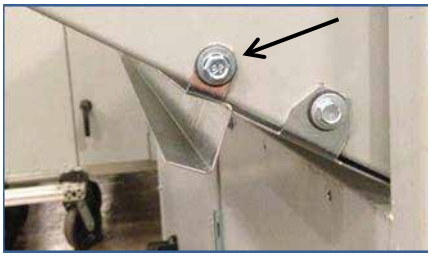


Figure 30: Install Filters with Arrow Pointing Into the Unit (Step 5).

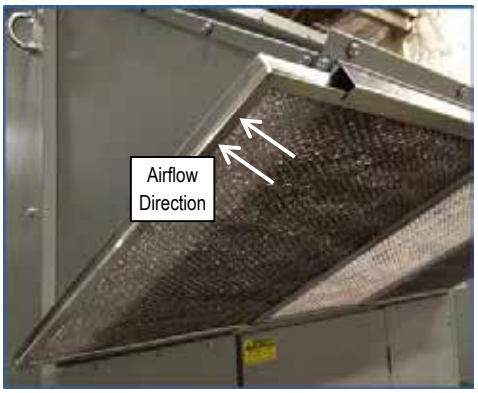


Figure 31: Install Side Spacers (Step 6).

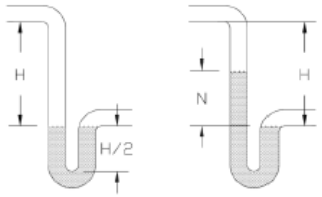
Duct and Condensate Drain Connections

Condensate Drain Connection

Note:

All condensate drain connections must be properly trapped and primed before operating the unit. Failure to properly trap a drain will result in flooding the drain pan and potential water damage to the unit or building.

Figure 32: Trap Specifications.



N=Negative Fan Pressure (InWc)

H=N+[1InWc (minimum)]

Slope the piping from the trap downward in direction of flow. The trap must be primed before startup by filling the "U" portion of the trap with water. Drains that are not properly trapped and primed will not operate correctly. Each drain connection must be individually trapped.

Drains that are inactive will dry out and air will be drawn through the drain, preventing water flow. Inactive drains should be plugged or connected to a shutoff valve. On outdoor units that operate during freezing weather, install a heat trace around trap piping. Refer to the following figure to determine the correct trap height.

Drain Sizes and Locations

Drains are located on the access side of all units and are sized as shown in the following diagrams.

Figure 33: AR-DR / AR-DE 11-XX, 21-XX, and 31-XX Chassis Drain Sizes and Locations.

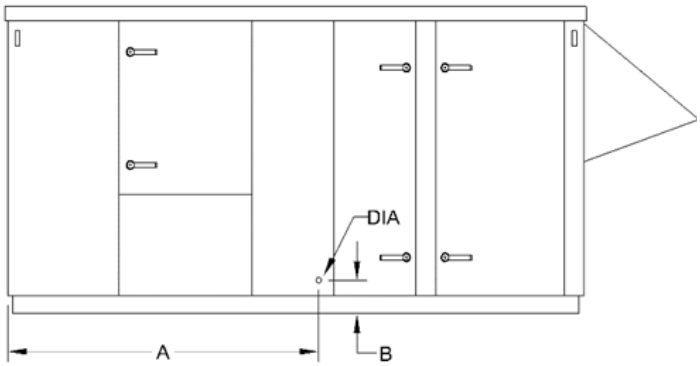


Figure 34: AR-DR / AR-DE 35-XX Chassis Drain Size and Location.

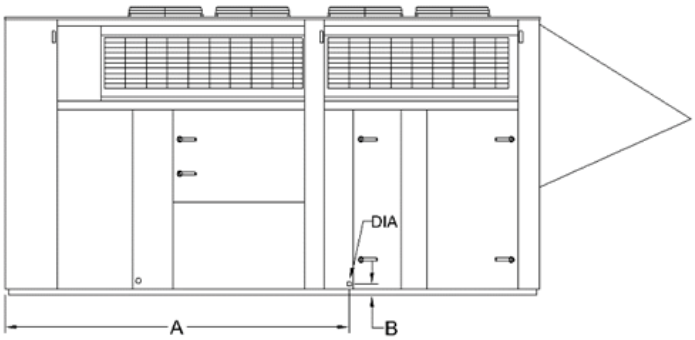


Table 11: AR-DR / AR-DE 11-XX, 21-XX, 31-XX, and 35-XX Chassis Drain Sizes and Locations.

Chassis Size	A (in.)	B (in.)	Diameter (in.)
11-XX	58	7	1.0
21-XX	65	7	1.0
31-XX	75	7	1.0
35-XX	119	4	1.0

Duct Connections

The contractor is responsible for providing transitions to accommodate difference in sizing between the unit and the building ducts. Duct connections to collar-type openings can be made with S-cleats or overlapping joints. Apply caulk around each duct connection. Failure to seal duct connections can cause air leakage and system performance problems.

A straight duct for a distance of three (3) to six (6) duct diameters from the unit discharge should be used to develop a full dynamic head. Branching and turning closer to the discharge causes system effect losses.

Note:

When an air duct which carries supply air or warm air passes through a combustible roof, a clearance of one inch must be maintained between the outside perimeter of ductwork and any combustible materials, per NFPA Standard 90A.

Access Holes

A number of pre-punched holes / openings are provided on the cabinet for electrical and gas connections for each unit.

Figure 35: AR-DR / AR-DE 11-XX Chassis Access Holes.

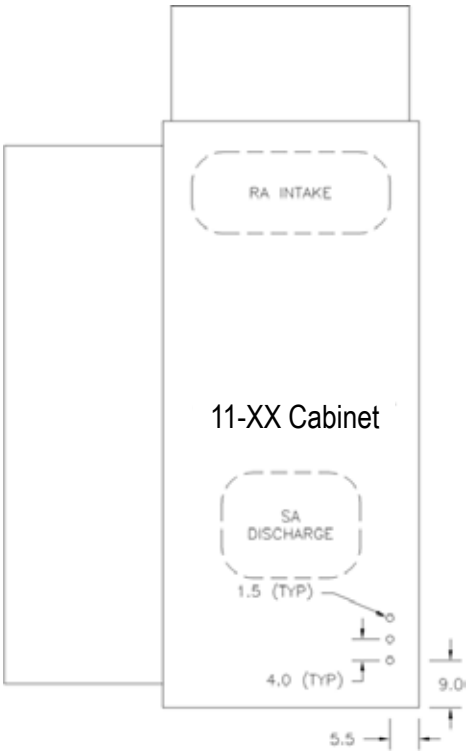


Figure 36: AR-DR / AR-DE 21-XX Chassis Access Holes.

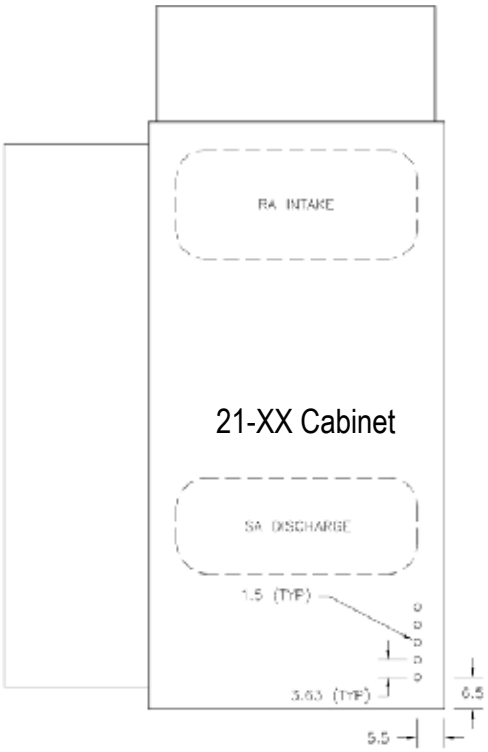


Figure 37: AR-DR / AR-DE 31-XX Chassis Access Holes.

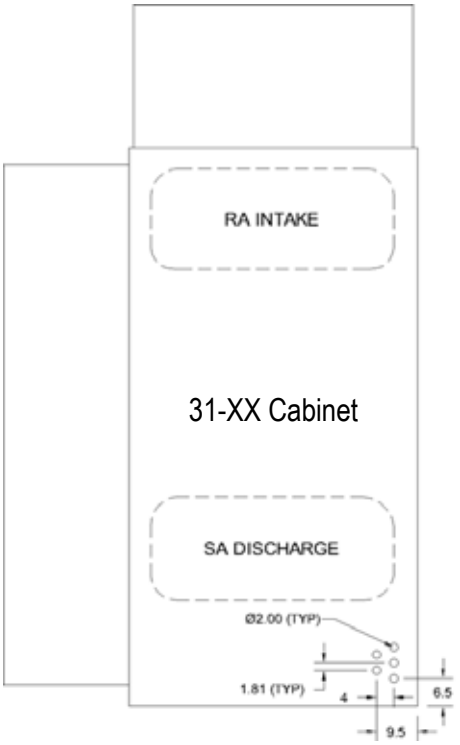
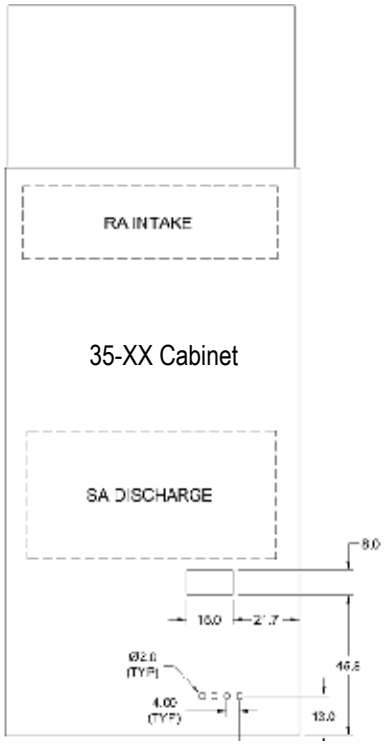


Figure 38: AR-DR / AR-DE 35-XX Chassis Access Holes.



Electrical Connections

⚠DANGER

Line voltage wiring must be drawn and landed to the unit in accordance with all local and national electrical codes.
Improper connections and inadequate grounding can cause accidental injury or death.

Note:

All wiring to the unit must be drawn through one of the pre-punched holes in the bottom of the floor pan immediately underneath the control center or through a field-cut hole in the side of the unit casing.

Field-Mounted Sensors

All field-mounted sensors are designed to be connected to the terminal strip located in the upper left corner of the control panel. All sensors and end devices for the product have been factory wired with the exception of the following items:

Table 12: Field-Mounted Sensor Information.

Sensor Type	Maximum Wire Length	Mounting Location
Supply Air Temperature Sensor	1,500 feet	Supply Air Ductwork Downstream of Ventilator (Minimum ten [10] feet downstream of unit in straight run of duct)
Space Temperature Sensor	1,500 feet	Wall Mounted in the Space
Space Relative Humidity Sensor	1,500 feet	Wall Mounted in the Space
Space CO_2 Sensor	1,500 feet	Wall Mounted in the Space

Note:

- *Special control sequences are required for many field-mounted sensors.*
- ⃠ *Do NOT run sensor wiring in the same conduit as high or low voltage AC wiring. Inaccurate signal levels are possible when AC power wiring is present in the same conduit as the sensor wires.*

Supply Air Temperature Sensor

A supply air temperature sensor is required on all units and ships loose with approximately twenty (20) feet of wiring for mounting in the supply air ductwork downstream of the unit. Wiring is two-conductor, 22 AWG, twisted, shielded, and stranded communication cable. A minimum five (5) feet of duct run is required for installation of the supply air temperature sensor. If mounted too close to the discharge of the ventilator, the sensor may provide a false reading to the microprocessor controller when in heating mode.

ELECTRICAL CONNECTIONS

Space Temperature and Humidity Sensors

When a unit is equipped with space temperature and humidity reset, both a wall-mounted temperature sensor and a wall-mounted humidity sensor ship loose with the unit. Both sensors must be mounted in the space served by the ventilator at a height of approximately five (5) feet from the floor. Two (2) individual sensors are provided to prevent interference, but the individual enclosures may be installed on a wall immediately next to each another. Wiring between the ventilator and the temperature sensor must be through a field-supplied, four-conductor, 22 AWG, twisted, shielded, and stranded communication cable.

Terminations must be made per the following chart.

Table 13: Space Temperature Sensor Terminations.

Space Temperature Sensor	Terminal Strip TB3
SP1	13
SP2	14
SN	4
SN	5
Shield	G

Wiring between the ventilator and the space humidity sensor must be through a field-supplied, three-conductor, 22 AWG, twisted, shielded, and stranded communication cable.

Terminations must be made per the following chart.

Table 14: Space Humidity Sensor Terminations.

Space Humidity Sensor	Terminal Strip TB3
SIG	6
–	7
+	HB

Note:

⃠ *Do not use a single, multi-conductor cable to wire both the space temperature and humidity sensors. Use separate communication cables for each sensor. Incorrect wiring may result in communication problems or failure to operate at all.*

Space CO_2 Sensor

A space-mounted CO_2 sensor is provided with ventilators that include a modulation controls sequence based on CO_2. The sensor must be mounted in the space served by the ventilator at a height of approximately five (5) feet from the floor. Wiring between the ventilator and the space CO_2 sensor must be through a field-supplied, three-conductor, 22 AWG, twisted, shielded, and stranded communication cable.

Terminations must be made per the following chart.

Table 15: Space CO_2 Sensor Terminations.

CO_2 Sensor	Terminal Strip TB3
OUT1	33
GO	34
G+	35

Gas Heater Connection and Startup

⚠DANGER

Gas pipes must be sized and installed in accordance with applicable codes and by qualified personnel. Authorities having jurisdiction must be consulted before installing and connecting gas lines. Improper installation by the user may result in fire, explosion, physical injury or death.

Gas furnaces are designed for gas pressure of 5 to 13.5 in. w.c. for natural gas (six [6] inch minimum on single 500 and 600 MBH furnaces) and 11 to 13.5 in. w.c. for LP. If the gas pressure at the job location is greater than 13.5 in. w.c., an additional regulator is required to reduce pressure.

Gas Connection Sizes

All gas furnace sections require one (1), two (2), or three (3) gas connections (usually 3/4 in. NPT) based on the total heating capacity as shown in the chart.

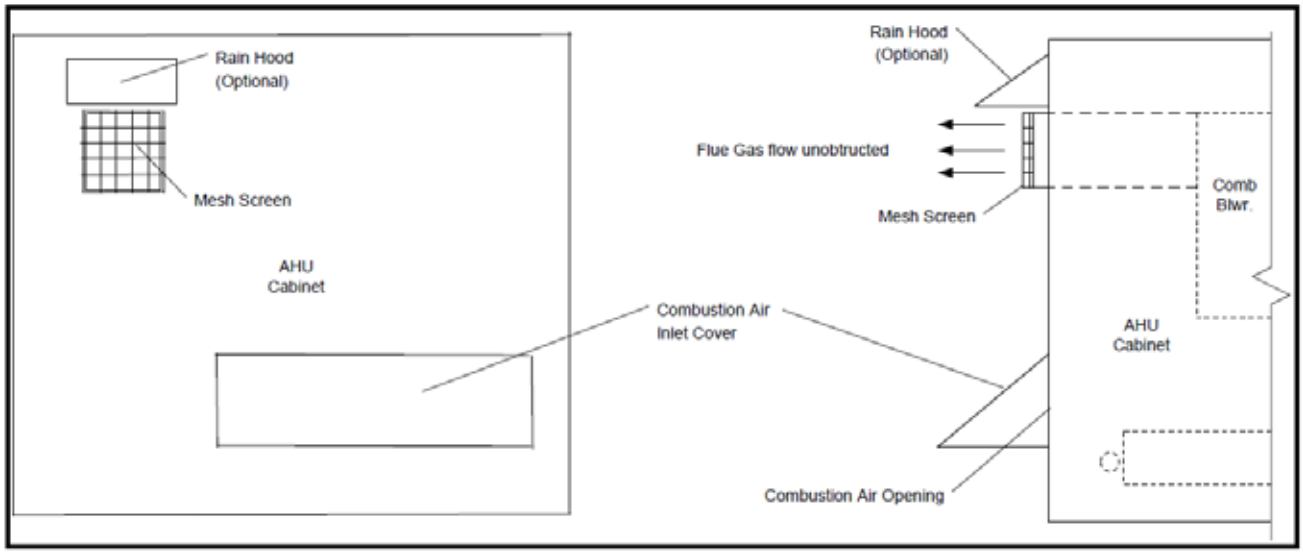
Table 16: Gas Connection Sizes.

Total Heating Capacity (Input in MBH)	Gas Connections (3/4 in. NPT unless noted)
100	1
150	1
200	1
250	1
300	1
350	1
400	1
500	1 @ 1 in. NPT
600	1 @ 1 in. NPT
800	2 for 31-XX Chassis 1 @ 2 in. NPT for 35-XX Chassis
1,000	1 @ 2 in. NPT
1,200	1 @ 2 in. NPT

Flue Venting (Outdoor Installations)

The venting system is designed for direct discharge of flue gases to the outdoors. The vent discharge opening must be located to provide an unobstructed discharge to the outside, and must be located as far from the combustion air inlet as possible, but in the same pressure zone. Vent duct must pitch down toward outlet, to ensure that any condensate that occurs in vent duct drains away from combustion blower fan housing. The duct opening must be protected by 1/2 in x 1/2 in. mesh screen. An optional rain hood may be used over the discharge opening to prevent wind driven rain from entering the vent duct, but must not intersect the flue gas discharge port. See below.

Figure 39: Outdoor Horizontal Venting Diagram.



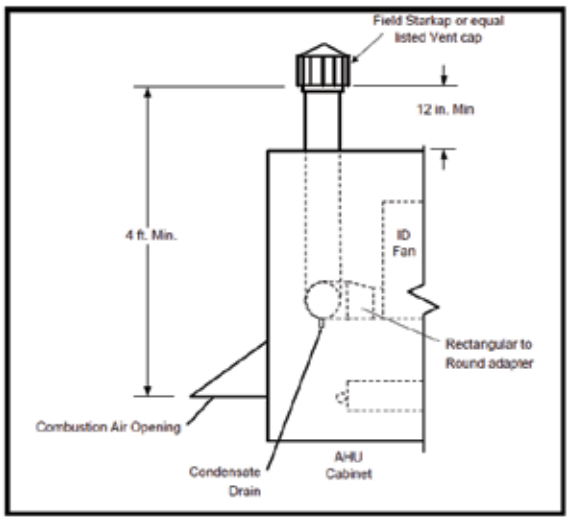
⚠WARNING

Combustion air inlet cover must be extended and opened prior to starting the gas heat. Inadequate ventilation is a health hazard that may result in physical injury or death.

GAS HEATER CONNECTION AND STARTUP

Where sufficient clearance for proper horizontal venting cannot be provided, or in jurisdictions requiring a four (4) foot separation between flue gas discharge and combustion air inlet, flue gases need to be vented vertically. Refer to the figure below for acceptable venting method. Vent pipe must terminate at least one (1) foot above the cabinet. The vent must be located on the same side of the appliance as the combustion air inlet opening. Condensation in the vent pipe is likely during heater start up cycle and provision for drainage must be provided.

Figure 40: Outdoor Vertical Venting Diagram.



⚠DANGER

Flue gases must be directed away from combustion air inlets, to avoid recirculation into combustion air supply. There is risk of fire, explosion, and physical injury or death.

⚠WARNING

Flue gases must be directed away from combustion air inlets, to avoid recirculation into combustion air supply. Inadequate ventilation is a health hazard that may result in physical injury or death.

Exterior Gas Connections

Refer to the following figures for possible locations to run gas connections through the exterior of the cabinet.

Note:

Check inside the cabinet before drilling to avoid damaging interior equipment.

Figure 41: AR-DR / AR-DE 11-XX, 21-XX, 31-XX Chassis Exterior Gas Connections.

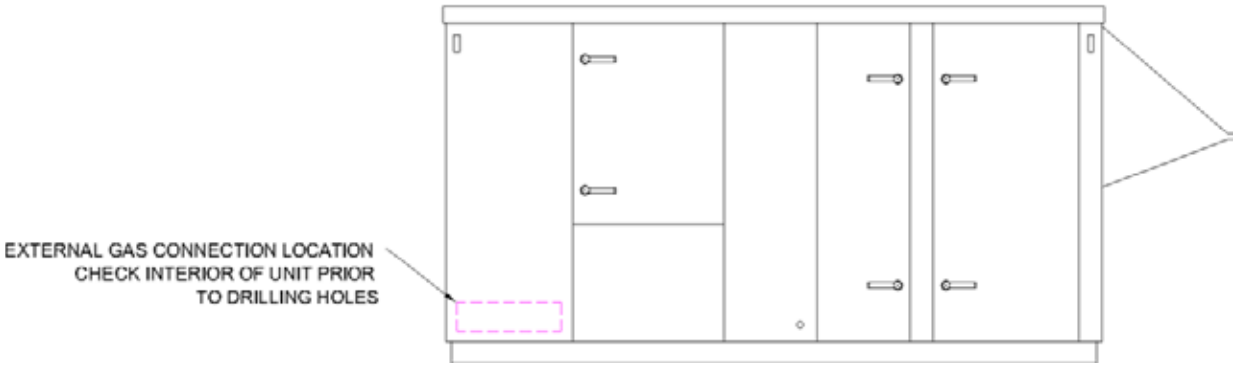
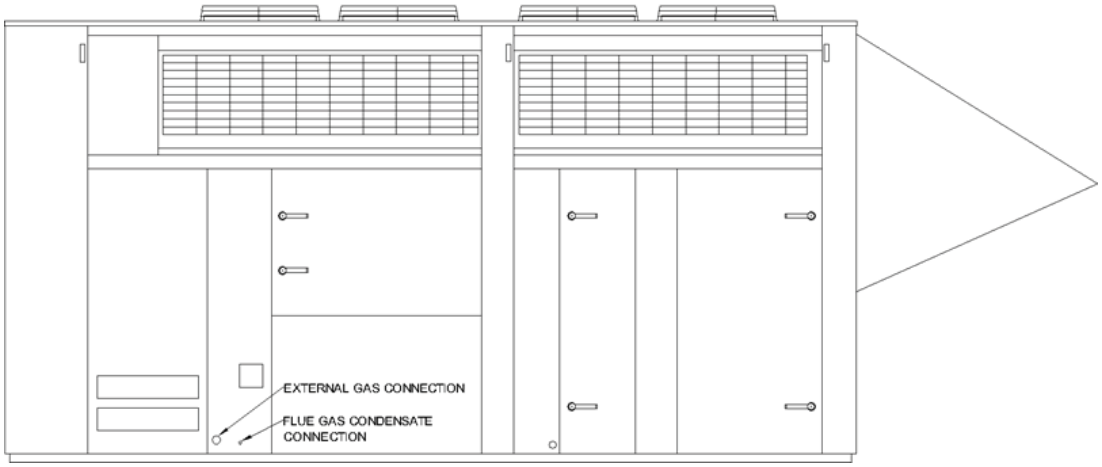


Figure 42: AR-DR / AR-DE 1 35-XX Chassis Exterior Gas Connections.



Pressure Testing the Gas System

- When test pressures exceed 14 in. w.c., the heater must be disconnected from the supply gas piping.
- When test pressures are 14 in. w.c. or less, the heater must be isolated from the supply gas piping by closing its individual manual shutoff valve.
- The gas pressure to the unit must be checked to make sure that the gas pressure does not fall out-side of the maximum and minimum allowable gas pressures listed on the unit nameplate.

⚠ DANGER

Carbon monoxide is a lethal, colorless, odorless gas.

Fuel gas poses a danger of explosion which can cause personal injury, product damage, or property damage. ⃠ Do not use matches, candles, flame, of other sources of ignition to check for leaks.

Gas-fired equipment is designed to provide safe, controlled combustion. The installer must ensure that the correct amount of supply combustion air and a properly operating vent system is provided. If the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur and carbon monoxide may be produced.

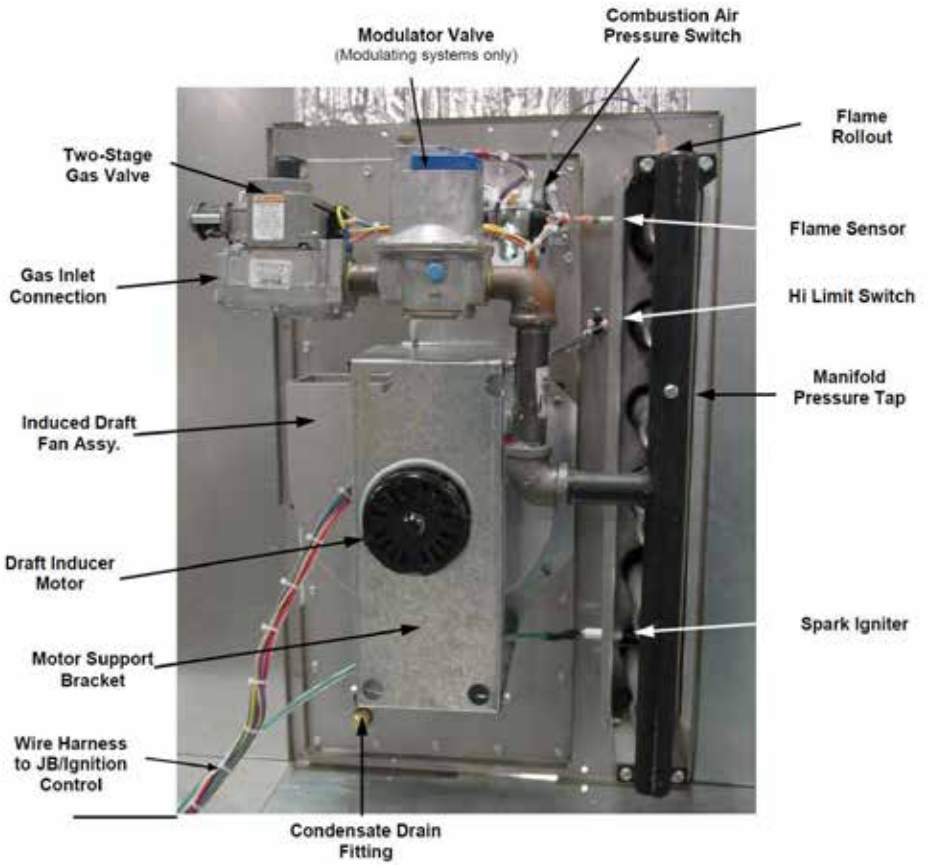
For your safety, if you smell gas:

- *Open windows.*
- ⃠ *Don't touch electrical switches.*
- *Extinguish any open flame.*
- *Vacate the area.*
- *Immediately call your gas supplier.*

Note:

Check both the supply lines and factory piping for leaks. Apply a soap and water solution to all piping and watch for bubbling. Some soap used for leak detection are corrosive to some metals. Carefully rinse to remove soap and clean the pipe after leak test is completed.

Figure 43: Furnace Module Component Description.



⚠ DANGER

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of the furnace is hazardous. There is a risk of fire, explosion, physical injury or death.

GAS HEATER CONNECTION AND STARTUP

Operating and Safety Instructions

Wiring diagram and sequence of operation are included in this manual for the specific control system provided on the heater. Refer to the documents before attempting to place heater in service.

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

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

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

⚠WARNING

Forcing or attempting to repair the gas valve may result in fire or explosion, which can lead to injury and / or death.

Start Up

1. Adjust the unit controller discharge air temperature set-point to lowest setting.

2. Turn OFF gas supply at the manual shut-off valve.

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

4. Remove access panel or open door to unit vestibule housing the gas heater.

5. Move gas control knob to “OFF” position.

6. Install a tapped fitting for attachment to a manometer, or other gauge suitable for 14.0 in. w.c., in the inlet pressure tap and for 10.0 in. w.c. in the manifold pressure tap.

7. Wait five (5) minutes for any gas to clear out. If you smell gas, see Step 2 above and correct the leak. If you don’t smell gas or have corrected any leaks, go to next step.

8. Turn gas control knob to “ON” position.

9. Open all manual gas valves.

10. Turn power ON at disconnect switch.

11. Adjust unit controller discharge air temperature set-point to the highest setting to initiate call for heat and maintain operation of unit.

12. Draft inducer will run for 15 to 30 second pre-purge period.

13. At the end of the pre-purge the direct spark will be energized and gas valve will open.

14. Burners will ignite.

Failure to Ignite

1. On the initial start-up, or after furnace has been off for a long period, the first ignition trial may be unsuccessful due to need to purge air from manifold at start-up.

2. If ignition does not occur on the first trial, the gas and spark are shut-off by the ignition control and the control enters an inter-purge period of 15 seconds, during which the draft inducer continues to run.

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

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

5. Furnace controller can be brought out of lockout by turning unit controller to its lowest discharge air set-point (no call for heat) and waiting five (5) seconds and then turning back up to call for heat. Furnace controller will automatically reset after one hour and initiate a call for heat.

Manifold Pressure Adjustment

A pressure tap is provided in each furnace module manifold for measuring the gas manifold pressure. Manifold pressure must be checked at start-up and during any service or maintenance. All systems require a manifold pressure of 3.40 to 3.50 in. w.c. at maximum input on natural gas, and 10.0 in. w.c. on propane gas at rated input. See figures below for gas valve adjustment locations.

Figure 44: VR8305Q Gas Valve.

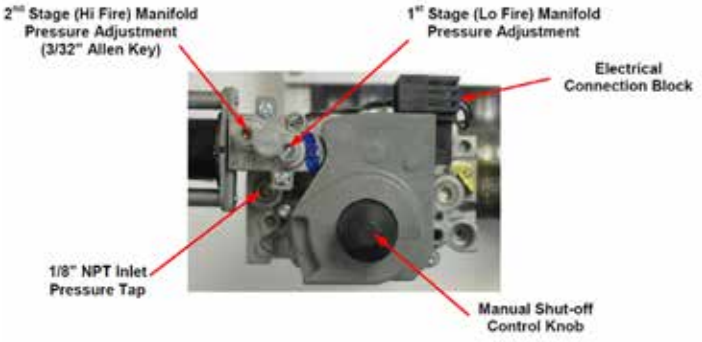
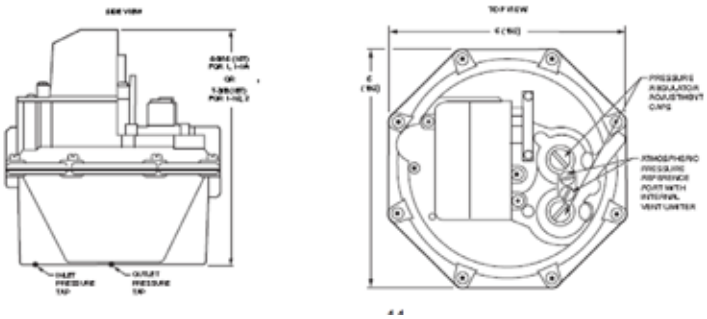


Figure 45: 36H Gas Valve.

Figure 46: V8944 Gas Valve.

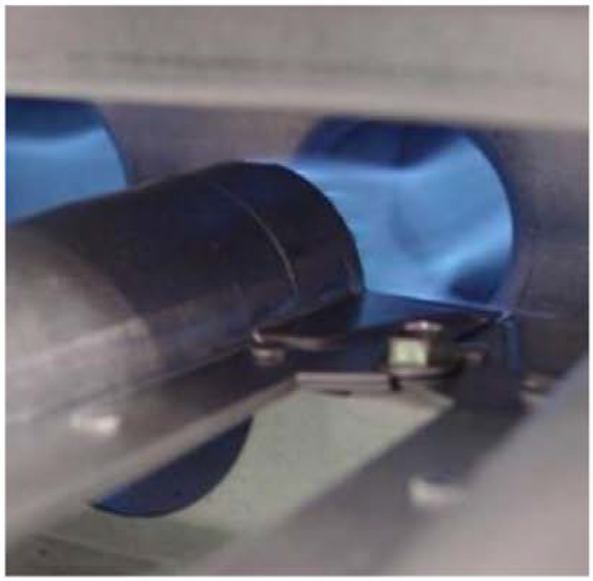


GAS HEATER CONNECTION AND STARTUP

Burner Flames

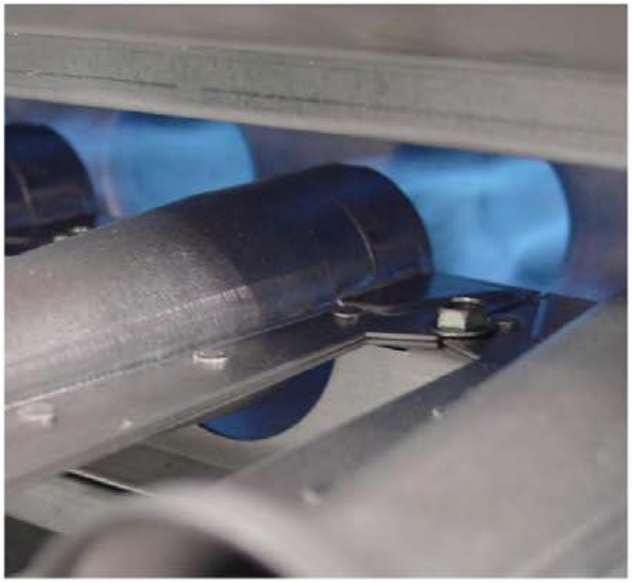
Before completing the startup, check the appearance of the main burner flame. See figures for flame characteristics of properly adjusted natural gas systems.

Figure 47: Burner Flame at Startup.



Burner Flame @ Start-up 1.2" w.c. Manifold
Pressure Draft Inducer – High Speed

Figure 48: Burner Flame at High Fire.



Burner Flame @ High Fire 3.5" w.c. Manifold
Pressure Draft Inducer – High Speed

1. The burner flame must be predominately blue in color and well defined and centered at the tube entry as shown in the figures above. Distorted flame or yellow tipping of natural gas flame, or a long yellow flame on propane, may be caused by lint and dirt accumulation inside burner or at burner ports, at air inlet between burner and manifold pipe, or debris in the main burner orifice. Soft brush or vacuum clean affected areas.

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

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

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

Shutdown

1. Set unit controller to lowest discharge air set-point (no call for heat).

2. Turn OFF electrical supply at unit disconnect.

3. Turn off gas supply valve.

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

5. Replace vestibule access panel and close door.

GAS HEATER CONNECTION AND STARTUP / REFRIGERATION SYSTEM STARTUP

Normal Operation

1. Turn ON electrical supply to unit at disconnect switch.
2. Turn ON gas supply valve.
3. Set unit controller to desired heating discharge air set-point temperature.

Operating and Safety Controls

Combustion Air Pressure Switch

An air pressure switch is provided as part of the control system to verify airflow through induced draft fan (ID fan) by monitoring the difference in pressure between the ID fan and the atmosphere. If sufficient negative pressure is not present, indicating lack of proper air movement through the heat exchangers, the switch opens shutting off gas supply through the ignition control module. On units with two (2) speed draft inducer operation, a dual air pressure switch is used, monitoring high and low speed pressures. The air pressure switches have fixed settings and are not adjustable.

Roll-out Switch (Manual Reset)

The furnace is equipped with manual reset roll-out switches in the event of burner flame roll-out. The switch will open on temperature rise and shut off gas supply through the ignition control module. Flame roll-out 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 must not be placed back in operation until the cause of roll-out condition is identified. The roll-out 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 heater through the ignition control module before the air temperature reaches 250°F. Reduced airflow may be caused by restriction 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 automatically reset when the temperature drops to 30°F below the setpoint, initiating a furnace ignition. The furnace will continue to cycle on limit until the cause of the reduced airflow is corrected.

Ignition Control Module

Ignition control modules are available having a number of different operating functions.

Refrigeration Charge

Upon startup, refrigeration charge must be verified on each circuit by checking superheat and subcooling. Superheat must be measured at the suction line port nearest the compressor. Subcooling must be measured at the liquid line port nearest the thermal expansion valves (TXV). All compressors on the circuit must be on at 100% when checking superheat and subcooling. Readings must fall within the ranges outlined in the table below.

Table 17: Subcooling and Superheat Reading Ranges.

Stage	Cooling Mode, 0% Reheat	Cooling Mode, 100% Reheat	Heating Mode (Heat Pumps Only)
Subcooling	10 to 15°F	2 to 10°F	10 to 20°F
Superheat	10 to 20°F	10 to 30°F	10 to 20°F

Record superheat and subcooling readings on the startup form. If readings do not fall within the desired ranges, refrigerant charge or thermal expansion valve adjustments may need to be made. Refer the “Troubleshooting Refrigeration Table” in the Troubleshooting Section on page 112.

Note:

When adding refrigerant charge, only use R410A, otherwise the product will be damaged and will malfunction.

REFRIGERATION SYSTEM STARTUP

Compressor Staging (For DOAS Units with Multiple Compressors)

Table 18: Compressor Staging for Units with Two (2) Compressors.

	Cooling Mode	Dehumidification Mode (For Units Equipped with a Hot Gas Reheat Coil)
Circuit	Circuit B; Circuit A If Needed	Circuit A; Circuit B If Needed
Physical Compressor Labels	Two (2); One (1) If Needed	One (1); Two (2) If Needed
Controls Compressor Labels	One (1); Two (2) If Needed	Two (2); One (1) If Needed

Table 19: Compressor Staging for Units with Four (4) Compressors.

	Cooling Mode	Dehumidification Mode (For Units Equipped with a Hot Gas Reheat Coil)
Circuit	Circuit B; Circuit A If Needed	Circuit A; Circuit B If Needed
Physical Compressor Labels	Three (3) and Four (4); One (1) and Two (2) If Needed	One (1) and Two (2); Three (3) and Four (4) If Needed
Controls Compressor Labels	One (1) and Two (2); Three (3) and Four (4) If Needed	Three (3) and Four (4); One (1) and Two (2) If Needed

Cooling Mode – The Digital Scroll compressor (Circuit B) will engage to maintain cooling demand. If more cooling is needed than the Digital Scroll compressor can provide, the Standard Scroll compressor (Circuit A) will engage and the Digital Scroll compressor (Circuit B) will modulate to maintain the desired supply air temperature.

Dehumidification Mode – For units equipped with a hot gas reheat coil, the Standard Scroll compressor (Circuit A) will run to lower the DX coil temperature to the direct expansion (DX) coil set-point and modulate the hot gas reheat (HGRH) valve to maintain the supply air temperature. If more capacity is needed to decrease the DX coil temperature to the set-point, the Digital Scroll compressor (Circuit B) will engage to meet the set-point. The hot gas reheat valve will continue to modulate as needed to maintain the supply air temperature.

Digital Scroll Compressor Controllers

Figure 49: Digital Scroll Controllers.

Digital Scroll Controller Error Codes

Flash Code 1 - Reserved for future use.

Flash Code 2 - High Discharge Temperature.

- The discharge temperature thermistor has measured a temperature above 268°F (130°C) or the thermistor is short circuited (jumpered out).
- The Digital Compressor Controller will de-energize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.
- The compressor will be allowed to restart after a thirty (30) minute delay and after the thermistor temperature is below 250°F (120°C). The flash code and alarm relay contacts will be reset after the compressor has run for sixty (60) uninterrupted minutes without any other ALERTs. If five (5) high discharge temperature ALERTs have occurred within four (4) hours, the Digital Compressor Controller will lock out the compressor. The lockout can only be reset by cycling the 24VAC power OFF and ON.

Flash Code 3 - Compressor Protector Trip.

- The demand signal from the system controller is greater than 1.44VDC and there is no compressor current detected. This could be due to the compressor's internal overload protector being open, fuse or breaker open, power disconnected to compressor contactor, compressor power wiring not run through Digital Compressor Controller current transformer port or a compressor contactor failure.
- The Digital Compressor Controller will de-energize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.
- The Digital Compressor Controller will wait for the two (2) minute anti-short cycle timer to time out, and if the system controller demand signal is still greater than 1.44VDC, it will energize the compressor contactor again. If compressor current is detected on the restart, the ALERT code and alarm relay output will reset. The Digital Compressor Controller will attempt to restart compressor as long as the system controller demand is above 1.44VDC. There is no lockout feature for this ALERT.

Flash Code 4 - Locked Rotor.

- A locked rotor condition in the compressor is sensed by the Digital Compressor Controller on four (4) consecutive start ups.
- The Digital Compressor Controller will de-energize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.
- This code results in a lockout and can only be reset by cycling the 24VAC power off and on.

Flash Code 5 - Demand Signal Loss.

- The demand signal input has dropped below 0.5VDC. The demand input signal wire may be disconnected or the system controller providing the signal may not be powered.
- The Digital Compressor Controller will de-energize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.
- Once the system controller demand signal input has risen above 0.5VDC, the ALERT code and alarm relay output will reset. If the demand signal is above 1.44VDC and the anti-short cycle timer has timed out, the compressor will restart.

Flash Code 6 - Discharge Thermistor Fault.

- The Digital Compressor Controller is not receiving a signal from the discharge temperature thermistor. The thermistor may be missing, disconnected or a wire is broken.
- The alarm relay contacts will close and the Digital Compressor Controller will not increase the capacity of the compressor beyond 50% loading.
- This ALERT code and alarm relay output are reset by reconnecting the thermistor.

Flash Code 7 - Reserved for future use.

REFRIGERATION SYSTEM STARTUP

Digital Scroll Controller Error Codes, continued.
Flash Code 8 - Compressor Contactor Fault.

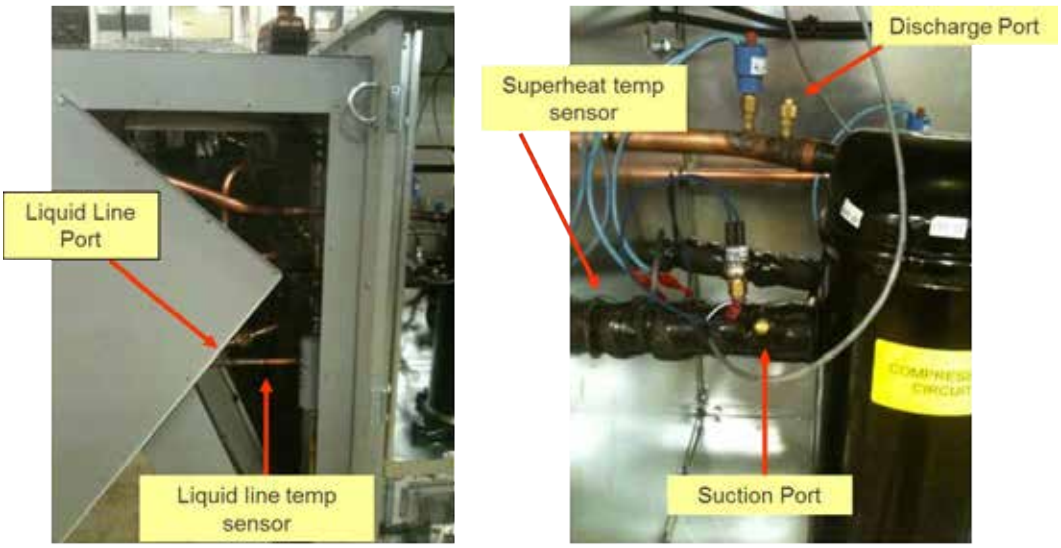
- Compressor current is detected when the system controller demand signal is below 1.44VDC. The compressor contactor may have welded contacts or the contacts may be mechanically jammed. The compressor will continue to run in this condition since the Digital Compressor Controller cannot open the compressor contactor.
- The Digital Compressor Controller will energize the compressor contactor and vapor injection solenoid. The alarm relay contacts will close. The unloader solenoid will remain energized causing the compressor to run unloaded as long as the system controller demand signal is less than 1.44VDC. If the system controller demand is greater than 1.44VDC, the unloader solenoid will de-energize causing the compressor to run loaded.
- The ALERT code and alarm relay output are reset when current is no longer detected while system controller demand signal is below 1.44VDC.

Flash Code 9 - Low 24VAC Supply.

- Supply voltage to the Digital Compressor Controller has dropped below 18.5VAC.
- The Digital Compressor Controller will de-energize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts may close if the voltage is high enough for the alarm relay to pull in.
- The ALERT code and alarm relay output are reset when the supply voltage to the Digital Compressor Controller rises above 19.5VAC.

Refrigeration Access Points

Figure 50: Refrigerant Circuit Component Locations in DOAS Chassis.



ENERGY RECOVERY WHEEL (AR-DE MODELS ONLY)

Energy Recovery Wheel (AR-DE Models Only)

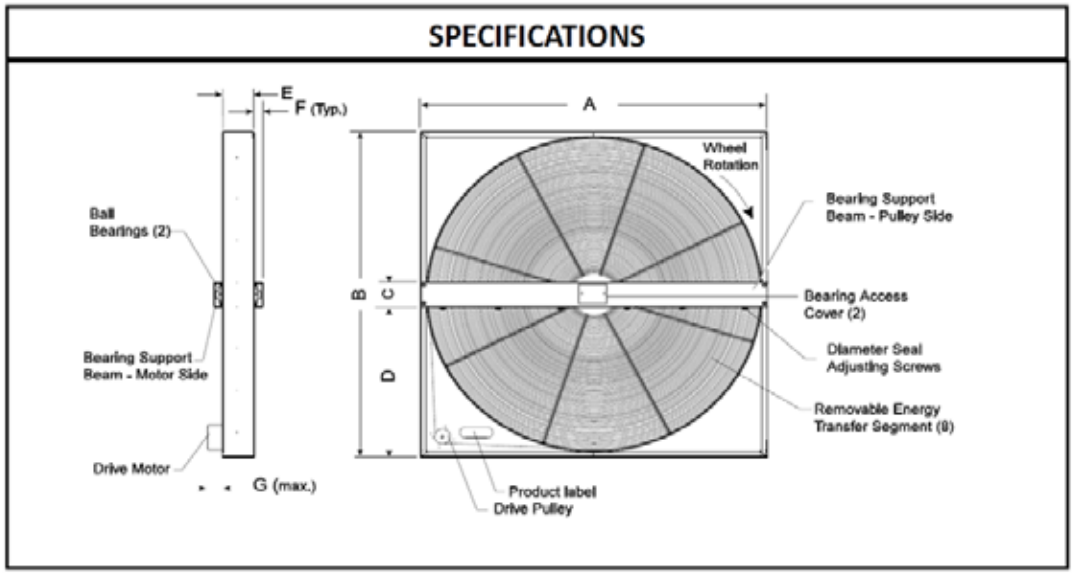
Each AR-DE series ventilator includes an integral total enthalpy wheel for energy recovery. The energy recovery media (wheel) is built into a cassette that can slide out of the ventilator without tools. The energy wheel is accessed through a hinged door with quarter-turn handles and latches.

The first two (2) digits of the model number indicate the wheel diameter in inches. The next two digits indicate the recommended airflow rating (in hundreds of cubic feet per minute). The wheel assemblies are stainless steel. With the exception of replaceable drive motors, belts, and energy transfer wheels, the cassette has a minimum design life of twenty (20) years. Wheel effectiveness and pressure drop are determined by the selection of airflow.

Table 20: Heat Wheel Models in AR-DE Chassis.

AR-DE Chassis	Heat Wheel Model
11-XX	ERC-3628C
21-XX	ERC-5262C
31-XX	ERC-5874C
35-XX	ERC-81146C

Figure 51: Heat Wheel Components.



Cleaning

Routine maintenance of the Energy Recovery cassettes includes periodic cleaning of the Energy Recovery Wheel, as well as inspection of the Air Seals and Wheel Drive Components. The need for periodic cleaning of the energy recovery wheel will be a function of operating schedule, climate, and contaminants in the indoor air being exhausted and the outdoor air being supplied to the building.

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

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

To clean, gain access to the energy recovery wheel and remove the wheel. Brush foreign material from the face of the wheel. Wash the wheel in a 5% solution of non-acid based coil cleaner or alkaline detergent and warm water. Soak in the solution until grease and tar deposits are loosened. Some desiccant staining may remain and is not harmful to performance. Before removing, rapidly run finger across surface of wheel to separate polymer strips for better cleaning action. Rinse the dirty solution from the wheel, and remove excess water before reinstalling.

ENERGY RECOVERY WHEEL (AR-DE MODELS ONLY)

Note:

- ⃠ *DO NOT use acid based cleaners, aromatic solvents, steam or temperatures in excess of 170°F; damage to the wheel may occur.*
- *Use of pressure washer to clean segments is not recommended; it could damage the wheel.*

Removing the Energy Recovery Wheel Segments for Cleaning

⚠DANGER

Before performing service or maintenance operation on the wheel, turn off main power at the unit disconnect. Electric shock can cause physical injury or death.

⚠WARNING

The weight of the installed segment will cause the wheel to accelerate in rotation. Failure to maintain control of the wheel rotation while installing all segments could cause severe injury to fingers or hand caught between revolving spokes and the bearing support beam. Handle of hammer, or other stop should be inserted through spokes and above or below bearing support beams to limit rotation of unbalanced wheel.

Note:

Both installation and removal procedures must be performed from the pulley side of the cassette.

1. Open the energy recovery wheel access door and slide out the wheel cassette. Unlock and open the segment retaining brackets on both sides of the selected segment opening.

2. Gently lift segment (pie section) outward.

3. Close segment retaining latches, and rotate wheel 180° to remove next segment. Follow this pattern to remove all segments. This pattern will help keep wheel balanced.

Figure 52: Location of Retainer Clips.

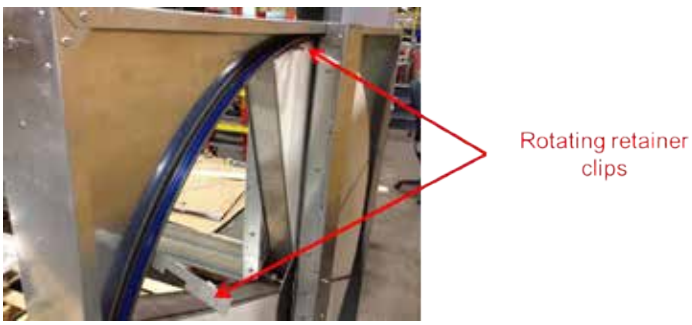


Figure 53: Unlocking and Opening the Segment Retaining Bracket (Step 1).

ENERGY RECOVERY WHEEL (AR-DE MODELS ONLY)

Reinstalling the Energy Recovery Wheel Segments

1. Position one (1) segment opening at the top of the cassette. Unlock and open the segment retaining brackets on both sides of the selected segment. Use a hammer as a “stop”.

2. Holding the segment as vertically as possible and centered between spokes, insert nose of segment downward between the hub plates.

3. Ease the segment downward until its outer rim clears the inside of the wheel rim, then press the segment inward against the spoke flanges.

4. Close and latch segment retaining brackets to the correct position. Verify the retaining bracket is fully engaged under the catch.

5. Slowly rotate, by hand, the first installed segment to the bottom of the cassette. Install the second segment opposite the first. Repeat this sequence with the two (2) installed segments rotated to the horizontal position to balance the weight of installed segments. Continue this sequence with the remaining segments.

Figure 54: Unlocking and Opening the Segment Retaining Brackets Using a Hammer as a “Stop (Step 1).

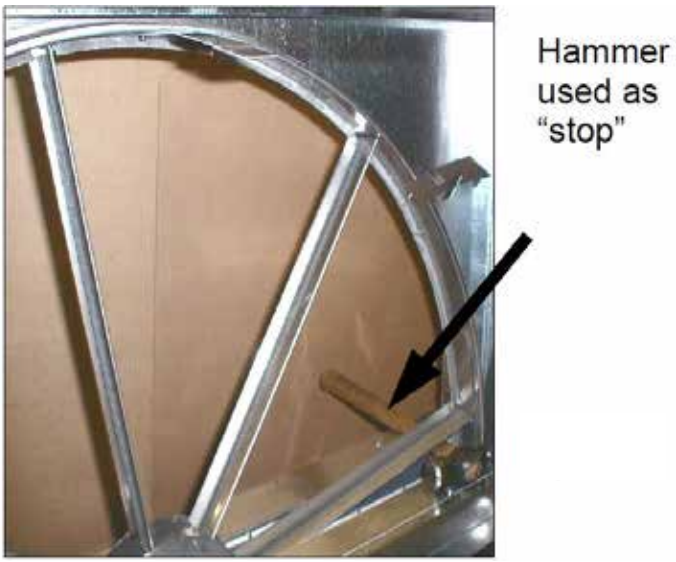
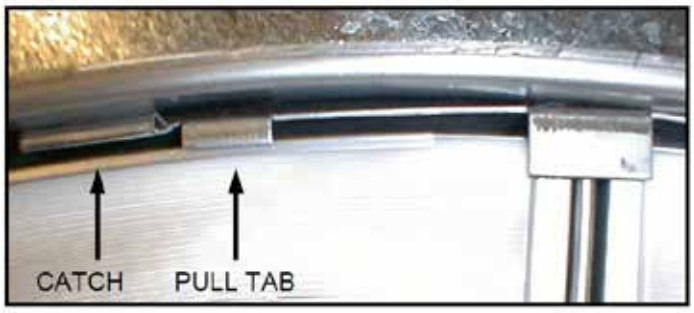


Figure 55: Positioning the Wheel Segment (Step 2).

Figure 56: Close and Latch Segment Retaining Brackets (Step 4).



ENERGY RECOVERY WHEEL (AR-DE MODELS ONLY)

Wheel Belt Replacement

1. Confirm that the model number on the belt replacement kit matches the model number on the energy recovery wheel cassette label. Remove the old belt from cassette.

2. Uncoil new belt as appropriate to minimize twisting when feeding the belt around wheel rim.

3. At a location near the pulley, tape the hook end of the link to the wheel rim with the narrow face of the V-belt positioned against rim.

4. Rotate the wheel clockwise while feeding the belt onto the wheel rim. ⃠ Do not twist the belt until the taped end returns to the location of the pulley.

5. Remove the tape, and join the links with the belt positioned around the wheel rim.

6. Rotate the wheel clockwise to position the linked ends approximately 180° from the location of the pulley.

Note:

To avoid releasing of the segment latch, ⃠ do not insert retainer on the other side of spoke.

7. At the location of the pulley, insert the right angle red belt retainer between the rotatable segment retainer latch and the wheel rim at the left side of a spoke.

8. Rotate the wheel counterclockwise to position the red belt retainer close to the wheel bearing beam.

9. Create slack in the belt by removing it from the rim between the location of the pulley and the red belt retainer, and then place the belt over pulley.

10. Rotate the wheel clockwise until the belt is fully stretched around the wheel rim and the pulley.

11. Remove the red belt retainer and rotate the wheel clockwise a minimum of two (2) full rotations (sixteen [16] spokes) while verifying by observation and touch that the belt is not twisted on wheel rim or where it enters the pulley. If a metallic “click” is heard when link rotates past the wheel bearing beam, see note below.

Note:

Pile seal brackets are fixed with a single screw to the cassette frame near the ends of the wheel bearing beam. Because the height of the belt link is slightly higher than that of the urethane belt, a metal click (a rare interference) may occur when it passes the seal bracket. If this occurs, remove the interfering bracket(s). No measurable change of performance will occur.

Figure 57: Taping the Hook End of the Link to the Wheel Rim (Step 3).

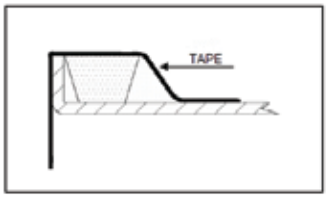


Figure 58: Tape Covering the Hook and Belt (Step 3).

Figure 59: Joining the Links (Step 5).

Figure 60: Inserting the Red Belt Retainer (Step 7).

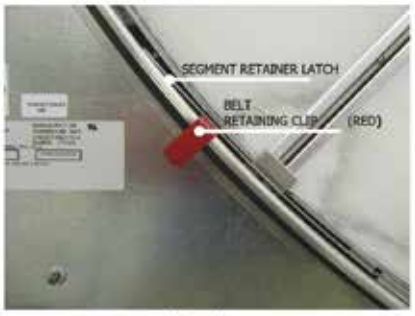


Figure 61: Positioning the Red Belt Retainer and Placing the Belt Over the Pulley (Steps 8 and 9).

ENERGY RECOVERY WHEEL (AR-DE MODELS ONLY)

Wheel Drive Components

Wheel Drive Motor Bearings

The wheel drive motor bearings are pre-lubricated, so no further lubrication is necessary. Make certain air cooling ports are not blocked. The wheel drive pulley is secured to the drive motor shaft by a set screw. The set screw is secured with a removable adhesive to prevent loosening. Confirm annually that the set screw is secure.

Wheel Drive Belt

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

Diameter Seals

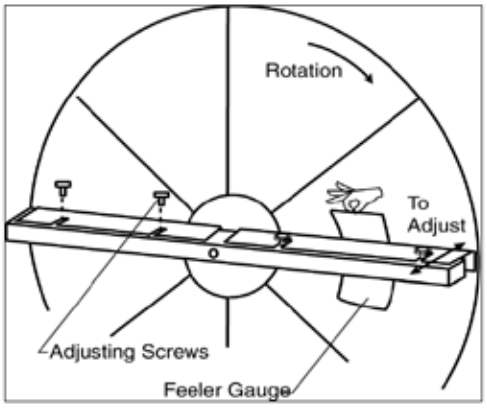
Diameter seals are provided on each cassette to minimize transfer of air between counter-flowing air streams. To adjust the diameter seals:

1. Loosen the diameter seal adjusting screws and back seals away from wheel surface. Larger wheels may have a center seal.

2. Rotate wheel clockwise until the two (2) opposite spokes are hidden behind the bearing support beam. Using a folder piece of paper as a feeler gauge, position paper between the wheel surface and diameter seals.

3. Adjust the seal towards the wheel surface until a slight friction on the feeler gauge (paper) is detected when the gauge is moved along the length of the spoke.

Figure 62: Adjusting the Diameter Seals (Step 1).



Wheel Drive Motor and Pulley Replacement

1. Disconnect power to the wheel drive motor.

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

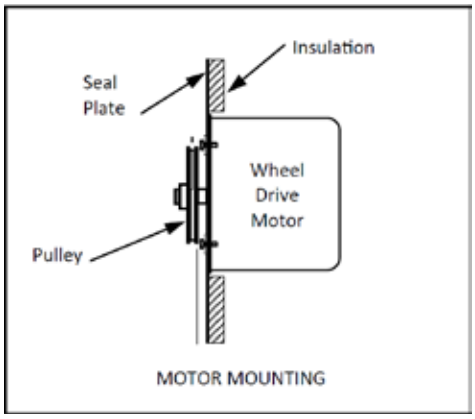
3. Loosen the set screw in the wheel drive pulley using an Allen wrench, and then remove the pulley from the motor drive shaft.

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

5. Install the replacement motor.

6. Install the pulley and secure the set screw to the flat surface of the drive shaft.

Figure 63: Wheel Drive Motor Mounting.



CONTROLLER

Overview

CAREL® Controller Overview

All units are equipped with a fully programmed, microprocessor-based controller that is responsible for unit operation; monitoring inputs and regulating outputs to maintain unit operation. The controller includes:

- Internal schedule (may be disabled).
- Unit-specific controls sequence.
- Component safeties and alarms.
- Ethernet RJ-45 network port.
- MODBUS® protocol to connect to AC Smart and ACP (Modbus is a registered trademark of Schneider Electric, licensed to the Modbus Organization, Inc.).
- Points, scheduling, and system settings can be manipulated through a computer running Web UI software.

The controller also provides user feedback through an optional handheld keypad/display (hardwired), or can be connected to a building management system interface.

Expansion Boards

Some unit configurations require control expansion boards CAREL c.pCO2 or CAREL EVD evolution. Expansion boards communicate with the controller through MODBUS® protocol.

Electrical Specifications

The DOAS controller receives 24 VAC power from a transformer on the main control panel, and is energized when the main disconnect is on. The size of the CAREL cpCO board varies with unit configuration.

Figure 64: CAREL® Controller.

CAREL is a registered trademark of CAREL INDUSTRIES in Italy and/or other countries.

Figure 65: Web User Interface.

Figure 66: Optional Handheld Keypad / Display.

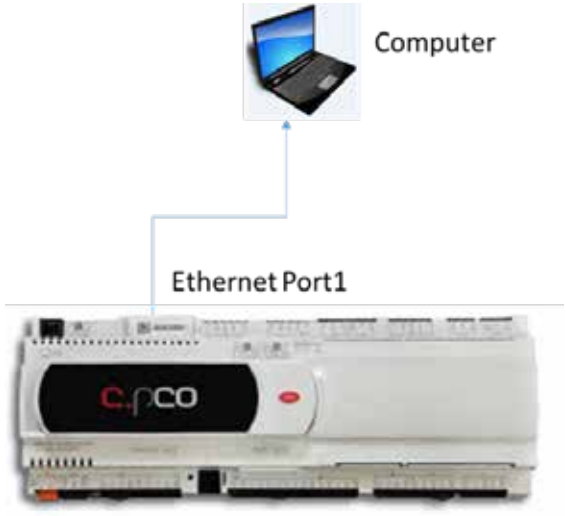
Connecting to the Web UI

To use the Web UI and to access the controller from a computer, tablet, or smart phone connected to the local area network resides, enter the controller's IP address into the device's web browser.

1. Using a standard CAT5 Ethernet cable, connect the computer to the controller at the Ethernet Port 1 connection as shown in the figure.
2. Open a web browser (Internet Explorer® or Chrome® browsers are supported). (Internet Explorer is a registered trademark of Microsoft Corporation. Chrome is a registered trademark of Google LLC.)
3. Type in IP address 192.168.1.101 (factory-configured).

Figure 67: Expansion Board Example.

Figure 68: Connecting to the Web UI.



Service Password

A service password is required to change or enter some settings. To obtain service-level access:

1. Go to Main > Ctrl Variables > Advanced > Login > Password.
2. Change password “0000” to “4800”.
3. The Advanced Menu should display “F” in the upper right hand corner.

Startup Settings

Most controller settings are configured at the factory, however, the settings described below must be defined before unit startup. Service-level access is required to enter or change these settings. See the “Service Password” section above.

- Time and Date: Go to the Main > Ctrl Variables > Advanced > Unit Settings screen.
- Altitude: Go to the Main > Ctrl Variables > Advanced > Unit Settings screen
- IP Address: Go to the Main > Ctrl Variables> Advanced > Network Settings screen
- BMS / AC Smart Communication: Go to the Main > Ctrl Variables > Advanced > Network Settings screen to set up network communication. AC Smart should be set to “MODBUS” protocol.

pLAN Addresses

Control components are assigned the following pLAN addresses at the factory:

- CAREL c.pCO Main Controller: 01
- CAREL c.pCOe Expansion Boards: 02, 03, 04, 05, 06, 07
- Optional Handheld Keypad / Display: 32

pLAN addresses are visible on the main controller and on c.pCOe expansion boards as shown.

Figure 69: pLAN Address Windows.

pLAN address windows
The main controller's pLAN address is 01.
c.pCO expansion board pLAN addresses are:
02, 03, 04, 05, 06, or 07.

Expansion Board Addresses and DIP Switch Settings

Rooftop DOAS units use CAREL c.pCO and c.pCOe expansion boards when additional inputs or outputs are required.

- See the following pages for standard terminal connection points and other information for c.pCOe expansion boards.
- See wiring schematics shipped with the unit for factory-configured expansion board connection points.

Figure 70: CAREL c.pCOe Expansion Board with DIP Switch Locations.

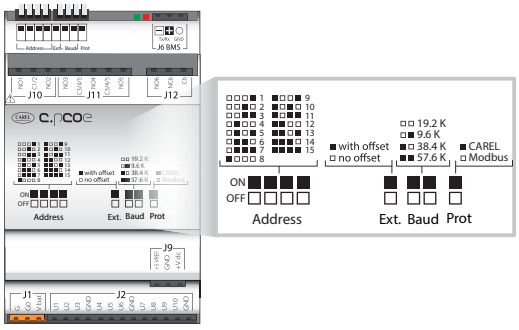


Table 21: DIP Switch Settings for CAREL c.pCOe Expansion Board.

Expansion Board	Address	Offset	Baud Rate	Protocol				Ext	Baud		Prot
Exp 1	2	No	19.2 K	MODBUS	Off	On	Off	Off	Off	Off	Off
Exp 2	3	No	19.2 K	MODBUS	Off	On	On	Off	Off	Off	Off
Exp 3	4	No	19.2 K	MODBUS	On	Off	Off	Off	Off	Off	Off
Exp 4	5	No	19.2 K	MODBUS	On	Off	On	Off	Off	Off	Off
Exp 5	6	No	19.2 K	MODBUS	On	On	Off	Off	Off	Off	Off
Exp 6	7	No	19.2 K	MODBUS	On	On	On	Off	Off	Off	Off

CONTROLLER

Overview

IP Address

The controller's IP address must be unique within it TCP / IP network. The controller may have a DHCP server-assigned address or a manually assigned static IP address. IP addresses are configured at the factory as follows:

- DHCP: off
- IP address: 192.168.1.101
- Subnet mask: 255.255.255.0
- Gateway: 192.168.1.1
- DNS: 0.0.0.0

The controller's default address may need to be changed. This address can be set manually at the Main > Ctrl Variables > Advanced > Network Settings screen. A service password is required to change this setting.

Main Control Board Terminal Connections

Identifying Input and Output Terminals

The following terminal markings are on the control boards and indicate:

- ID: Digital Inputs
- NO: Normally Open Digital Outputs
- NC: Normally Closed Digital Outputs
- Y: Analog Outputs
- U: Universal (for analog inputs or outputs, or digital inputs)

Control Board Terminal Connections

- See image below for general board layout.
- See the tables on the following pages for standard terminal connection points.
- See the wiring schematics shipped with the unit for factory-configured terminal connection points for all units.

Figure 71: Main Control Board Layout.

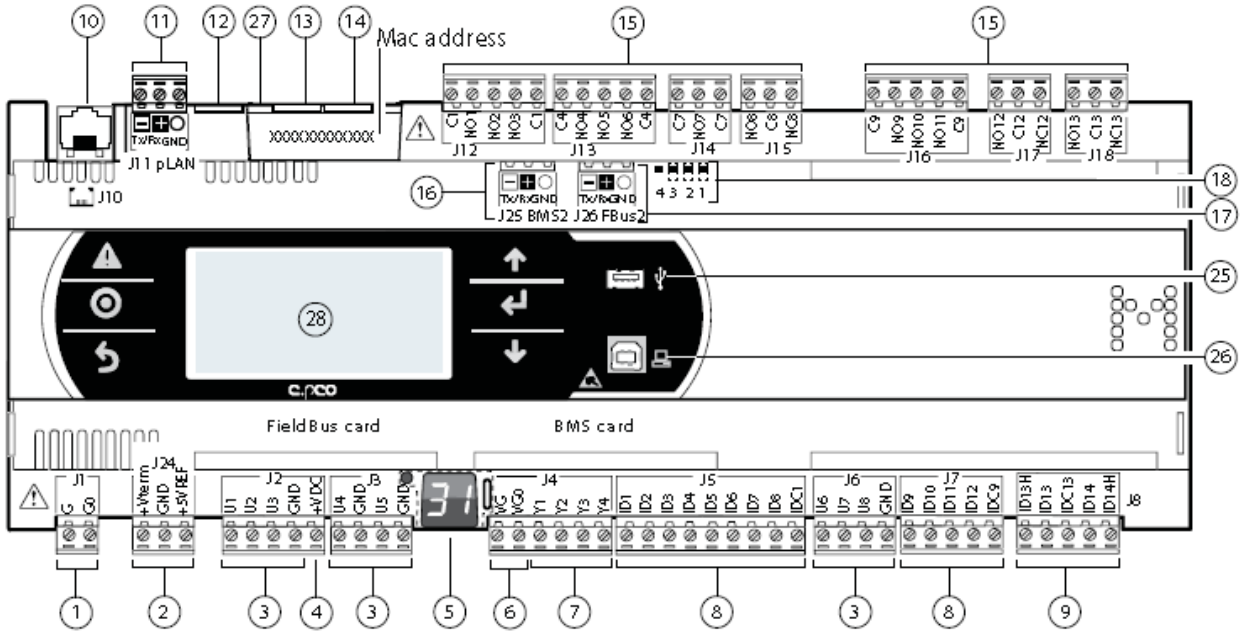


Table 22: CAREL c.cPO Control Board Terminal Connections.

Drawing Reference	Description	Drawing Reference	Description
1	Power connection [G(+), G0(-)]	12	Reserved
2	+Vterm: power supply for additional terminal +5 VREF: power supply for ratiometric probes	13	Ethernet port 1
3	Universal inputs/outputs	14	Ethernet port 2
4	+Vdc: power supply for active probes	15	Relay digital outputs
5	Button for setting pLAN address, second display, LED	16	BMS2 port
6	VG: power supply at voltage A a for opto-isolated analog output VG0: power to optically-isolated analog output, 0 Vac/Vdc	17	Fieldbus2 port
7	Analog outputs	18	Jumpers for selecting fieldbus/BMS
8	ID: digital inputs for voltage A (24 VAC or 28-36 VDC)	25	USB Host Port (Master)
9	ID: digital inputs for voltage A (24 VAC or 28-36 VDC) IDH: digital inputs for voltage B (230V 50/60Hz)	26	USB Host Port (Slave)
10	pLAN telephone connector for handheld display	27	Faston (blade) for ground to Ethernet port
11	pLAN connection. Do not use.	28	Built-in and Keypad

Table 23: Main Board Analog and Digital Inputs.

Analog Inputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Sensor Type**	**Range**
3	J2	U1	Refrigerant pressure transducer, Circuit A	0.5–4.5 V[a]	0–650 psig
3	J2	U2	Refrigerant pressure transducer, Circuit B	0.5–4.5 V[a]	0–650 psig
3	J2	U3	Supply air temperature	CAREL NTC 10K Type 4	
3	J3	U4	Cooling coil leaving air temperature	CAREL NTC 10K Type 4	
3	J3	U5	Outside air temperature	CAREL NTC 10K Type 4	
3	J6	U6	Outside air humidity	0–10 Vdc	0–100%
3	J6	U7	Used as analog output.		
3	J6	U8	Used as analog output.		
Digital Inputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Position Indicates**	
8	J5	ID1	Supply air temperature	Closed = fan on	
8	J5	ID2	High pressure switch, Circuit A	Closed = normal	
8	J5	ID3	Low pressure switch, Circuit A	Closed = normal	
8	J5	ID4	Occupancy input, BMS input	Closed = occupied	
8	J5	ID5	OA/RA damper end switch	Closed = end switch made and damper(s) open	
8	J5	ID6	Shutdown input, BMS input	Closed = run	
8	J5	ID7	High pressure switch, Circuit B	Closed = normal	
8	J5	ID8	Low pressure switch, Circuit B	Closed = normal	
8	J7	ID9	Exhaust fan status	Closed = fan on	
8	J7	ID10	Filter pressure switch	Closed = dirty filter alarm	
8	J7	ID11	Energy recovery wheel status	Closed = stopped alarm	
8	J7	ID12	Low temp protection input, freeze stat[b]	Closed = normal	
9	J8	ID13H	Unassigned		
9	J8	ID13	Condensate drain pan switch	Closed = alarm	
9	J8	ID14	Remote start input, BMS input	Closed = run	
9	J8	ID14H	Unassigned		

[a]Radiometric transducers.

[b]Chilled water or hot water units only.

CONTROLLER

Overview

Table 24: Main Board Analog and Digital Outputs.

Analog Outputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Sensor Type**	**Range**
7	J4	Y1	Modulating compressor output or cooling capacity output[a]	Use-dependent	0–100%
7	J4	Y2	Condenser fan VFD output Circ. A; or water valve output Circ. A[b]	0–10 Vdc	0–100%
7	J4	Y3	Hot gas reheat valve output	0–10 Vdc	0–100%
7	J4	Y4	Condenser fan VFD output Circ. B[c] or water valve output Circ. B[d]	0–10 Vdc	0–100%
3	J6	U7	OA/RA damper output	0–10 Vdc	0–100%
3	J6	U8	Supply fan speed output	0–10 Vdc	0–100%
Digital Outputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Position Indicates**	
15	J12	NO1	Compressor 1 start	Closed = start compressor	
15	J12	NO2	Compressor 2 start	Closed = start compressor	
15	J12	NO3	Compressor 3 start	Closed = start compressor	
15	J13	NO4	Compressor 4 start	Closed = start compressor	
15	J13	NO5	Supply fan start	Closed = start fan	
15	J13	NO6	Exhaust fan start	Closed = start fan	
15	J14	NO7	Actuator power	Closed = enabled	
15	J15	NO8	Global alarm output, BMS output	Closed = enabled	
15	J15	NO8	Unassigned		
15	J16	NO9	Condenser fan VFD start	Closed = start condenser fan	
15	J16	NO10	Condenser fan stage 2 start	Closed = start condenser fan	
15	J16	NO11	Condenser fan stage 3 start	Closed = start condenser fan	
15	J17	NO12	Unassigned		
15	J17	NC12	Inverter scroll compressor E-stop[e]	Open = stop compressor	
15	J18	NO13	Reversing valve output[f]	Closed = heating	
15	J18	NC13	Unassigned		

[a]Chilled water option, no compressors (0 to 10 VDC, direct or reverse).

[b]Water source heat pump units only.

[c]352 Casing with Active Head Pressure control 2.0.

[d]Water source heat pump units with more than one compressor.

[d]Units with inverter scroll compressor.

[f]Heat pump units.

Expansion Board (c.pCOe) Terminal Connections

Table 25: c.pCOe Expansion Board 1 Analog Inputs / Outputs and Digital Outputs.

Analog Inputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Sensor Type**	**Range**
1	J2	U1	Used as analog output		
1	J2	U2	Used as analog output		
1	J2	U3	Used as analog output		
1	J2	U4	Space temperature	CAREL NTC 10K Type 4	
1	J2	U5	Mixed air temperature	CAREL NTC 10K Type 4	
1	J2	U6	Exhaust air temperature	CAREL NTC 10K Type 4	
1	J2	U7	Space humidity	0–10 Vdc	0–100%
1	J2	U8	Space static pressure	0–10 Vdc	-0.5–0.5"wc
1	J2	U9	Supply air duct static pressure	0–10 Vdc	0 to 5.0"wc
1	J2	U10	Space set-point adjustment	Resistance 0 to 10 kΩ	-3.0–3.0 Δ °F
Analog Outputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Sensor Type**	**Range**
1	J2	U1	Heating capacity output	0–10 Vdc	0–100%
1	J2	U2	Exhaust fan speed output	0–10 Vdc	0–100%
1	J2	U3	Energy recovery capacity output – damper or wheel	0–10 Vdc	0–100%
Digital Outputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Position Indicates**	
2	J10	NO1	Energy recovery wheel start	Closed = rotating	
2	J10	NO2	Unassigned		
2	J11	NO3	Gas furnace heating stage 1 enable	Closed = stage enabled	
2	J11	NO4	Gas furnace heating stage 2 enable	Closed = stage enabled	
2	J11	NO5	Gas furnace heating stage 3 enable	Closed = stage enabled	
2	J12	NO6	Preheat enable	Closed = start heater	
2	J12	NC6	Unassigned		

Figure 72: Expansion Board c.PCOe Terminal Connections.

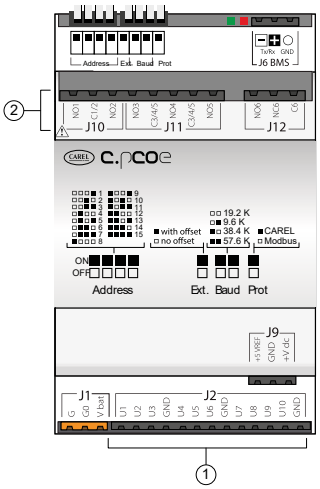


Table 26: c.pCOe Expansion Board 2 Analog Inputs / Outputs and Digital Outputs.

Analog Inputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Sensor Type**	**Range**
1	J2	U1	Analog output		
1	J2	U2	Space CO2 level	0–10 Vdc	0–2000 ppm
1	J2	U3	Outside air flow measuring station	0–10 Vdc	0–1"wc or 0–0.5"wc
1	J2	U4	Supply fan air flow measuring station	0–10 Vdc	0–30" wc
1	J2	U5	Exhaust fan air flow measuring station	0–10 Vdc	0–30" wc
1	J2	U6	OA/RA damper control, BMS input b	0–10 Vdc	0–100%
1	J2	U7	Supply fan control, BMS input c	0–10 Vdc	0–100%
1	J2	U8	Exhaust fan control, BMS input c	0–10 Vdc	0–100%
1	J2	U9	Unassigned		
1	J2	U10	Used as digital input.		
Analog Outputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Sensor Type**	**Range**
1	J2	U1	Electric heat capacity output d	0–10 Vdc	0–100%
Digital Outputs					
Drawing Reference	**Terminal**	**Label**	**Unit Connection**	**Position Indicates**	
2	J10	NO1	Unassigned		
2	J10	NO2	Unassigned		
2	J11	NO3	Unassigned		
2	J11	NO4	Unassigned		
2	J11	NO5	Unassigned		
2	J12	NO6	Unassigned		
2	J12	NC6	Unassigned		

Expansion Valve Driver (EVD) Terminal Connections

Systems use CAREL EVD evolution expansion valve drivers to control electronic expansion valves, if equipped.

- See the figure and table for terminal connection points.
- See the wiring schematics shipped with the unit for the factory-configured connection points.

Figure 73: Expansion Valve Driver Terminal Connections.

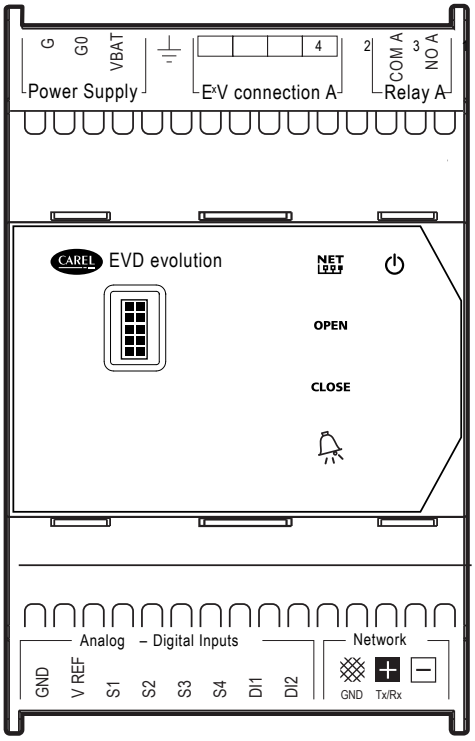


Table 27: Expansion Valve Driver Terminal Connections.

Analog Inputs			
Label	**Unit Connection**	**Sensor Type**	**Range**
S1	Suction refrigerant pressure transducer	0.5–4.5 V c	0–250.0 psig
S2	Suction refrigerant temperature	CAREL NTC 10K Type 4	
S3	Unassigned		
S4	Discharge refrigerant temperature	CAREL NTC 10K Type 4 HT	
Digital Inputs			
DI-1	Unassigned		
DI-2	Unassigned		
Electronic Expansion Valve			
1	CAREL ExV (green)		
3	CAREL ExV (brown)		
2	CAREL ExV (yellow)		
4	CAREL ExV (white)		

CONTROLLER

Overview

Navigation

The function buttons for the handheld keypad / display and the virtual keypad / display are described in table below.

Figure 74: Handheld Keypad / Display.

Figure 75: Virtual Keypad / Display.

Table 28: Function Buttons for the Handheld Keypad / Display and the Virtual Keypad / Display.

Button	Description	Functions
	Main Menu (target button)	Navigates directly to the Main Menu from any screen. Backlight indicates that the unit is enabled. From the Main Menu, navigate to the following screens (see also the Menu map section): • Unit Enable • Unit Status • Control Variables • Alarm Menu
	Alarm	The Alarm button flashes when there is an active alarm. Press to view active alarms. Press twice to go to the alarms reset screen.
	Escape	Access from the Main Menu to view the Unit Status screen. Press to navigate one menu level back. Press when editing a variable to cancel editing.
	Up	Navigates through the menus/screens. Press after entering a variable to increase a current value.
	Enter	Press to enter a highlighted menu or screen item. Press to enter a writable variable and press again to confirm the new variable value.
	Down	Press to navigate menus/screens. Press after entering a variable to decrease the current value.
		Virtual keypad/display on web interface only. These two buttons on the virtual keypad/display simulates two-button actions on the handheld keypad/display. To simulate pressing two buttons simultaneously: 1. Click on 2-Button Click. 2. Sequentially click two keypad buttons (Main, Alarm, Escape, Up, Enter, Down). To simulate pressing and holding two buttons simultaneously: 1. Click on 2-Button Hold. 2. Sequentially click two keypad buttons (Main, Alarm, Escape, Up, Enter, Down).

Main Status Screen

The Main Status screen displays current operating information. This screen includes:

- Header Line: The header line alternates between the job name and unit tag. If there are active alarms, the number of active alarms is displayed instead of the job information.
- Unit Status Line: System startup information and unit operation status appears here.
- Four Quadrants: These quadrants have information that may change every three (3) seconds, depending on options and sensors installed:
  - Upper Left Quadrant: Displays the current value of the primary control variable. For example, this could be supply air temperature, room air temperature, return air temperature, or coil leaving temperature
  - Upper Right Quadrant: Displays all temperature and humidity values that pertain to the air handler
  - Lower Left Quadrant: Displays the set-point that corresponds to the primary control variable in the upper left quadrant and may rotate through other set-points
  - Lower Right Quadrant: Displays animated symbols that represent current unit operation (symbols described in the table below).

Figure 76: Main Status Screen.

Table 29: Main Status Screen Lower Right Quadrant Symbols.

Symbol	Name	Description
	Fan Blades	Supply air fan status. Rotation indicates airflow; static blades indicate no airflow.
	Snowflake	Cooling
	Flame	Heating
	Air Currents	Economizing
	Rain	Dehumidifying
	Vapor Spray	Humidifying

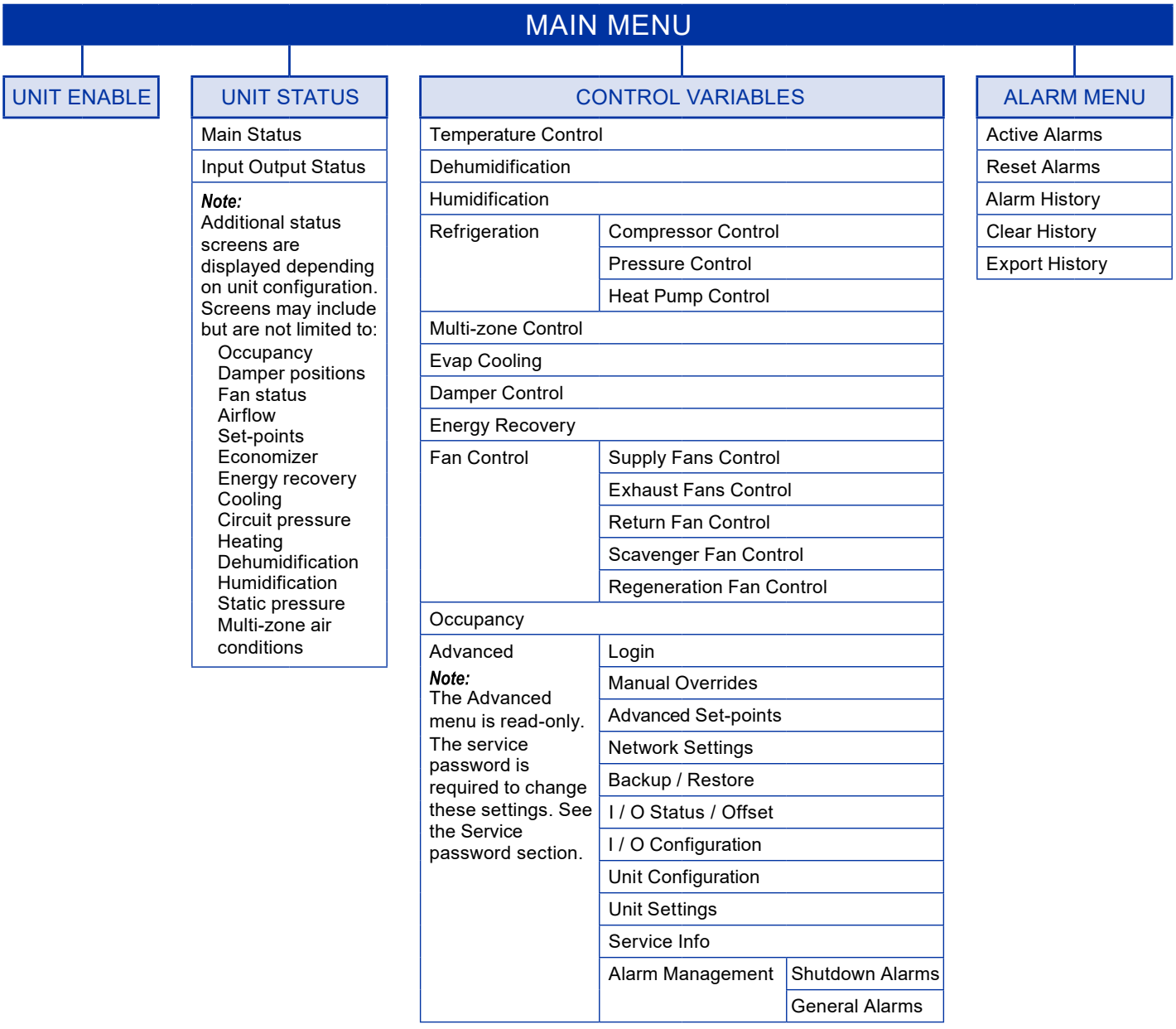
CONTROLLER

Overview

Menu Map

The Menu Map shows screen order when using either the Handheld Keypad / Display or the Virtual Keypad / Display on the web interface. See the Navigation section for instructions about moving through menu screens.

Figure 77: Menu Map.

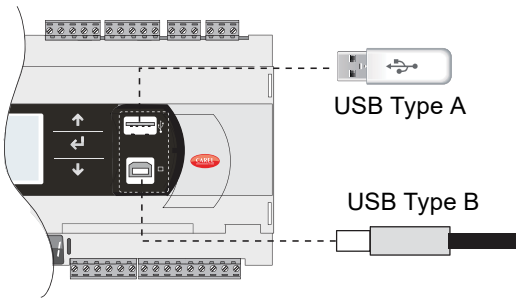


Software Backup and Restore

Connecting to USB Drives

The controller has built-in USB ports for connecting to USB drives. The USB drives can be used for backing up all settings and reported conditions such as alarm history and current values.

Figure 78: USB Port Locations.



Creating a Backup File

The controller can create a backup file of set-points and configuration variables on a USB drive or in the controller's internal memory. File is automatically named "User_Backup.txt".

Note:

- *During first startup or commissioning, or prior to communicating with Technical Support about performance issues, it is recommended that a backup file is created for each controller.*
- *Name each file with the unit sales order-line number found on the silver nameplate attached to the electrical access door.*
- *It is recommended that the backup files are emailed to Technical Support.*
- *Also, consider creating a backup file whenever significant program changes are made.*

To create a system backup file using the Handheld or Virtual Keypad / Display Buttons:

1. Go to Main Menu > Ctrl Variables > Advanced > Login screen. Press the Enter and Up or Down Arrow buttons to enter the service password "4800".
2. Go to Main Menu > Ctrl Variables > Advanced > Backup > Restore screen.
3. Press the Up or Down Arrow buttons to navigate to the Backup Settings screen.
4. Press the Enter and Up or Down Arrow buttons to select the backup location (internal memory or USB). If creating a backup to the USB drive, insert the USB drive into the main controller
5. Press Enter to highlight and then the Up or Down Arrow buttons to fill the "Save Checkbox" and create the backup file.

Restoring from a Backup File from the USB

1. Place the restore file in the root directory of a USB drive. ⃠ Do not place the file within a folder on the USB drive. Name the file "User_Backup.txt".
2. Insert the USB drive into the controller's USB port.
3. Go the Main Menu > Unit Enable screen. Press the Enter and Up or Down Arrow buttons to disable the unit.
4. Go to the Main Menu > Ctrl Variables > Advanced > Login screen. Press the Enter and Up or Down Arrow buttons to enter the service password "4800".
5. Go to the Main Menu > Ctrl Variables > Advanced > Backup > Restore screen.
6. Press the Up or Down Arrow buttons to navigate to the USB Restore screen.
7. Press Enter to highlight and then the Up or Down Arrow buttons to fill the Restore checkbox and restore the backup file. If there is an error during the process, the specific error is displayed on this screen.
8. Cycle power to the controller.

AC Smart Setup

Note:

Only AC Smart 5 or later must be used with CAREL controller. AC Smart 4 is not compatible with CAREL controller.

1. Confirm control wiring between rooftop unit CAREL controller and AC Smart 5 Channel 1 (Wiring is 18 AWG, 2-conductor, twisted, stranded, shielded, and must comply with all applicable local and national codes.).

Figure 79: DOAS Controller to AC Smart 5 Connections.

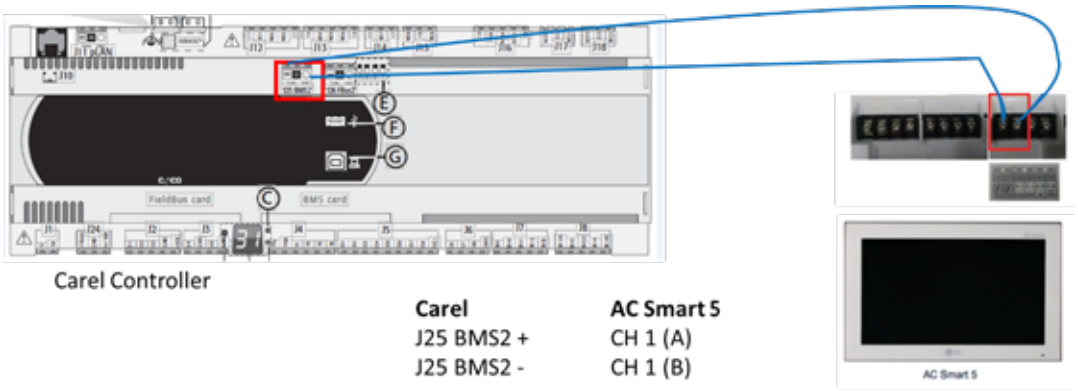
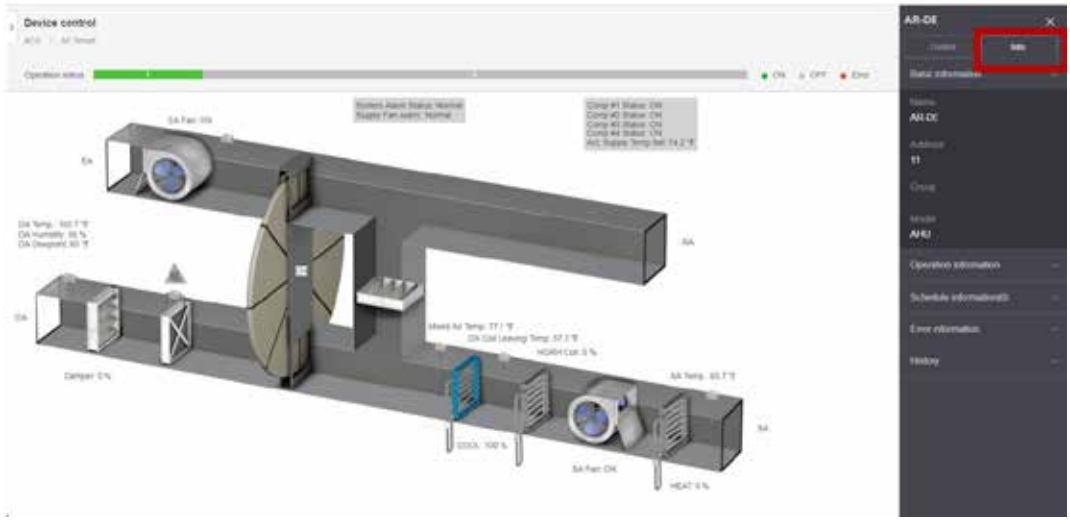


Figure 80: AC Smart 5.

2. On the CAREL controller, under “Network Settings” set the Device I.D. as:

- For AR-DE DOAS models: CAREL Device I.D. = 17 (Decimal) and AC Smart Address = 11 (Hex)
- For AR-DR DOAS models: CAREL Device I.D. = 18 (Decimal) and AC Smart Address = 12 (Hex)

Figure 81: Device I.D. Screen.



AC Smart Controller Setup

1. Under the AC Smart “Settings” tab, find and click on “Installing”.

2. Press on the “AC Smart[00]” tab, go to “Registration Status”, and change the CH1 setting to “MODBUS_9600”.

3. Click “Auto Search” to find the devices connected to the controller.

4. After the search is complete, click “Send All”.

5. Units can be added by clicking “Add Unit”, and then clicking on the buttons next to the name(s) of the applicable devices. After all necessary units are selected, click “Apply”.

6. Click “Send All” to finish adding the device(s).

Figure 82: Clicking “Installing” Under the AC Smart “Settings” Tab (Step 1).

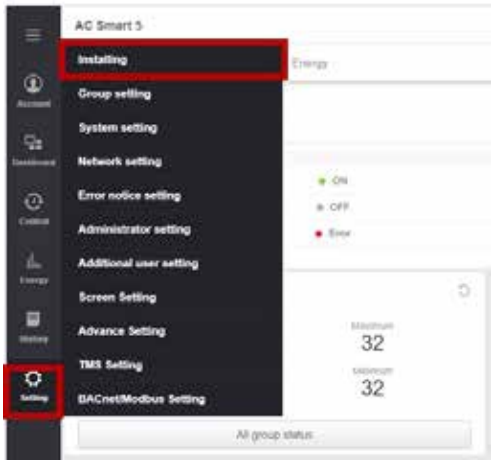


Figure 83: Changing CH1 Setting to “MODBUS_9600” (Step 2).

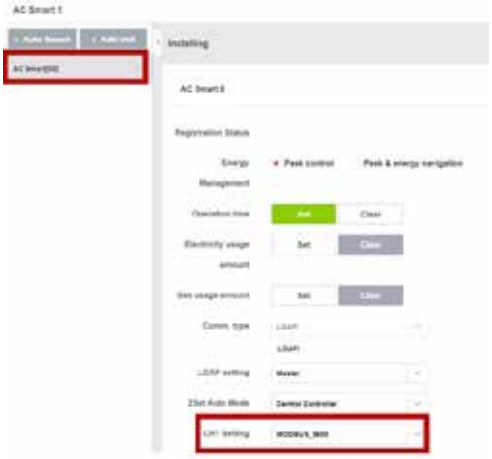
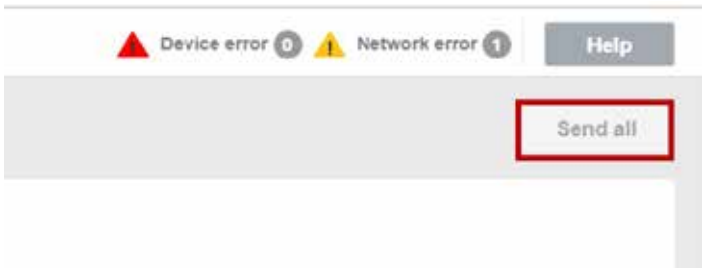


Figure 84: Clicking “Auto Search” (Step 3).

Figure 85: Clicking “Send All” (Step 4).

Figure 86: Adding Units (Step 5).

Figure 87: Clicking “Send All” to Finish Adding Devices (Step 6).



AC Smart Controller Setup, continued.

7. Under the AC Smart “Control” tab, find and select “Device Control”.

8. Find the “Installation” tab and select “AC Smart”. A list of devices available for view will appear in the middle of the screen.

9. Click on the device to be viewed. A new section will appear on the right side of the screen. Click “View Details”.

10. A detailed picture of the unit will be displayed. Click on “Info” to review information on the unit, such as the model, address, mode, temperature, etc.

Figure 88: Clicking on “Device Control” (Step 7).

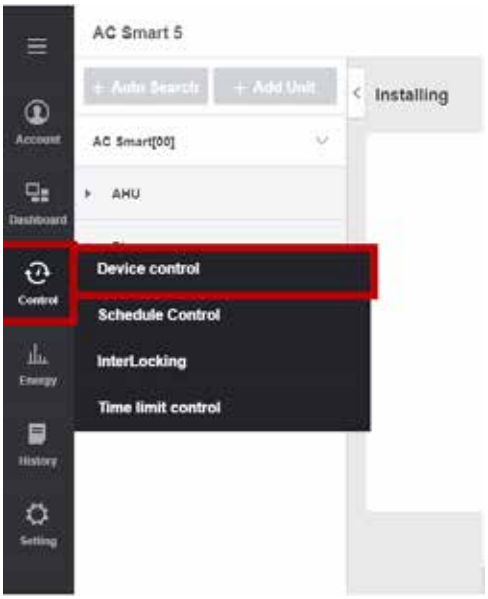


Figure 89: Selecting “AC Smart” (Step 8).

Figure 90: Selecting “View Details” (Step 9).

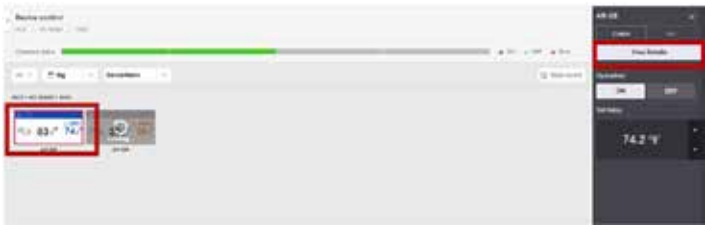
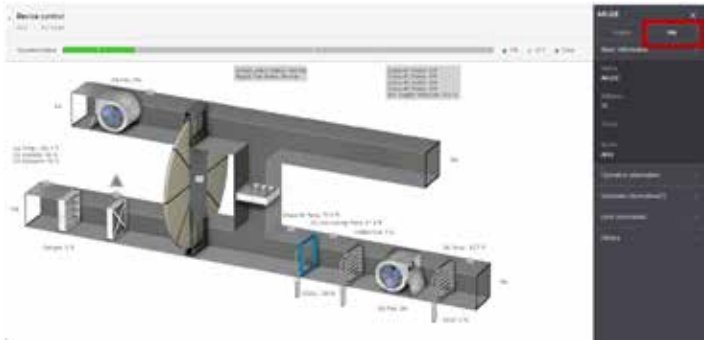


Figure 91: Selecting “Info” (Step 10).



Sequences of Operation

Note:

Sequence of operation varies based on unit configuration. See submittal documentation for configuration detail. Custom applications may have sequences that vary from those described below.

Unit Availability

Unit Start Command. The unit is available for operation when the following conditions are met:

- After powering up and a five-second initial delay.
- There are no active shutdown alarms.
- The unit has been enabled at the Unit Enable screen or by the building management system (BMS), and the unit service switch, if installed, is in the on position.

Unit Commands Occupied Start: The unit operates in the occupied mode under any of the following conditions, based on user selection:

- BMS command
- Digital hardwired input
- Daily schedule
- Always occupied
- Always unoccupied

Occupied Auto Mode: In occupied auto mode, if space reset is enabled, the unit cycles on and off based on space temperature. The unit starts when the space temperature exceeds the set-point plus a deadband. The unit transitions to off/standby when the set-point is achieved.

Occupancy Timed Override Input: A user can override the unit, placing it into occupied mode by pressing the occupancy override button. The unit then remains occupied for the occupancy override duration.

Unoccupied Start: The unit operates in the unoccupied mode under any of the following conditions:

- Unoccupied heating
- Unoccupied cooling
- Unoccupied humidification
- Unoccupied dehumidification
- Unoccupied multi-zone heating
- Unoccupied multi-zone cooling

System On

System on mode occurs when there is an active occupied or unoccupied start command. When a start command becomes active the following steps occur:

- Actuators are powered.
- Fan damper delay timers start counting down from their initial value.
- Individual fan delays start counting down from their initial value.
- Fans are commanded on after timers have expired, and damper end switches prove dampers are open.
- The startup delay timer starts counting down from its initial value.
- After the startup delay timer expires, thermodynamic sequences are allowed.

Power Loss Auto Restart: If power loss auto restart is enabled, the unit returns to the last known operation state based on the unit enable value after an application restart or power loss. If power loss auto restart is disabled, the unit remains off until commanded on.

Shutdown Alarm Auto Restart: If the shutdown alarm auto restart is enabled, the unit remains enabled while a shutdown alarm is active, allowing the unit to automatically restart after a shutdown alarm is cleared. If the shutdown alarm auto restart is disabled, the unit is disabled when there is an active shutdown alarm. This requires the unit to be re-enabled manually after the shutdown alarm condition is cleared.

CONTROLLER

Sequences of Operation

Off / Standby

Standby occurs when there is not an occupied or unoccupied start command.

Hard Shutdown: A hard shutdown occurs under the following conditions:

- A user or the BMS disables the system, and the supply temperature is less than the soft shutdown enable set-point.
- The service switch is in the off (disabled) position.
- Occupancy is commanded to unoccupied while there is no unoccupied start command, and the supply temperature is less than the soft shutdown enable set-point.

When a hard shutdown occurs:

- The unit shuts down immediately; and
- Dampers spring-return to their off position.

Soft Shutdown: A soft shutdown occurs under the following conditions:

- A user or the BMS disables the system, and the supply temperature is greater than or equal to the soft shutdown enable setpoint.
- There is no unoccupied or occupied start command and the supply temperature is greater than or equal to the soft shutdown enable set-point.

The following occur during a soft shutdown:

- Thermodynamic outputs immediately revert back to their off value; while
- Dampers remain open and fans continue to run; until
  - The supply air temperature falls below the soft shutdown enable set-point minus 5.0°F; or
  - The soft shutdown delay timer has expired.

System Disabled

The unit becomes disabled due to the following:

- The unit was disabled from the Unison controller's Main Menu > Unit Enable screen.
- The unit was disabled from the BMS.
- The service switch is in the off position.
- The shutdown input is in the shutdown position.
- A shutdown alarm was activated.

When disabled, the following actions occur:

- The unit shuts down immediately; and
- Dampers spring-return to their off position.

Damper Sequences

Outside Air Damper: The outside air damper modulates based on the maximum value of the following control options:

- CO_2 control
- Economizer
- Outside air damper CFM
- Space static pressure

The final outside air damper position command is constrained by the outside air damper minimum and maximum set-points. The maximum outside air damper position may be limited by one of the following:

- Heat pump defrost
- Winter ramp

Damper Sequences, continued.

Minimum Outside Air Damper: The minimum outside air damper modulates to maintain the CFM set-point. This damper position is constrained by its minimum and maximum set-points.

Return Air Damper: The return air damper is set to control inversely to the outside air damper. This damper position is constrained by its minimum and maximum set-points.

Recirculation Air Damper: The recirculation air damper is set to control inversely to the outside air damper. This damper position is constrained by its minimum and maximum set-points.

Exhaust Air Damper: The exhaust air damper is set to control directly to the outside air damper. This damper position is constrained by its minimum and maximum set-points.

Fan Sequences

Supply Fan Control: The following sequences are selectable for supply fan control. The fan speed is constrained by its minimum and maximum speed set-points.

- Constant volume
- Duct static pressure
- Space static pressure
- Hardwired input
- Single zone variable air volume
- CFM control

Return Fan Control: The following sequences are selectable for return fan control. Fan speed is constrained by its minimum and maximum speed set-points.

- Constant volume
- Return duct static pressure
- Return static with supply tracking
- Space static pressure
- Hardwired input
- Single zone variable air volume
- Supply tracking with offset

Exhaust Fan Control: The following sequences are selectable for exhaust fan control. Fan speed is constrained by its minimum and maximum speed set-points.

- Constant volume
- Space static pressure
- Supply tracking with offset
- CFM control
- Hardwired input
- Return duct static pressure

Winter Ramp

The winter ramp function prevents the supply temperature from dropping below set-point under the following conditions:

- Outside air temperature is below the winter ramp enable setpoint; and
- Heating capacity is at 100%.

One of the following is used to perform the winter ramp function:

- Supply fan speed; or
- Outside air damper position.

Note:

If the unit is a heat pump, the supply fan is always used.

CONTROLLER

Sequences of Operation

Temperature Control

Temperature control sequences determine when the unit is in fan-only, heating, or cooling modes. The following control sequences are available:

Supply Temperature Control: The heating and cooling devices modulate to maintain the supply air temperature set-point.

Space or Return Temperature Reset: The supply temperature set-point is calculated based on the active set-point (see below) and the current space or return temperature. The calculated set-point is scaled between the supply temperature minimum and maximum set-points determined by the current mode of operation.

Active Set-point: The heating and cooling set-points are determined by the temperature set-point and deadband. The deadband is divided by two (2) and added to and subtracted from the set-point to determine the cooling and heating set-points.

- Dual Set-point Mode: When a deadband value is greater than zero, the unit is placed into dual set-point mode.
- Cooling: If the space or return temperature is above the cooling set-point, the cooling set-point is active.
- Heating: If the space or return temperature is below the heating set-point, the heating set-point is active.
- Transitioning between set-points: if the space or return temperature is between the heating and cooling set-point, the last active set-point is used.
- Start between set-points: if the unit starts while in between set-points, the heating set-point is active.
- Single Set-point Mode: If a deadband of zero is entered, the unit is in single set-point mode and controls directly to the user-entered temperature set-point.

Outside Reset: The heating and cooling devices modulate to maintain the supply air temperature set-point as determined by the outside reset calculation.

- Outside Reset Calculation: The supply temperature set-point is scaled between the supply temperature minimum and maximum set-points as the outside air temperature changes between the outside reset minimum and maximum set-points.

Heat / Cool Mode Switch Delay: This delay is used in transitioning between heating and cooling modes. The delay timer starts counting when the unit is no longer heating, cooling, or economizing.

1. Enable Heating: The unit enables heating when the following occurs:

- All cooling devices are off; and
- Economizer is at zero; and
- The heat cool mode switch timer has expired; and
- Heating is not locked out; and
- There is a demand for heating.

2. Enable Cooling: The unit enables cooling when the following occurs:

- All heating devices are off; and
- The heat cool mode switch timer has expired; and
- Cooling is not locked out; and
- There is a demand for cooling.

Fall Back: During a sensor failure the temperature control mode reverts to the previous available option based on the following order:

- Supply temperature control
- Outside air reset
- Space/return reset
  - If both space and return temperature sensors are present, the remaining sensor is used during a failure.

Economizer

The economizer function is used to modulate the outside air damper to cool the supply air temperature using outside air. The outside damper modulates open based on the economizer demand in order to maintain the supply temperature set-point.

Economizer Availability: The economizer is available when the following conditions are met:

- Heating is not active; and
- Cooling is active; and
- The enable condition for the selected mode is met.

Economizer Modes: The user can select the economizer control method from the following options:

- Outside Dry Bulb: Economizing is allowed when the outside dry bulb is less than the economizer temperature enable set-point.
- Outside Enthalpy: Economizing is allowed when outside enthalpy is less than the economizer enthalpy set-point.
- Comparative Dry Bulb: Economizing is allowed when outside temperature is less than the space or return temperature.
- Comparative Enthalpy: Economizing is allowed when outside enthalpy is less than the space or return enthalpy.
- Fall Back: If enabled, the economizer control mode can revert to the previously available option during a sensor failure to continue economizing.

Energy Recovery

The heat wheel or flat plate heat exchanger face/bypass damper is controlled to maintain the supply temperature set-point.

Defrost: Energy recovery devices may require defrosting if the exhaust air temperature gets too cold. The following methods are available depending on the type of energy recovery installed in the unit:

- Modulating: Energy recovery output is reduced in order to maintain the exhaust air temperature above the defrost set-point.
- Fixed Capacity: The wheel will be cycled on and off to maintain an exhaust temperature above the defrost set-point. The wheel cycles on for thirty (30) seconds then off for five (5) minutes.

Wheel Pressure Drop Control: Wheel supply and exhaust bypass dampers modulate to maintain a differential pressure set-point across the wheel.

Heat Wheel Jog Function: Momentarily enables the wheel to expose a new section to the air stream.

Dehumidification

When dehumidification mode is active, the cooling device is controlled to maintain the cooling coil leaving air temperature set-point. Reheat or Reheat Plus is controlled to maintain the supply temperature set-point.

Note:

This sequence does not apply to pool application units.

Availability: The following must occur to enable dehumidification mode:

- Humidification is not active; and
- The humidification/dehumidification mode switch delay has expired; and
- Cooling is not locked out (except in the case of a regeneration unit); and
- There is a call for dehumidification.

CONTROLLER

Sequences of Operation

Dehumidification, continued.

Dehumidification Call: The dehumidification call can vary based on installed sensors and user selection. Dehumidification is called when a sensor is greater than a dehumidification set-point. The following dehumidification modes are available when the space is in occupied mode:

- Inside RH*
- Inside dewpoint*
- Outside dewpoint
- Inside RH or inside dewpoint*
- Inside RH or inside dewpoint or outside dewpoint
- Inside RH and inside dewpoint*
- Inside RH and inside dewpoint or outside dewpoint

Note:

** indicates availability during unoccupied mode.*

There must be a constant call for dehumidification for the duration of the enable delay for dehumidification mode to become enabled. The call remains active until conditions are satisfied and dehumidification mode has been active for the minimum active time.

- Unoccupied Mode: If the unit is unoccupied while there is a dehumidification call, the unit will start and dehumidify until the unoccupied dehumidification set-points are satisfied. The above dehumidification modes marked with an * indicate availability during unoccupied mode. The unoccupied dehumidification mode can be set differently than the occupied dehumidification mode.

Dehumidification Priority: The following priorities are used to determine what is more important in the unit: temperature over dehumidification, or dehumidification over heating. Both priority selections determine when the unit is allowed to dehumidify.

1. Temperature Over Dehumidification: Determines when the unit is allowed to dehumidify based on the space/return air temperatures.
- Temperature: If temperature is set as the priority and the space or return air is overcooled, dehumidification is locked out until the space or return temperature is no longer overcooled.
- Dehumidification: If the priority is dehumidification and the space or return air is overcooled, the coil offset will be added to the coil leaving set-point.
- Overcooled: If space or return reset is enabled, the target is considered overcooled when it is 4.0°F below set-point for five (5) minutes. It remains overcooled until the target is at set-point and overcool has been active for a minimum of five (5) minutes.

2. Heating Over Dehumidification: Determines when the unit is allowed to dehumidify when heating is active.
- Heating: If priority is set to heating, the unit locks out dehumidification while heating is active.
- Dehumidification: If priority is set to dehumidification, the unit is allowed to switch to dehumidification when heating is active.

Preheat

A preheat device can be installed in the unit to preheat outside air coming into the unit.

Availability

1. Modulating Capacity: The following must occur to enable a modulating preheater:
- Preheat is not locked out; and
- The preheat sensor has a valid reading; and
- The outside air damper is greater than the enable position; and
- The system is on.

2. Fixed Capacity: The following must occur to enable a fixed preheater:
- Preheat is not locked out; and
- The outside air sensor has a valid reading; and
- The outside air damper is greater than the enable position; and
- The system is on.

Preheat Call

1. Modulating Capacity: The preheat call occurs when the preheat temperature is less than the preheat set-point.
2. Fixed Capacity: The preheat call occurs when it is available.

Compressor Staging

Compressors are staged to maintain the active temperature set-point.

Modulating Compressor: The modulating compressor is used to trim capacity between stages of fixed compressors.

Fixed Compressor: Fixed compressors are staged on when more capacity is needed than the modulating compressor is capable of providing, and staged off when the modulating compressor is at its minimum speed.

Lead / Lag Sequencing: Compressors are staged based on the lead/lag mode selected:

- Always Lead: Compressors always stage based on the order selected for lead staging.
- Always Lag: Compressors always stage based on the order selected for lag staging.
- With Dehumidification: Compressors stage based on the lead staging order when not dehumidifying. When dehumidification is active, the compressors stage based on the lag staging order.
- Weekly: If weekly is chosen, the lead lag order switches at midnight of the user-selected switching day.

Compressor Failure: If a compressor becomes unavailable due to an alarm, that compressor will be replaced by the next available compressor specified in the sequence.

Chilled Water Coil

If a chilled water coil is installed, the chilled water valve modulates to maintain the active temperature set-point when the unit is in cooling mode. The chilled water valve can optionally be held open to maintain flow when the unit is off.

Hot Water Coil

If a hot water coil is installed, the hot water valve modulates to maintain the active temperature set-point when the unit is in heating mode.

Case Heat

Case heat is available to keep the unit casing at a specific temperature using the hot water coil.

1. Availability: The following must be true to enable the case heat function:
   - Unit is in off / standby mode; and
   - The minimum of the cooling coil leaving air temperature or the mixed air temp is less than the case heat set-point.
2. Hot Water Valve Modulation: When case heat is enabled, the hot water valve modulates to maintain the case heat set-point while the unit is in standby.

Hot Gas Reheat

The hot gas reheat coil heats air to maintain supply air temperature by modulating a reheat valve when the unit is in dehumidification mode, or when single zone, variable air volume cooling mode with reset is active.

Purge: When hot gas reheat purge occurs the hot gas reheat valve opens to 100% and remains open for the duration of the purge delay. This function only occurs when the unit controller deems it necessary.

CONTROLLER

Sequences of Operation

Furnace Staging

Furnaces are staged to maintain the supply temperature set-point. Furnaces stage in a fixed order based on factory installation:

Modulating Furnace: The modulating signal tracks the heating ramp of the controller.

Fixed Stage Furnace: The heating ramp of the controller stages furnaces as needed.

Circuit Pressure Control

Condenser fans or water valves modulate to maintain the saturated gas temperature set-point.

Set-points: The circuits can be controlled to three different set-points: heating, cooling, and dehumidification.

Condenser Fan Staging: Condenser fans stage to maintain the active circuit pressure control set-point.

- Modulating Fans: Modulating fans are ramped with the circuit pressure control ramp. If a unit has both modulating and fixed capacity fans, the modulating fan is used to trim capacity between stages of fixed fans.
- Fixed Fans: Fixed fans are staged on when more capacity is needed than the modulating fan is capable of providing and staged off when the modulating fan is at its minimum speed.

Water Source Heat Pump Head Pressure Control: Circuit pressure control in a water source heat pump consists of one or two water valves and a coaxial heat exchanger. The water valves modulate to maintain the active circuit pressure control setpoint in cooling, dehumidification, and heating modes.

Compressor Envelope Control

Compressor envelope control is available for all units but is dependent on hardware installed. The operating envelope is comprised of minimum and maximum evaporating and condensing temperatures that create an envelope of desired operating limits based on the compressor manufacturer's limitations.

Units Without Electronic Expansion Valves: If any of the following alarm conditions occur, the modulating capacity of the compressor is reduced or the fixed stage compressor is turned off. These alarm conditions can be disabled by disabling compressor envelope alarms:

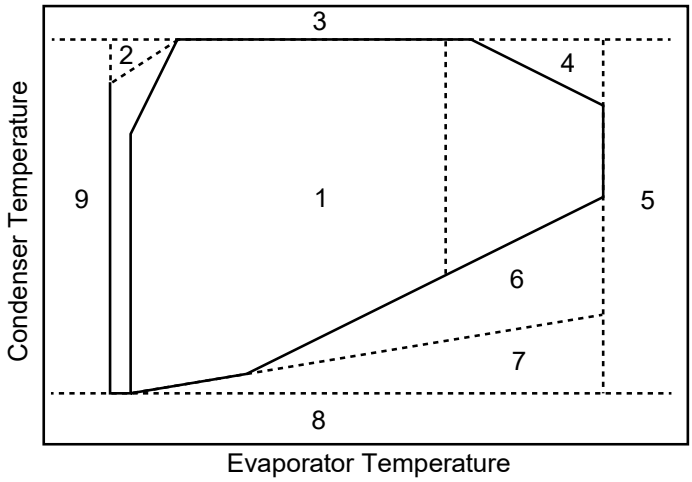
- High Saturated Discharge Temperature: A high saturated discharge temperature alarm activates if the saturated discharge temperature rises above the alarm set-point.
- Low Saturated Suction Temperature: A low saturated suction temperature alarm activates if the saturated suction temperature falls below the alarm set-point for a delay.
- High Discharge Line Temperature: If the discharge line temperature rises above the alarm set-point for the duration of the compressor protection delay, a high discharge line temperature alarm activates.
- High Superheat: If the superheat rises above the alarm set-point for the duration of the compressor protection delay, a high superheat alarm activates.
- High Compression: Based on sliding pressure ranges and the difference between suction and discharge refrigerant pressures, if the difference rises above a calculated set-point for the compressor protection delay, a high compression ratio alarm activates. This alarm remains active after the alarm condition clears for the duration of the envelope alarm lockout delay or until the alarm is manually reset.
- High Suction: If the suction pressure rises above the alarm set-point for the duration of the envelope alarm protection delay, a high suction pressure alarm activates. This alarm remains active after the alarm condition clears for the duration of the envelope alarm lockout delay or until the alarm is manually reset.

- Low Condenser Pressure: If the liquid pressure, or the discharge pressure minus an offset (if liquid pressure is not available), falls below the low condenser set-point for the duration of the compressor protection delay, a low condenser pressure alarm activates. This alarm remains active after the alarm condition clears for the duration of the envelope alarm lockout delay or until the alarm is manually reset.
- Abnormal Pressure: If the discharge pressure minus the suction pressure is less than 30 psi for 240 seconds, an abnormal pressure alarm activates. This alarm remains active after the alarm condition clears for the duration of the envelope alarm lockout delay or until the alarm is manually reset.

Units With Electronic Expansion Valves: When an inverter scroll compressor is installed with an electronic expansion valve, the following compressor envelope logic applies:

- Compressor Envelope Zones: As the compressor operation approaches a zone other than the normal operation (Zone 1), the controller modulates the inverter compressor's speed according to the compressor control algorithm to prevent the compressor from leaving Zone 1.

Figure 92: Compressor Envelope Example (see Zone Descriptions).



If the compressor is outside Zone 1 for a period, an alarm activates corresponding to the following zones:

- Zone 2: High Pressure Ratio
- Zone 3: High Discharge Pressure
- Zone 4: High Motor Current
- Zone 5: High Suction Pressure
- Zone 6: Low Pressure Ratio
- Zone 7: Low Delta Ratio
- Zone 8: Low Discharge Pressure
- Zone 9: Low Suction Pressure

Water Source Heat Pump

Water Valve: At a call for a compressor, the following occurs:

- The water source heat pump water valve for that circuit opens to 100%; and
- Notifies the BMS to start the pump via:
  - Hardwired output by closing the contact on the board; and
  - BMS-communicated point by enabling a pump request.
- The water source heat pump compressor delay timer starts; and
- Allows the compressor to start after the delay time has expired.

After the last compressor in the circuit turns off, the controller:

- Forces the water source heat pump water valve for that circuit to open 100% for five (5) minutes; and
- Starts the water source heat pump compressor delay timer to delay notifying the BMS to turn the pump off; and
- Notifies the BMS to stop the pump via:
  - Hardwired output by opening the contact on the board; and
  - BMS-communicated point by disabling a pump request.

CONTROLLER

Sequences of Operation

Water Source Heat Pump, continued.

Entering Water Temperature Alarms: The following alarms occur based on coaxial coil entering water temperatures:

- An entering water temperature alarm activates:
  - When cooling and entering water temperature is greater than set-point; or
  - When heating and entering water temperature is less than set-point.
- The controller responds to an entering water temperature alarm:
  - When heating, it displays a low entering water temp alarm.
  - When cooling, it displays a high entering water temp alarm.
- An entering water temp alarm automatically resets:
  - When cooling and entering water temperature is less than set-point; or
  - When heating and entering water temperature is greater than set-point.

Coax Coil Defrost, Heating: In heating mode, a water source heat pump may need to initiate a defrost cycle of the water coil to prevent a complete freeze.

1. Initialized: The saturated suction temperature determines when a defrost cycle occurs. The following conditions must be true:

- Saturated suction temperature is less than the fluid freeze temperature set-point; and
- Cold weather start is not active; and
- The unit has controls enabled.

2. Termination: The defrost cycle terminates when the active circuit's saturated suction temperature is greater than the cancel set-point. At defrost cycle termination, the unit reverts back to heating mode operation.

3. Water Source Heat Pump Heating Lockout: Water source heat pump heating mode is unavailable when:

- The water source heat pump defrost cycle continues for more than the maximum defrost time; or
- A defrost cycle is initiated three times in any one-hour period.
- Each strike created by a defrost mode entry clears one hour after the strike occurs.

4. Water Source Heat Pump Heating Lockout Reset: The water source heat pump heating lockout resets when:

- The water source heat pump heating lockout occurred more than two (2) hours prior; and
- The saturated suction temperature is greater than or equal to the cancel set-point; or
  - If the maximum defrost time triggered the lockout, the outside air temperature is greater than the fluid freeze temp set-point plus 10°F.

Supply Fan Modulation: In heating mode, if the supply air temperature is less than 60°F, the supply fan speed decreases to maintain 60°F.

Air Source Heat Pump

Outside Coil Defrost: An air source heat pump periodically needs to initiate a defrost cycle of the outside coil to remove accumulated frost when operating in heating mode.

Defrost Sequence

1. Initialized: The saturated suction temperature determines when a defrost cycle occurs. For a defrost cycle to initiate, one of the following must be true:

- The saturated suction temperature is less than set-point; or
- The saturated suction temperature is less than a calculated set-point based on ambient conditions.

At defrost cycle initiation, the following steps occur:

- The reversing valve switches to the cooling position; and
- Condenser fans turn off; and
- The hot gas reheat valve moves to the closed position; and
- Auxiliary heat is enabled.

2. Terminated: The defrost cycle terminates when:

- The saturated suction temperatures of all circuits are greater than or equal to the cancel set-point; or
- The maximum allowed defrost time has been exceeded.

At defrost cycle termination, the unit reverts back to heating mode operation.

3. Auxiliary Heat: Auxiliary heat is enabled with the following constraint: during auxiliary heat, the unit will use heating sources other than the heat pump in order to maintain the supply air temperature set-point. The electric heat maximum output must meet the auxiliary heat maximum set-point during defrost.

Note:

Controls Lite notifies the third-party controller when auxiliary heat should be enabled.

4. Air Source Heat Pump Heating Lockout: Air source heat pump heating mode is unavailable when:

- The air source heat pump defrost cycle continues for more than the maximum defrost time; or
- A defrost cycle is initiated three (3) times in any one hour period.
  - Each strike created by a defrost mode entry clears one hour after the strike occurs.

5. Heating Lockout Reset: The air source heat pump heating lockout resets when:

- The air source heat pump heating lockout occurred more than one hour prior; and
  - The outside air temperature increases; or
  - The outside humidity decreases.

CONTROLLER

Sequences of Operation

BMS Watchdog

The BMS watchdog function verifies BMS connectivity. The watchdog is required for the BMS to take the place of a hardwired sensor. The BMS toggles the watchdog variable from true to false within the timeout delay. If the timer expires, the controller falls back to hardwired sensors until the BMS connection can be established. At this time, a BMS watchdog alarm activates.

The following variables may be used by the BMS in place of hardwired sensors:

- Outside_RH_from_BMS
- Outside_Temp_from_BMS
- Return_RH_from_BMS
- Return_Temp_from_BMS
- Space_1_CO2_from_BMS
- Space_2_CO2_from_BMS
- Return_CO2_from_BMS
- Space_RH_from_BMS
- Space_Static_from_BMS
- Space_Temp_from_BMS

Unit Alarms

Refer to the Alarms Data Table for a list of available alarms.

Global Alarm Output: The global alarm output is active via hardwired or BMS output. The output can be selected to energize based on any alarm condition or to shut down alarms only.

Alarm Resetting Methods: The following methods may be used to manually reset the alarms:

- Push the Alarm button twice on the Handheld or Virtual (web-based) Keypad / Display to access the alarm reset screen and press Enter; or
- From the Alarms menu go to Reset Alarms; or
- Reset all alarms via the BMS.

Set-Points Data Tables

The following tables are quick references for control variables, ranges, and defaults.

Note:

Not all variables are available on every unit.

Table 30: Temperature Control Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Reset Control Mode - Temperature Control Mode Selection	Space Reset	Supply Temp. Control, Space Reset, Return Reset, Outside Reset		
Temperature Set-point	72.0°F	50.0°F	100.0°F	
Heat / Cool Deadband	4.0 Δ°F	0.0 Δ°F	20.0 Δ°F	
Supply Set-points - Cooling Mode				
Maximum	100.0°F	70.0°F	100.0°F	
Minimum	50.0°F	50.0°F	70.0°F	
Supply Set-points - Heating Mode				
Maximum	100.0°F	70.0°F	100.0°F	
Minimum	55.0°F	50.0°F	70.0°F	
Outside Set-points - Outside Reset				
Maximum	80.0°F	-30.0°F	130.0°F	
Minimum	30.0°F	-30.0°F	130.0°F	
Mode Switch Delay	120 sec.	30 sec.	600 sec.	
Startup Delay	30 sec.	0 sec.	600 sec.	
Cooling Ambient Lockout	55.0°F	30.0°F	100.0°F	
Heating Ambient Lockout	80.0°F	30.0°F	100.0°F	
Pre-heat				
Ambient Lockout	10.0°F	-40.0°F	65.0°F	
OAD En. Pos.	30%	0%	100%	
Unoccupied Cooling				
Set-point	80.0°F	65.0°F	85.0°F	
Hysteresis	5.0 Δ°F	0.0 Δ°F	10.0 Δ°F	
Unoccupied Heating				
Set-point	60.0°F	50.0°F	70.0°F	
Hysteresis	5.0 Δ°F	0.0 Δ°F	10.0 Δ°F	
Winter Ramp				
Enable	Disabled (□)	Disabled (□)	Enabled (X)	
Mode	Supply Fan	Supply Fan	Outside Damper	
OAT Enable	40.0°F	20.0°F	70.0°F	
Case Heat Set-point	40.0°F	0.0°F	100.0°F	

Note:

Set-point availability varies based on unit configuration.

CONTROLLER

Set-Points Data Tables

Table 31: Dehumidification Control Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Dehumidification Mode				
Inside RH >	60%	0%	100%	
Inside Dewpoint >	60.0°F	0.0°F	90.0°F	
Outside Dewpoint >	60.0°F	0.0°F	100.0°F	
Unoccupied Dehumidification Mode				
Inside RH >	5%	0%	100%	
Unoccupied Inside Dewpoint >	70.0°F	0.0°F	90.0°F	
Dehumidification Hysteresis				
Humidity	4%	0%	10%	
Dewpoint	2.0 Δ°F	0.0 Δ°F	10.0 Δ°F	
Cold Coil Set-point	55.0°F	46.0°F	80.0°F	
Priority Selection				
Dehum. →Temp.	Disabled (□)	Disabled (□)	Enabled (X)	Disabled = Dehumidification Priority; Enabled = Temperature Priority
Heat → Dehum.	Enabled (□)	Disabled (□)	Enabled (X)	Disabled = Heating Priority; Enabled = Dehumidification Priority
Overcool Coil Offset	0.0 Δ°F	0.0 Δ°F	10.0 Δ°F	
Dehumidification Force Comp. On				
Clg Ramp 1	Enabled (X)	Disabled (□)	Enabled (X)	

Table 32: Refrigeration Compressor Control Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Add Deadband	0.5 Δ°F	0.0 Δ°F	20.0 Δ°F	
Sub Deadband	0.5 Δ°F	0.0 Δ°F	20.0 Δ°F	
Cooling Delays				
Interstage	60 sec.	10 sec.	600 sec.	
Subtract	60 sec.	10 sec.	600 sec.	
Heating Delays				
Interstage	60 sec.	10 sec.	600 sec.	
Subtract	60 sec.	10 sec.	600 sec.	
Re-Add Delay	300 sec.	10 sec.	600 sec.	
Min. On	60 sec.	1 sec.	600 sec.	
Min. Off	270 sec.	1 sec.	600 sec.	
Cold Coil Low Limit Set-point	42.0°F	35.0°F	55.0°F	
Coil Staging Safety Set-point	46.0°F	35.0°F	55.0°F	

Note:

Set-point availability varies based on unit configuration.

Table 33: Refrigeration Pressure Control Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Pressure Control				
Condenser Type	Condenser Fan Control	Condenser Fan Control	Water Valve Control	
Cooling	105.0°F	80.0°F	140.0°F	
Dehumidifying	115.0°F	80.0°F	140.0°F	
Offset	5.0 Δ°F	1.0 Δ°F	20.0 Δ°F	AHPC 1.0
Heating	50.0°F	40.0°F	60.0°F	
Offset	2.0 Δ°F	1.0 Δ°F	10.0 Δ°F	AHPC 1.0
Pressure Control - Water Valve				
Cooling Min. Position	20%	0%	100%	WSHP
Heating Min. Position	20%	0%	100%	WSHP
Off Position	100%	0%	100%	WSHP
Condenser Fan Minimum Speed	25%	0%	100%	

Table 34: Refrigeration Heat Pump Control Set-points Data Table.

Control Variable	Default	Min.	Max.	Notes
WSHP Cold Start				
OAT Enable	30.0°F	0.0°F	60.0°F	
Duration	60 sec.	0 sec.	600 sec.	
WSHP Fluid Freeze Set-point	32.0°F	0.0°F	32.0°F	
ASHP Low Ambient Lockout	17.0°F	10.0°F	50.0°F	
WSHP Low Saturated Suction Lockout	-15.0°F	-30.0°F	0.0°F	
Heat Pump Defrost				
WSHP Cancel Set-point	95.0°F	55.0°F	110.0°F	
ASHP Cancel Set-point	60.0°F	55.0°F	80.0°F	
Max. Time	10 min.	5 min.	20 min.	

Table 35: Damper Control Set-points Data Table.

Control Variable	Default	Min.	Max.	Notes
Fan Damper Delay	30 sec.	0 sec.	300 sec.	
Outside Damper				
Minimum	0%	0%	100%	
CO_2 Minimum	20%	0%	100%	
Maximum	100%	0%	100%	
Outside Damper Airflow Set-point	0 CFM	0 CFM	999999 CFM	
Economizer Mode Selected	Outside Dry Bulb	Disabled, Outside Dry Bulb, Outside Enthalpy, Comparative Dry Bulb, Comparative Enthalpy		
Economizer Settings				
Outside Dry Bulb Set-point	65°F	50.0°F	90.0°F	
Outside Enthalpy Set-point	23 Btu/lb.	15 Btu/lb.	40 Btu/lb.	
Hysteresis				
Temperature	2.0 Δ°F	0.0 Δ°F	10.0 Δ°F	
Enthalpy	2.0 Btu/lb.	0.0 Btu/lb.	10.0 Btu/lb.	
Space CO_2 Set-point	700 ppm	0 ppm	5,000 ppm	

Note:

Set-point availability varies based on unit configuration.

CONTROLLER

Set-Points Data Tables

Table 36: Energy Recovery Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Defrost Ramp Exhaust Set-point	36.0°F	15.0°F	50.0°F	
Heat Wheel				
Minimum Speed	20%	0%	100%	
Enable Jog	Enabled (X)	Disabled (□)	Enabled (X)	
Jog Enable Delay	60 min.	10 min.	300 min.	
Jog Duration	2 min.	1 min.	99 min.	

Table 37: Fan Control Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Supply Fan Control				
Enable Delay	5 sec.	0 sec.	60 sec.	
Minimum Speed	50%	50%	100%	
Maximum Speed	100%	50%	100%	
Constant Volume Set-point				
Occupied	100%	50%	100%	
Unoccupied	60%	50%	100%	
Duct Static Set-point	1.00"wc	0.00"wc	5.00"wc	
Space Static Set-point	0.05"wc	-0.50"wc	0.50"wc	
Airflow Set-point	0 CFM	0 CFM	999999 CFM	
Soft Shutdown Enable				
Set-point	85.0°F	70.0°F	150.0°F	
Delay	120 sec.	0 sec.	999 sec.	
Exhaust Fan Control				
Constant Volume Set-point Enable Delay	0 sec.	0 sec.	60 sec.	
Constant Volume Set-point Enable When OAD >=	15%	0%	99%	
Minimum Speed	25%	25%	100%	
Maximum Speed	100%	25%	100%	
Constant Volume Set-point Occupied	100%	25%	100%	
Constant Volume Set-point Unoccupied	60%	25%	100%	
Space Static Set-point	0.05"wc	-0.50"wc	0.50"wc	
Supply Tracking Offset	-10%	-100%	100%	
Airflow Set-point	0 CFM	0 CFM	999999 cfmCFM	

Note:

Set-point availability varies based on unit configuration.

Table 38: Occupancy Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Occupancy Mode	BMS	BMS, Digital Input, Schedule, Always Occ, Always Unocc		
BMS Comm Loss Occupancy Fallback Mode	BMS Last Known	BMS Last Known, Digital Input, Schedule, Occupied, Unoccupied		
Occupancy Schedule Day	Monday	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday		All days on one screen. Choose the day to change then the operation and start / stop times
Mode	Occupied	Occupied, Unoccupied, Schedule		
Start Time: 00:00	06:00 AM	12:00 AM	11:59 PM	
Stop Time: 00:00	06:00 PM	12:00 AM	11:59 PM	
Occupied Timed Override				
Enable	Disabled (□)	Disabled (□)	Enabled (X)	
Duration	60 min.	0 min.	240 min.	
Occupied Auto Mode				
Enable	Disabled (□)	Disabled (□)	Enabled (X)	
Deadband	4.0 Δ°F	0.1 Δ°F	20.0 Δ°F	
Unoccupied Start Enable Modes				
Cooling	Enabled (X)	Disabled (□)	Enabled (X)	
Heating	Enabled (X)	Disabled (□)	Enabled (X)	
Dehumidification	Enabled (X)	Disabled (□)	Enabled (X)	

Note:

Set-point availability varies based on unit configuration.

CONTROLLER

Set-Points Data Tables

Table 39: Advanced Set-Points Data Table.

Control Variable	Default	Min.	Max.	Notes
Login				
Enter Password	0000	0000	9999	
Current Access Level	Read Only	Read Only, Service Level, Factory Level		
Manual Overrides				
Manual Override Mode Enable	Disabled (X)	Disabled (□)	Enabled (X)	
Manual Override Mode Duration	480 min.	0 min.	480 min.	
Occupancy Override	Auto	Auto	Manual	
Occupancy Value	Current Operation	Unoccupied	Occupied	
Supply Fan (1-4) Override	Auto	Auto	Manual	
Supply Fan (1-4) Command (1-4)	Current Command	Off	On	
Supply Fan (1-4) Speed	Current Speed	0%	100%	
Exhaust Fan (1-4) Override	Auto	Auto	Manual	
Exhaust Fan Command (1-4)	Current Command	Off	On	
Exhaust Fan Speed	Current Speed	0%	100%	
Outside Damper Override	Auto	Auto	Manual	
Outside Damper Position	Current Speed	0%	100%	
Exhaust Damper Override	Auto	Auto	Manual	
Exhaust Damper Position	Current Position	0%	100%	
Compressor Request Override	Auto	Auto	Manual	
Compressor Request Comp #: (1-8)	Current Request	Off	On	
Compressor Signal Override	Auto	Auto	Manual	
Compressor Signal Comp #: (1-8)	Current Signal	0%	100%	
Cooling Ramp 1-4 Override	Auto	Auto	Manual	
Cooling Ramp 1-4 Demand	Current Ramp %	0%	100%	
Furnace Request Override	Auto	Auto	Manual	
Furnace Request Furnace Stage (F1-8 S1-2)	Current State	Off	On	
Electric Heat Override	Auto	Auto	Manual	
Electric Heat Elec Heater #: (1-2)	Current Ramp %	0%	100%	
Heating Ramp Override	Auto	Auto	Manual	
Heating Ramp Demand	Current Ramp %	0%	100%	
Heat Pump Heating Ramp Override	Auto	Auto	Manual	
Heat Pump Heating Ramp Demand	Current Ramp %	0%	100%	
Economizer Ramp Override	Auto	Auto	Manual	
Economizer Ramp Value	Current Ramp %	0%	100%	
Hot Gas Reheat Ramp Override	Auto	Auto	Manual	
Hot Gas Reheat Ramp Value	Current Ramp %	0%	100%	
Defrost Ramp Override	Auto	Auto	Manual	Reduces Energy Recovery - 100%= Full Bypass/Min Speed
Defrost Ramp Value	Current Ramp %	0%	100%	
Energy Recovery Ramp Override	Auto	Auto	Manual	
Energy Recovery Ramp Value	%	0%	100%	
Pressure Control Override	Auto	Auto	Manual	Compressor Operation must be off to override Pressure Control
Pressure Control Ramp No.: (1-8)	Current Ramp %	0%	100%	
Pressure Control Override	Auto	Auto	Manual	Compressor Operation must be off to override Pressure Control
Pressure Control AHPC VFD %	Current Ramp %	0%	100%	
Pressure Control Fixed Stage No.: (2-4)	Current State	Off	On	

Note:

Set-point availability varies based on unit configuration.

Table 40: Advanced Set-Points Data Table, continued.

Control Variable	Default	Min.	Max.	Notes
Advanced Set-points, continued.				
Temp Reset PID Tuning P Gain	6.000	0.001	999.999	
Temp Reset PID I Time	300 sec.	0 sec.	1800 sec.	
Temp Reset PID Cycle Time	30 sec.	0 sec.	100 sec.	
Cooling/HP PID Tuning P Gain	3.000	0.001	999.999	
Cooling/HP PID Tuning I Time	60 sec.	0 sec.	1800 sec.	
Cooling/HP PID Tuning Cycle Time	1 sec.	0 sec.	100 sec.	
Cooling/HP PID Tuning Deadband	0.0	0.0	10.0	
Heating PID Tuning P Gain	3.000	0.001	999.999	
Heating PID Tuning I Time	150 sec.	0 sec.	1800 sec.	
Heating PID Tuning Cycle Time	1 sec.	0 sec.	100 sec.	
Heating PID Tuning Deadband	0.0	0.0	10.0	
Supply Duct Static PID P Gain	4.000	0.001	999.999	
Supply Duct Static PID I Time	30 sec.	0 sec.	1800 sec.	
Supply Space Static PI P Gain	100.000	0.001	999.999	
Supply Space Static I Time	30 sec.	0 sec.	1800 sec.	
Return Static PID P Gain	0.500	0.001	999.999	
Return Static PID I Time	60 sec.	0 sec.	1800 sec.	
Winter Ramp PID Tuning P Gain	1.000	0.001	999.999	
Winter Ramp PID Tuning I Time	200 sec.	0 sec.	1800 sec.	
Winter Ramp PID Tuning Cycle Time	1 sec.	0 sec.	100 sec.	
Winter Ramp PID Tuning Deadband	1.0°F	0.0°F	50.0°F	
OAD Airflow Ramp P Gain	0.015	0.001	999.999	
OAD Airflow Ramp I Time	30 sec.	0 sec.	1800 sec.	
Min OAD Airflow Ramp P Gain	0.020	0.001	999.999	
Min OAD Airflow Ramp I Time	250 sec.	0 sec.	1800 sec.	
Heat Wheel Bypass P Gain	2.000	0.001	999.999	
Heat Wheel Bypass I Time	60 sec.	0 sec.	1800 sec.	
Circuit Pressure P Gain	1.800	0.001	999.999	
Circuit Pressure I Time	20 sec.	0 sec.	1800 sec.	
Economizer P Gain	2.000	0.001	999.999	
Economizer I Time	300 sec.	0 sec.	1800 sec.	
Economizer Disable Fallback	Disabled (□)	Disabled (□)	Enabled (X)	
Hot Gas Reheat P Gain	10.000	0.001	999.999	
Hot Gas Reheat I Time	150 sec.	0 sec.	1800 sec.	
CO_2 Control P Gain	4.000	0.001	999.999	
CO_2 Control I Time	600 sec.	0 sec.	1800 sec.	
Supply Fan Airflow P Gain	0.006	0.001	999.999	
Supply Fan Airflow I Time	40 sec.	0 sec.	1800 sec.	
Exhaust Fan Airflow P Gain	0.006	0.001	999.999	
Exhaust Fan Airflow I Time	40 sec.	0 sec.	1800 sec.	
HGRH Purge Mode Purge Interval	60 min.	30 min.	480 min.	
HGRH Purge Mode Purge Duration	120 sec.	45 sec.	300 sec.	
Login Duration	30 min.	5 min.	60 min.	
Chilled Water Valve Position	Closed	Closed	Open	
Modulating Compressor Minimum Signal Cooling	12%	12%	100%	
Modulating Compressor Minimum Signal Dehumidify	50%	Cooling Min.	100%	
Comp Signal Ramp Rate	30 sec.	1 sec.	100 sec.	
Password Management - Service Password	9998	0001	9999	
WSHP Freeze Protection	0.0°F	32.0°F	32.0°F	
WSHP Compressor Delay	60 sec.	30 sec.	120 sec.	

Note:

Set-point availability varies based on unit configuration.

CONTROLLER

Network Settings Data Tables

Table 41: Network Settings Data Table.

Control Variable	Default	Min.	Max.	Notes
pCO Board Address				
Enable DHCP	Disabled (□)	Disabled (□)	Enabled (X)	
IP	192.168.1.101	0.0.0.0	255.255.255.255	
Mask	255.255.255.0	255.0.0.0	255.255.255.0	
GW	192.168.1.1	0.0.0.0	255.255.255.255	
DNS	0.0.0.0	0.0.0.0	255.255.255.255	
BMS Communications Type	None	None, BACnet IP BMS Card, BACnet MSTP BMS Card, Lonworks BMS Card, MODBUS TCP BMS Card, MODBUS RTU BMS Card, BACnet MSTP J25 BMS2, MODBUS RTU J25 BMS2, BACnet IP Ethernet, Fieldserver J25 BMS2, MODBUS TCP Ethernet		
BACnet MSTP Config (J25 BMS2) - Onboard BACnet MSTP				
Device	77077	1	4194302	
Info Frames	20	1	127	
Max. Masters	127	1	127	
MSTP Address	77	0	126	
Baud Rate	76800	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200		
MODBUS RTU Config (J25 BMS2) - Onboard MODBUS RS485				
Address	1	1	277	
Baud Rate	76800	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200		
Stop Bits	2	1	2	
Parity	None	None, Odd, Even		
BACnet IP Config (Ethernet) - Onboard BACnet TCP/IP				
Device	77077	1	4194302	
UDP Port	47808	0	65535	
MODBUS TCP Slave (Ethernet) - Onboard MODBUS TCP/IP				
Device ID	1	1	277	
BMS Watchdog				
Enable	Disabled (□)	Disabled (□)	Enabled (X)	
Timeout Delay	15 min.	1 min.	99 min.	
BACnet COV Increment				
PPM	10.0 ppm	0.0 ppm	100.0 ppm	
Pressure	5.0 psig	0.0 psig	10.0 psig	
Static	0.001"wc	0.0"wc	1.0"wc	
Temp	0.1 Δ°F	0.0 Δ°F	2.0 Δ°F	
Airflow	100 CFM	0 CFM	100 CFM	
Enthalpy	0.5 Btu/hr.	0.0 Btu/hr.	2.0 Btu/hr.	
Percent	1.0%	0.0%	5.0%	
Sensor Source				
Outside Air Temp.	Local	Local	BMS	
Outside % RH	Local	Local	BMS	
Space Temp.	Local	Local	BMS	
Space % RH	Local	Local	BMS	
Space 1 CO_2	Local	Local	BMS	
Space 2 CO_2	Local	Local	BMS	
Return CO_2	Local	Local	BMS	
Space Static Pressure	Local	Local	BMS	
Backup Settings				
Save In	Int. Memory	Int. Memory	USB Drive	
Save	Do Not Save (□)	Do Not Save (□)	Save (X)	

Note:

Set-point availability varies based on unit configuration.

Table 42: Network Settings Data Table, continued.

Control Variable	Default	Min.	Max.	Notes
USB Restore				
Disable Unit Prior to Restore	Disabled	Disabled	Enabled	
Enable Restore	No Restore (□)	No Restore (□)	Restore (X)	
Internal Restore				
Disable Unit Prior to Restore	Disabled	Disabled	Enabled	
Enable Restore	No Restore (□)	No Restore (□)	Restore (X)	
Last Save Time	hh: mm mm/dd/yy			
IO Status/Offset				
Input Offset Ch↑↓	Press Enter to select the analog input channel			
Input Offset	Press Enter again to select a value to offset the input by			
Input Offset Value	Current Value of the Channel selected			
Channel Menu IO Type	Select the IO Type: Univ Ch, Digital In, Digital Out, Analog Out			
Channel Menu Ch↑↓	Select the Channel: Dependent on control boards installed			
Channel Menu Value	Current Value of the Channel selected			
Unit Configuration				
Exp 1	Not Installed	Not Installed, Standard c.pCO, c.pCOe		
Exp 2	Not Installed	Not Installed, Standard c.pCO, c.pCOe		
Exp 3	Not Installed	Not Installed, Standard c.pCO, c.pCOe		
Expansion Connection Port	FBus2 to BMS2	FBus2 to BMS2	Ethernet IP	
FB2 Expansion Board Baud Rate	19200	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200		
FB2 Expansion Board Stop_Bits	1	1	2	
FB2 Expansion Board Parity	None	None, Odd, Even		
Airflow Monitoring Density Calc	Disabled (□)	Disabled (□)	Enabled (X)	
Supply Fan Control Type	Constant Volume	Constant Volume, Duct Static, Space Static, Hardwired Input, Single Zone VAV, CFM Control		
Supply Fan Control K Factor	0.0	0.0	99999.9	Default determined by the unit purchased
Exhaust Fan Control Type	Not Installed	Not Installed, Constant Volume, Space Static, Sup Track w/Off, Pool Space Static, CFM Control, Hardwired, Rtn Duct Static		
Exhaust Fan Control K Factor	0.0	0.0	99999.9	Default determined by the unit purchased
Dehumidification Mode Installed	Disabled (□)	Disabled (□)	Enabled (X)	
Occupied Dehum. Call Enabled	Inside RH AND Inside Dewpoint OR Outside Dewpoint	Inside RH, Inside Dewpoint, Outside Dewpoint, Inside RH OR Inside Dewpoint, Inside RH OR Inside Dewpoint OR Outside Dewpoint, Inside RH AND Inside Dewpoint, Inside RH AND Inside Dewpoint OR Outside Dewpoint		
Unoccupied Dehum. Call Enabled	Inside RH	Inside RH, Inside Dewpoint, Inside RH OR Inside Dewpoint, Inside RH AND Inside Dewpoint		
Unoccupied Unit Operation	Night Setback Cycle	Night Setback Cycle, Normal Op wUnoc Spts, Recirc wUnoc Spts		
Morning Warm Up	CMN	Disabled (□)	Enabled (X)	
Morning Cool Down	CMN	Disabled (□)	Enabled (X)	
Max Duration	30 min.	0 min.	99 min.	
Economizer Installed	CMN	Disabled (□)	Enabled (X)	
Econ w/Mech Clg	Enabled (X)	Disabled (□)	Enabled (X)	
CO_2 Control	CMN	Not Installed (□)	Installed (X)	
OAD CFM Control	CMN	Not Installed (□)	Installed (X)	
Min OAD CFM Control	CMN	Not Installed (□)	Installed (X)	
Cooling Enabled	Enabled (X)	Disabled (□)	Enabled (X)	

Note:

Set-point availability varies based on unit configuration.

CONTROLLER

Network Settings Data Tables

Table 43: Network Settings Data Table, continued.

Control Variable	Default	Min.	Max.	Notes
Unit Configuration, continued.				
Controls Lite Mode	Set-point	Set-point	Demand	
Heating Enabled	Enabled (X)	Disabled (□)	Enabled (X)	
Case Heat Installed	Not Installed (□)	Not Installed (□)	Installed (X)	
Compressor Config - Stage	Read Only			Up to 8 compressors
Compressor Config- Ramp	Read Only			Up to 8 compressors
Compressor Config-Circuit	Read Only			Up to 8 compressors
Compressor Config-Modulates	Read Only			Up to 8 compressors
Change Lead Lag Mode	Lead	Lead, Lag, w/Dehumid, Weekly		
Change Lead Lag Day	Monday	Not Installed, Standard c.pCO, c.pCOe		Shows when Weekly is selected
Ramp 1 Lead Order Stage (1-8)	1	1	No. Comps on Ramp	Has only 1 Cooling Ramp with up to 4 stages
Ramp 1 Lag Order Stage (1-8)	1	1	No. Comps on Ramp	Has only 1 Cooling Ramp with up to 4 stages
OAD Space Static Enabled	Disabled (□)	Disabled (□)	Enabled (X)	
Reheat Plus Enabled	Disabled (□)	Disabled (□)	Enabled (X)	Only shows when Reheat Plus is Installed from CMN
Heat Pump Defrost Enabled	Enabled (X)	Disabled (□)	Enabled (X)	Shows when unit is configured as an ASHP
Max. Elec. Heat	100%	0%	100%	
CMN Breakout BMS Comm	Stand Alone, Lontalk, BACnet IP, BACnet MSTP, MODBUS RTU, MODBUS IP			CMN
CMN Breakout Dmp Ctrl	100% Outside Air, Recirculating			CMN
CMN Breakout Sup Fan	Constant Volume, VAV Duct Static, Hardwired Input, BMS, CV Damper Static, Space Static, Single Zone VAV, CFM Control			CMN
CMN Breakout CO_2 Ctrl	Disabled, Enabled			CMN
CMN Breakout Exh Fan	None, Supply Tracking, Space Pressure, Hardwired, BMS Control, CFM Control			CMN
CMN Breakout Rem Dmp	Disabled, BMS Control, CFM Control			CMN
CMN Breakout PreHeat	None, Installed			CMN
CMN Breakout Air Flow	None, Supply Inlet Cone, IAQ Damper, Supply Inlet & IAQ Damper, Exhaust Inlet Cone, Supply & Exhaust Inlet Cones, Exhaust Inlet & IAQ Damper, SF/EF Inlets & IAQ Damper			CMN
CMN Breakout Heating	None, Gas 1 or 2 burner, Gas and Electric, Electric Only, 12:1 Gas, Hot Water, 6:1 Gas, 10:1-2 Furnace Gas			CMN
CMN Breakout Cooling	None, 1 Compressor, 2 Compressors, 4 Compressors, 1 Mod Comp, 2 Comps w/Mod, 4 Comps w/Mod, Chilled Water			CMN
CMN Breakout Enrg Rec	None, Heat Wheel w/VFD, Heat Wheel On/Off, Sensible Plate, Enthalpic Plate, Enthalpic Plate with Bypass			CMN
CMN Breakout Economizer	None, Installed			CMN
CMN Breakout AMD Type	Standard, Thermal Dispersion			CMN
CMN Breakout Cond Fan	None, 1 Fan, 2 Fans, 3 Fans, 4 Fans, 6 Fans, 8 Fans			CMN
CMN Breakout Cond HPC	None, 1.0 A Only, 1.0 B Only, 1.0 A and B, 2.0 A Only, 2.0 B Only, 2.0 A and B, 2.0 A/B Split			CMN
CMN Breakout Heat Pump	None, ASHP, WSHP			CMN

Note:

Set-point availability varies based on unit configuration.

Table 44: Network Settings Data Table, continued.

Control Variable	Default	Min.	Max.	Notes
Unit Configuration, continued.				
CMN Breakout AM Warm Up	None, Installed			CMN
CMN Breakout HGRH/Dehumidification	None, Installed			CMN
CMN Breakout Heat Wheel Rotation Sensor	None, Installed			CMN
CMN Breakout Set-point Adjustment	None, Slider, BAPI Stat			CMN
CMN Breakout Compressor Modulation	None, DSC, INV			CMN
CMN Breakout Condensate Overflow Switch	None, Installed			CMN
OA AMD Calculation Area	0.0	0.0	9999.9	Default determined by the unit purchased
OA AMD Calculation K	0.0	0.0	9999.9	Default determined by the unit purchased
OA AMD Calculation m	0.0	0.0	999.999	Default determined by the unit purchased
Unit Settings				
Timezone	11 (America/ Chicago Central Time)	1	84	
Time	Current Time	12:00 AM	11:59 PM	
Date	Current Date	Jan. 1, 2000	Dec. 31, 2099	
Temperature	°F	°F	°C	
Static Pressure	"wc	"wc	Pa	
Air Flow	CFM	CFM	m^3/h.	
Pressure	psi	psi	bar	
Enthalpy	Btu/lb.	Btu/lb.	kj/kg	
Fluid Flow	gpm	gpm	l/min.	
Distance	in.	in.	cm	
Unit Altitude	830 ft.	0 ft.	10000 ft.	
Advanced Alarm Logging Enable	Enabled (X)	Disabled (□)	Enabled (X)	
Power Loss Startup Auto Restart	Enabled (X)	Disabled (□)	Enabled (X)	
Service Information				
Unit Information Prg Initials	Read Only			
Unit Information Job Name	Read Only			
Unit Information SO#	Read Only			
Unit Information Unit	Read Only			
Unit Information Date	Read Only			
Unit Information Version	Read Only			
Blackout Information Record	No. of Total Records			
Blackout Information Power Cycled	MM/DD/YY HH:MM.SS			
Blackout Information Power Lost For	x Days, x Hours, x Mins			
c.pCO Board Info Cycle Time	Read Only			
c.pCO Board Info Cycles (Per Second)	Read Only			
c.pCO Board Info Board Temp.	Read Only			
c.pCO Board Info Board Power	Read Only			
Compressor Info Run Hours	Read Only			Reset Available
Compressor Info No. of Starts	Read Only			Reset Available
Compressor Maintenance Alarm Set-point	9999999	0	9999999	
EOL Test Enable EOLT	Disabled (□)	Enabled (X)	Disabled (□)	Hidden (Factory Password)

Note:

Set-point availability varies based on unit configuration.

CONTROLLER

Network Settings Data Tables

Table 45: Network Settings Data Table - Alarm Management.

Control Variable	Default	Min.	Max.	Notes
Shutdown Alarms				
Supply High Static Alarm Set-point	4.000"wc	0.000"wc	5.000"wc	
Supply Temp. Low Limit Alarm Set-point	35.0°F	30.0°F	50.0°F	
Supply Temp. Low Limit Delay	5 min.	0 min.	15 min.	
Supply Temp. High Limit Alarm Set-point	120.0°F	90.0°F	120.0°F	
Supply Temp. High Limit Delay	3 min.	0 min.	15 min.	
Space High Static Alarm Set-point	0.200"wc	-0.500"wc	0.500"wc	
Shutdown Alarm Lockout Enable	Enabled (X)	Disabled (□)	Enabled (X)	
Supply Fan Alarm Shutdown Unit	Enabled (X)	Disabled (□)	Enabled (X)	
Exhaust Fan Alarm Shutdown Unit	Enabled (X)	Disabled (□)	Enabled (X)	
General Alarms				
Alarm Digital Output Type	Any Alarm	Shutdown	Any Alarm	
Low Saturated Suction Temperature	25.0°F	0.0°F	40.0°F	WSHP Only
Fan Alarm Delay	60 sec.	30 sec.	120 sec.	
Internal Board Temp.	Enabled (X)	Disabled (□)	Enabled (X)	

Note:

Set-point availability varies based on unit configuration.

Table 46: Alarm Data.

Alarm ID	Alarm Screen Line 1	Alarm Screen Line 2	Reset Type	Lockout	Action Type	Notes
1	Supply Fan 1 Run	Status Not Proven	Auto		Optional Shutdown Unit	
2	Fire/Smoke Alarm	In Alarm Position	Auto		Shutdown Unit	
3	Phase Protection	Relay Tripped	Auto		Shutdown Unit	
4	Freeze Protection	Thermostat Tripped	Manual		Shutdown Unit	
5	High Supply Duct	Static Pressure	Manual		Shutdown Unit	
6	Low Return Duct	Static Pressure	Manual		Shutdown Unit	
7	Outside Air Temp	Sensor Value Not Valid	Auto		Informational	
8	Supply Air Temperature	Sensor Value Not Valid	Auto		Shutdown Unit	
9 - 10	Cold Coil (x) Temp	Sensor Value Not Valid	Auto		Disable Cooling Ramp	
11	Exhaust Air Temp	Sensor Value Not Valid	Auto		Disable Defrost	
12	HX LA Temperature	Sensor Value Not Valid	Auto		Informational	
13	Mixed Air Temperature	Sensor Value Not Valid	Auto		Informational	
14	Preheat Leaving Temp	Sensor Value Not Valid	Auto		Disable Preheat	
15	Return Air Temperature	Sensor Value Not Valid	Auto		Disable Return Temp/ Dewpoint Control	
16	Space Temperature	Sensor Value Not Valid	Auto		Disable Space Temp/ Dewpoint Control	
17	Return Air RH	Sensor Value Not Valid	Auto		Disable Return RH/ Dewpoint Control	
18	Space RH	Sensor Value Not Valid	Auto		Disable Space RH/ Dewpoint Control	
19	Supply Air RH	Sensor Value Not Valid	Auto		Disable Supply RH/ Dewpoint Control	
20	HX Leaving RH	Sensor Value Not Valid	Auto		Informational	
21	Outside RH	Sensor Value Not Valid	Auto		Disable OA RH/ Dewpoint Control	
22 - 23	Cold Coil (x) RH	Sensor Value Not Valid	Auto		Informational	
24	Exhaust Air RH	Sensor Value Not Valid	Auto		Informational	
25	Preheat Leaving RH	Sensor Value Not Valid	Auto		Informational	
26 -29	Low Pressure Switch	Circuit (x)	Auto until Lockout	3x in 1 hr	Disable Compressor Circuit	
30 -33	High Pressure Switch	Circuit (x)	Auto		Disable Compressor Circuit	Manual at the Switch
34	Damper Proving Switch	Dampers are closed	Manual		Shutdown Unit	
35	Exhaust Fan 1 Run	Status Not Proven	Manual		Optional Shutdown Unit	
36	Return Fan 1 Run	Status Not Proven	Manual		Optional Shutdown Unit	
37	Pre-Filters are Dirty	Replace Filters	Auto		Informational	
38	OA Filters are Dirty	Replace Filters	Auto		Informational	
39	RA Filters are Dirty	Replace Filters	Auto		Informational	
40	Cond Drain Pan Full	Check Drain	Manual		Shutdown Unit	
41 - 44	Exp Board (x) Status	Board is Offline	Auto		Shutdown Unit	
45 - 48	Low Pressure Switch	Circuit (x)	Auto until Lockout	3x in 1 hr	Disable Compressor Circuit	
49 - 52	High Pressure Switch	Circuit (x)	Auto		Disable Compressor Circuit	Manual at the Switch
53 - 64	Belimo Act (x) Comm	Actuator is Offline	Auto		Informational	
65	Non Volatile Memory Er	Contact Unison	Auto		Informational	
66 - 68	Supply Fan (x) Run	Status Not Proven	Manual		Optional Shutdown Unit	
69 - 71	Exhaust Fan (x) Run	Status Not Proven	Manual		Optional Shutdown Unit	
72 - 74	Return Fan (x) Run	Status Not Proven	Manual		Optional Shutdown Unit	
75 - 78	Scavenger Fan (x) Run	Status Not Proven	Manual		Optional Shutdown Unit	
79	Mixed Air RH	Sensor Value Not Valid	Auto		Informational	

CONTROLLER

Alarm Data

Table 47: Alarm Data, continued.

Alarm ID	Alarm Screen Line 1	Alarm Screen Line 2	Reset Type	Lockout	Action Type	Notes
80	Supply Water Temp 1	Sensor Value Not Valid	Auto		Disable Compressors	WSHP
81	Return Water Temp 1	Sensor Value Not Valid	Auto		Disable Compressors	WSHP
82	Reac Whl In Temp	Sensor Value Not Valid	Auto		50% DFF Control	
83	Reac Whl Out Temp	Sensor Value Not Valid	Auto		Informational	
84 - 85	Cold Coil (x) Temp	Sensor Value Not Valid	Auto		Disable Cooling Ramp	
86 - 87	Cold Coil (x) RH	Sensor Value Not Valid	Auto		Informational	
88	Return Filter Pressure	Sensor Value Not Valid	Auto		Informational	
89	Space 1 CO2	Sensor Value Not Valid	Auto		Disable CO_2	
90	Space Static Pressure	Sensor Value Not Valid	Auto		Informational	
91	OA Filter Pressure	Sensor Value Not Valid	Auto		Informational	
92	Supply Duct Stat Press	Sensor Value Not Valid	Auto		Disable Static Press Control	
93	Return Duct Stat Press	Sensor Value Not Valid	Auto		Disable Static Press Control	
94 - 97	Sup Fan (x) AFMS	Sensor Value Not Valid	Auto		Informational	
98 - 101	Ret Fan (x) AFMS	Sensor Value Not Valid	Auto		Informational	
102 -105	Exh Fan (x) AFMS	Sensor Value Not Valid	Auto		Informational	
106	Min Outside Dmpr AFMS	Sensor Value Not Valid	Auto		Informational	
107	Outside Damper AFMS	Sensor Value Not Valid	Auto		Informational	
108	HW Exhaust Pressure	Sensor Value Not Valid	Auto		Disable Wheel Ex Bypass	Heat Wheel
109	HW Supply Pressure	Sensor Value Not Valid	Auto		Disable Wheel Ex Bypass	Heat Wheel
110 - 121	Zone (x) Space Temp	Sensor Value Not Valid	Auto		Disable Zone Control	
122	Space Setpt Adj Slider	Sensor Value Not Valid	Auto		Informational	
123	Space 2 CO2	Sensor Value Not Valid	Auto		Disable CO2	
124	Return CO2	Sensor Value Not Valid	Auto		Disable CO2	
125 - 132	Discharge Press Ckt (x)	Sensor Value Not Valid	Auto		Disable Compressor Circuit	
133 - 140	Suction Press Ckt (x)	Sensor Value Not Valid	Auto		Disable Compressor Circuit	Only with EVD
141 - 148	Discharge Temp Ckt (x)	Sensor Value Not Valid	Auto		Disable Compressor Circuit	Only with EVD
149 - 156	Suction Temp Ckt (x)	Sensor Value Not Valid	Auto		Disable Compressor Circuit	Only with EVD
157 - 164	High Disch Temp Ckt (x)	Compressors Disabled	Auto		Disable Compressor Circuit	
165 - 172	High Superheat Ckt (x)	Compressors Disabled	Manual		Disable Compressor Circuit	
173 - 180	Low Superheat Ckt (x)		Auto		Disable Compressor Circuit	
181 - 188	High Compression	Ckt (x) Comps Disabled	Auto until Lockout	3x in 1 hr	Disable Compressor Circuit	
189 - 196	High Suction Pressure	Ckt (x) Comps Disabled	Auto until Lockout	3x in 1 hr	Disable Compressor Circuit	
197 - 204	Low Condenser Pressure	Ckt (x) Comps Disabled	Auto until Lockout	3x in 1 hr	Disable Compressor Circuit	
205 - 212	Ckt A High Saturated	Discharge Temperature	Auto		Disable Compressor Circuit	
213 - 220	Ckt A Low Saturated	Suction Temperature	Auto		Disable Compressor Circuit	
221	Supply Air Temperature	Low Limit Shutdown	Manual		Shutdown Unit	
222	Heat Wheel Rotation	Not Detected	Auto		Informational	
223 - 226	Slave Unit (x) Offline		Auto		Informational	
227	Master Unit Offline		Auto		Disable Slave Mode	
228 - 235	Ckt (x) Abnormal Press	Compressors Disabled	Auto		Disable Compressor Circuit	
236	Heat Pump Defrost	Mode is Active	Auto	3x in 1 hr	Informational	
237	Multi Devices per Ch	Contact Unison	Auto		Informational	
238 -239	Exp Board (x) Failure	Board is Offline	Auto		Shutdown Unit	
240	Shutdown Contact	In Alarm Position	Auto		Shutdown Unit	
241	Cold Deck Temperature	Sensor Value Not Valid	Auto		Disable Cold Deck Control	
242	Hot Deck Temperature	Sensor Value Not Valid	Auto		Disable Hot Deck Control	

Table 48: Alarm Data, continued.

Alarm ID	Alarm Screen Line 1	Alarm Screen Line 2	Reset Type	Lockout	Action Type	Notes
243	Neutral Deck Temp	Sensor Value Not Valid	Auto		Informational	
244	Comp Maint Alarm	Run Hours Spt Reached	Manual		Informational	
245	Supply Air Temperature	High Limit Shutdown	Manual		Shutdown Unit	
246	Space High Static Pres	Shutdown	Manual		Shutdown Unit	
247 - 254	Liquid Pres Ckt (x)	Sensor Value Not Valid	Auto		Switch to Discharge or 100% Cond Fan	
255	Internal Board Temp	Exceeds -40F or 158F	Auto		Informational	
256	Regeneration Fan Run	Status Not Proven	Auto		Disable Regen Control	
257 - 264	Water Flow Ckt (x)	Flow Switch not made	Manual		Disable Compressor Circuit	
265	Pre Cooling Coil Temp	Sensor Value Not Valid	Auto		Disable PreCooling	
266	Post Cooling Coil Temp	Sensor Value Not Valid	Auto		Informational	
267	BMS Offline	Watchdog is FALSE	Auto		Local Control	
268 - 275	Liquid Temp Ckt (x)	Sensor Value Not Valid	Auto		Switch to Discharge or 100% Cond Fan	
276	Clg Coil Setpt Input	Value is not valid	Auto		Informational	Controls Lite - Setpt Mode
277	Sup Air Setpt Input	Value is not valid	Auto		Informational	Controls Lite - Setpt Mode
278	Cond Circuit (x)	Overload Tripped	Auto		Disable Compressor Circuit	
286	Supply Fan	Overload Tripped	Auto		Informational	
287	Exhaust Fan	Overload Tripped	Auto		Informational	
288	Generic Fan	Overload Tripped	Auto		Informational	
289	BACnet License	Not Installed	Auto		Informational	
290	Regen Low Temp	Check Furnace	Auto		Informational	
291	Water Leak	Detected	Manual		Disable Compressors	
292	Oil Level Switch	Inverter Compressor	Auto		Disable Inverter Circuit	
293	Supply Water Temp 2	Sensor Value Not Valid	Auto		Disable Compressors	WSHP
294	Return Water Temp 2	Sensor Value Not Valid	Auto		Disable Compressors	WSHP
295 - 296	Low Suction SH ExV (x)	EVD Alarm	Auto		Disable Inverter Circuit	Only with EVD
297 - 298	LOP (x) EVD 1	Low Operating Pressure	Auto		Disable Inverter Circuit	Only with EVD
299 - 300	MOP (x) EVD 1	Max Operating Pressure	Manual		Disable Inverter Circuit	Only with EVD
301 - 302	EEV (x) EVD 1	Motor Alarm	Auto		Disable Inverter Circuit	Only with EVD
303 - 304	LowSuct (x) EVD 1	Refrigerant Temp	Auto		Disable Inverter Circuit	Only with EVD
305	High Condensing Temp		Auto		Disable Inverter Circuit	Only with EVD
306	Suction Press Sens S1	Sensor Value Not Valid	Auto		Disable Inverter Circuit	Only with EVD
307	Suction Temp Sens S2	Sensor Value Not Valid	Auto		Disable Inverter Circuit	Only with EVD
308	Probe S3 - Not Used	Sensor Value Not Valid	Auto		Disable Inverter Circuit	Only with EVD
309	Dschg Temp Sens S4	Sensor Value Not Valid	Auto		Disable Inverter Circuit	Only with EVD
310	EVD EEPROM Damaged	Call Unison	Auto		Disable Inverter Circuit	Only with EVD
311	Incomplete Closing EVD		Auto		Disable Inverter Circuit	Only with EVD
312	Emergency Closing EVD		Auto		Disable Inverter Circuit	Only with EVD
313	EVD Battery	Replace Battery	Auto		Disable Inverter Circuit	Only with EVD
314	FW Incompatibility	Call Unison	Auto		Disable Inverter Circuit	Only with EVD
315	EVD Config Error		Auto		Disable Inverter Circuit	Only with EVD
316	EVD Comm	EVD is Offline	Auto		Disable Inverter Circuit	Only with EVD
317	High Discharge Temp	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
318	Low Discharge Pressure	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
319	High Suction Pressure	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll

CONTROLLER

Alarm Data

Table 49: Alarm Data, continued.

Alarm ID	Alarm Screen Line 1	Alarm Screen Line 2	Reset Type	Lockout	Action Type	Notes
320	Low Suction Pressure	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
321	High Current	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
322	High Pressure Ratio	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
323	Low Pressure Ratio	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
324	Low Delta P	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
325	High Discharge Press	Inverter Compressor	Auto until Lockout	3x in 1 hr	Disable Inverter Circuit	Only with Inverter Scroll
326 -327	WSHP Freeze	Protection Circuit (x)	Auto		Disable Compressors	
328 - 329	Low Entering Water	Temp - Circuit (x)	Auto		Informational	
330 - 331	High Entering Water	Temp - Circuit (x)	Auto		Informational	
332	Compressor Staging	Order Skipped	Auto		Informational	
333	HP Defrost 3 Strike	HP Heating Not Avail	Manual		Disable HP Heating	2 hours + Temp Rise for Reset
334	EVD Error	Unexpected Position	Auto			

BACnet and MODBUS Points

Table 50: BACnet and MODBUS Points List.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Analog Inputs – Read Only										
Cold_Coil_1_Temp_Analog_Input	Cold Coil 1 Temperature			25	AI	ReadCOV_NoWrite	0.1	30244	Input	2
Exhaust_Temp_Analog_Input	Exhaust Temperature			30	AI	ReadCOV_NoWrite	0.1	30254	Input	2
CL_Coil_Spt_Temp	Controls Lite Cooling Coil Set-point Temperature			31	AI	ReadCOV_NoWrite	0.1	30256	Input	2
CL_Supply_Spt_Temp	Controls Lite Supply Set-point Temperature			32	AI	ReadCOV_NoWrite	0.1	30258	Input	2
Mixed_Temp_Analog_Input	Mixed Temperature			35	AI	ReadCOV_NoWrite	0.1	30264	Input	2
Outside_Air_Temp_Analog_Input	Outside Air Temperature			37	AI	ReadCOV_NoWrite	0.1	30268	Input	2
Return_Temp_Analog_Input	Return Temperature			41	AI	ReadCOV_NoWrite	0.1	30276	Input	2
Leaving_Water_Temp_1_Analog_Input	Leaving Water Temperature Circuit A			42	AI	ReadCOV_NoWrite	0.1	30278	Input	2
Space_Setpoint_Slider_Analog_Input	Space Set-point Slider Analog Input			43	AI	ReadCOV_NoWrite	0.1	30280	Input	2
Space_Temp_Analog_Input	Space Temperature			44	AI	ReadCOV_NoWrite	0.1	30282	Input	2
Supply_Temp_Analog_Input	Supply Temperature			45	AI	ReadCOV_NoWrite	0.1	30284	Input	2
Entering_Water_Temp_1_Analog_Input	Entering Water Temperature Circuit A			46	AI	ReadCOV_NoWrite	0.1	30286	Input	2
Outside_RH_Analog_Input	Outside % Relative Humidity			86	AI	ReadCOV_NoWrite	0.1	30350	Input	2
Return_RH_Analog_Input	Return % Relative Humidity			88	AI	ReadCOV_NoWrite	0.1	30354	Input	2
Space_RH_Analog_Input	Space % Relative Humidity			89	AI	ReadCOV_NoWrite	0.1	30356	Input	2
Space_Static_Pressure_Analog_Input	Space Static Pressure			94	AI	ReadCOV_NoWrite	0.001	30366	Input	2
Supply_Duct_Static_Pressure_Analog_ Input	Supply Duct Static Pressure			95	AI	ReadCOV_NoWrite	0.01	30368	Input	2
Space_CO2_1_Analog_Input	Space 1 CO_2 ppm			116	AI	ReadCOV_NoWrite	10	30402	Input	2
Circuit_A_Discharge_Pressure_Analog_ Input	Circuit A Discharge Pressure			119	AI	ReadCOV_NoWrite	0.1	30408	Input	2
Circuit_B_Discharge_Pressure_Analog_ Input	Circuit B Discharge Pressure			121	AI	ReadCOV_NoWrite	1	30412	Input	2
Exhaust_Fan_Speed_Analog_Input	Exhaust Fan Speed Remote Command Analog Input value			143	AI	ReadCOV_NoWrite	1	30456	Input	2
Supply_Fan_Speed_Analog_Input	Supply Fan Speed Remote Command Analog Input value			155	AI	ReadCOV_NoWrite	1	30462	Input	2
Entering_Water_Temp_2_Analog_Input	Entering Water Temperature Circuit B			161	AI	ReadCOV_NoWrite	0.1	30468	Input	2
Leaving_Water_Temp_2_Analog_Input	Leaving Water Temperature Circuit B			162	AI	ReadCOV_NoWrite	0.1	30470	Input	2

CONTROLLER

BACnet and MODBUS Points

Table 51: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Analog Values – Read/Write – Commandable										
Temperature_Setpoint	Main Temperature Set-point Supply, Space, or Return Target Temperature			1	AV	ReadCOV_ Commandable	0.1	40002	Holding	2
Temperature_Heat_ Cool_Deadband	Heat/Cool Spt Deadband when Space or Return control is active Clg Spt = Offset/2 + Temp Spt Htg Spt = Offset/2 - Temp Spt			2	AV	ReadCOV_ Commandable	0.1	40004	Holding	2
Cooling_Coil_Setpoint	Cooling Coil Leaving Air Set-point			3	AV	ReadCOV_ Commandable	0.1	40006	Holding	2
Dehumidification_ Setpoint	"Dehumidification Set-point %RH for Space or Return control"			5	AV	ReadCOV_ Commandable	0.1	40010	Holding	2
Outside_Dewpoint_ Setpoint	Outside Dewpoint Dehumidification Trigger Setpoint			6	AV	ReadCOV_ Commandable	0.1	40012	Holding	2
Inside_Dewpoint_ Setpoint	Inside Dewpoint Dehumidification Trigger Setpoint			7	AV	ReadCOV_ Commandable	0.1	40014	Holding	2
Unocc_Inside_ Dewpoint_Setpoint	Unoccupied Inside Dewpoint Dehumidification Trigger Setpoint			9	AV	ReadCOV_ Commandable	0.1	40018	Holding	2
Unoccupied_Cooling_ Setpoint	Unoccupied Cooling Setpoint			10	AV	ReadCOV_ Commandable	0.1	40020	Holding	2
Unoccupied_ Dehumidification_ Setpoint	"Unoccupied Dehumidification %RH Setpoint"			11	AV	ReadCOV_ Commandable	0.1	40022	Holding	2
Unoccupied_Heating_ Setpoint	Unoccupied Heating Setpoint			12	AV	ReadCOV_ Commandable	0.1	40024	Holding	2
Economizer_Temp_ Enable_Setpoint	Economizer Ambient Temp Enable Setpoint Allow Econ when OAT<Spt			16	AV	ReadCOV_ Commandable	0.1	40032	Holding	2
Economizer_Enthalpy_ Enable_Setpoint	Economizer Enthalpy Enable Setpoint Allow Econ when OA Enthalpy<Spt			17	AV	ReadCOV_ Commandable	0.1	40034	Holding	2
Supply_Fan_CFM_ Setpoint_BMS	Supply Fan CFM Setpoint			18	AV	ReadCOV_ Commandable	0.1	40036	Holding	2
OAD_CFM_Setpoint_ BMS	OAD CFM Setpoint			19	AV	ReadCOV_ Commandable	0.1	40038	Holding	2
Outside_RH_from_BMS	Outside RH from BMS Used when source selection is set to BMS			21	AV	ReadCOV_ Commandable	0.1	40042	Holding	2
Outside_Temp_from_ BMS	Outside Temp from BMS Used when source selection is set to BMS			22	AV	ReadCOV_ Commandable	0.1	40044	Holding	2
Return_RH_from_BMS	Return RH from BMS Used when source selection is set to BMS			23	AV	ReadCOV_ Commandable	0.1	40046	Holding	2

Table 52: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Analog Values – Read/Write – Commandable, continued.										
Return_Temp_from_BMS	Return Temp from BMS Used when source selection is set to BMS			24	AV	ReadCOV_Commandable	0.1	40048	Holding	2
Space_1_CO2_from_BMS	Space 1 CO2 from BMS Used when source selection is set to BMS			25	AV	ReadCOV_Commandable	0.1	40050	Holding	2
Space_RH_from_BMS	Space RH from BMS Used when source selection is set to BMS			28	AV	ReadCOV_Commandable	0.1	40056	Holding	2
Space_Static_from_BMS	Space Static from BMS Used when source selection is set to BMS			29	AV	ReadCOV_Commandable	0.1	40058	Holding	2
Space_Temp_from_BMS	Space Temp from BMS Used when source selection is set to BMS			30	AV	ReadCOV_Commandable	0.1	40060	Holding	2
Cooling_Lockout_Setpoint	Cooling Ambient Lockout Set-point			31	AV	ReadCOV_Commandable	0.1	40062	Holding	2
Heating_Lockout_Setpoint	Heating Ambient Lockout Set-point			32	AV	ReadCOV_Commandable	0.1	40064	Holding	2
Preheat_Lockout_Setpoint	Preheat Ambient Lockout Set-point			33	AV	ReadCOV_Commandable	0.1	40066	Holding	2
Space_Static_Pressure_Setpoint	Space Static Pressure Set-point			37	AV	ReadCOV_Commandable	0.1	40074	Holding	2
Supply_Duct_Static_Pressure_Setpoint	Supply Duct Static Pressure Set-point			38	AV	ReadCOV_Commandable	0.1	40076	Holding	2
Space_CO2_Setpoint	Space CO_2 Set-point			39	AV	ReadCOV_Commandable	0.1	40078	Holding	2
Exhaust_Fan_CFM_Setpoint_BMS	Exhaust Fan CFM Set-point			113	AV	ReadCOV_Commandable	0.1	40080	Holding	2
SF_Control_Signal_BMS	BMS to control signal for supply fan speed			133	AV	ReadCOV_Commandable	0.1	40084	Holding	2
EF_Control_Signal_BMS	BMS to control signal for exhaust fan speed			134	AV	ReadCOV_Commandable	0.1	40086	Holding	2
OAD_Control_Signal_BMS	Allows the BMS to control OAD position			136	AV	ReadCOV_Commandable	0.1	40090	Holding	2
Outside_Air_Damper_Minimum_Setpoint	Outside Air Damper Minimum Set-point			137	AV	ReadCOV_Commandable	1	40092	Holding	2

CONTROLLER

BACnet and MODBUS Points

Table 53: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Analog Values – Read Only										
Unit_Status_Mode	See Unit Status Mode Table			40	AV	ReadCOV_NoWrite	0	30002	Input	2
Supply_Temperature_ Calculated_Setpoint	Active Supply Temperature Set-point			41	AV	ReadCOV_NoWrite	0.1	30004	Input	2
Cooling_1_Ramp_Capacity	Cooling Ramp 1 Compressor Capacity			43	AV	ReadCOV_NoWrite	1	30008	Input	2
Defrost_Ramp	Defrost Ramp			47	AV	ReadCOV_NoWrite	1	30016	Input	2
Economizer_Ramp	Economizer Ramp			48	AV	ReadCOV_NoWrite	1	30018	Input	2
Exhaust_Fan_Space_ Static_Pressure_ Ramp	Exhaust Fan Space Static Pressure Ramp			49	AV	ReadCOV_NoWrite	1	30020	Input	2
Exhaust_Fan_Supply_ Tracking_Ramp	Exhaust Fan Supply Tracking Ramp			50	AV	ReadCOV_NoWrite	1	30022	Input	2
Head_Pressure_Control_ Ramp_1_Ramp	Head Pressure Control Ramp 1			51	AV	ReadCOV_NoWrite	1	30024	Input	2
Head_Pressure_Control_ Ramp_2_Ramp	Head Pressure Control Ramp 2			52	AV	ReadCOV_NoWrite	1	30026	Input	2
HP_Ramp_Capacity	Heat Pump Heating Compressor Capacity			59	AV	ReadCOV_NoWrite	1	30040	Input	2
Heating_Ramp	Heating Ramp			60	AV	ReadCOV_NoWrite	1	30042	Input	2
Hot_Gas_Reheat_Ramp	Hot Gas Reheat Ramp			61	AV	ReadCOV_NoWrite	1	30044	Input	2
OAD_CFM_Ramp	OAD CFM Ramp			64	AV	ReadCOV_NoWrite	1	30050	Input	2
Space_CO2_Control_ Ramp	Space CO_2 Control Ramp			71	AV	ReadCOV_NoWrite	1	30064	Input	2
Supply_Duct_Static_ Pressure_Ramp	Supply Duct Static Pressure Ramp			72	AV	ReadCOV_NoWrite	1	30066	Input	2
Supply_Fan_CFM_ Control_Ramp	Supply Fan CFM Control Ramp			73	AV	ReadCOV_NoWrite	1	30068	Input	2
Supply_Fan_Space_ Static_Pressure_Ramp	Supply Fan Space Static Pressure Ramp			74	AV	ReadCOV_NoWrite	1	30070	Input	2
Winter_Ramp_Output	Winter Ramp Output			75	AV	ReadCOV_NoWrite	1	30072	Input	2
Outside_Dewpoint	Outside Dewpoint			82	AV	ReadCOV_NoWrite	0.1	30086	Input	2
Outside_Enthalpy	Outside Enthalpy			83	AV	ReadCOV_NoWrite	0.1	30088	Input	2
Space_Dewpoint	Space Dewpoint			88	AV	ReadCOV_NoWrite	0.1	30098	Input	2
Space_Enthalpy	Space Enthalpy			89	AV	ReadCOV_NoWrite	0.1	30100	Input	2
Total_Exhaust_Fan_CFM_ BMS	Total Exhaust Fan CFM			107	AV	ReadCOV_NoWrite	10	30136	Input	2
Total_Supply_Fan_CFM_ BMS	Total Supply Fan CFM			110	AV	ReadCOV_NoWrite	10	30140	Input	2
OAD_CFM_BMS	OAD CFM_BMS			129	AV	ReadCOV_NoWrite	0.1	30174	Input	2
OAD_Space_Static_ Pressure_Ramp	OAD Static Pressure Ramp			131	AV	ReadCOV_NoWrite	1	30178	Input	2
Active_Temperature_ Setpoint	Active Temperature Set-point			132	AV	ReadCOV_NoWrite	0.1	30180	Input	2
Chilled_Water_1_Valve_ Analog_Output	Chilled Water 1 Valve Analog Output			201	AV	ReadCOV_NoWrite	0.1	30474	Input	2
Condenser_1_Analog_ Output	Condenser 1 Analog Output			205	AV	ReadCOV_NoWrite	0.1	30482	Input	2
Condenser_2_Analog_ Output	Condenser 2 Analog Output			206	AV	ReadCOV_NoWrite	0.1	30484	Input	2

Table 54: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Analog Values – Read Only, continued.										
Electric_Heater_1_Analog_ Output	Electric Heater 1 Analog Output			221	AV	ReadCOV_ NoWrite	0.1	30514	Input	2
Energy_Recovery_Analog_ Output	Energy Recovery Analog Output			229	AV	ReadCOV_ NoWrite	0.1	30518	Input	2
Exhaust_Fan_Speed_ Analog_Output	Exhaust Fan Speed Analog Output			231	AV	ReadCOV_ NoWrite	0.1	30522	Input	2
Hot_Gas_Reheat_Analog_ Output	Hot Gas Reheat Analog Output			235	AV	ReadCOV_ NoWrite	0.1	30524	Input	2
Hot_Water_Valve_1_Analog_ Output	Hot Water Valve 1 Analog Output			236	AV	ReadCOV_ NoWrite	0.1	30526	Input	2
Mod_Gas_Furnace_1_ Analog_Output	Mod Gas Furnace 1 Analog Output			242	AV	ReadCOV_ NoWrite	0.1	30538	Input	2
Outside_Air_Damper_ Analog_Output	Outside Air Damper Analog Output			250	AV	ReadCOV_ NoWrite	0.1	30542	Input	2
Supply_Fan_Speed_Analog_ Output	Supply Fan Speed Analog Output			264	AV	ReadCOV_ NoWrite	0.1	30558	Input	2
Modulating_Compressor_ Analog_Output_ BMS	Modulating Compressor Analog Output - BMS			285	AV	ReadCOV_ NoWrite	0.1	30586	Input	2
Circuit_A_Sat_Discharge_ Temperature	Circuit A Saturated Discharge Temperature			286	AV	ReadCOV_ NoWrite	0.1	30588	Input	2
Circuit_B_Sat_Discharge_ Temperature	Circuit B Saturated Discharge Temperature			287	AV	ReadCOV_ NoWrite	0.1	30590	Input	2
Binary Inputs – Read Only										
Comp_Circ_A_High_ Pressure_Digital_ Input	Circuit A High Pressure Switch	Alarm	Normal	3	BI	ReadCOV_ NoWrite	0	10052	Discrete	
Comp_Circ_A_Low_ Pressure_Digital_Input	Circuit A Low Pressure Switch	Alarm	Normal	4	BI	ReadCOV_ NoWrite	0	10053	Discrete	
Comp_Circ_B_High_ Pressure_Digital_ Input	Circuit B High Pressure Switch	Alarm	Normal	5	BI	ReadCOV_ NoWrite	0	10054	Discrete	
Comp_Circ_B_Low_ Pressure_Digital_Input	Circuit B Low Pressure Switch	Alarm	Normal	6	BI	ReadCOV_ NoWrite	0	10055	Discrete	
Controls_Lite_ Dehumidification_ Request_ Digital_Input	Controls Lite Dehumidification Request Status	Dehumidify	Cool	19	BI	ReadCOV_ NoWrite	0	10068	Discrete	
Controls_Lite_Cool_Heat_ Request_ Digital_Input	Controls Lite Cool Heat Request Status	Heating	Cooling	20	BI	ReadCOV_ NoWrite	0	10069	Discrete	
Drain_Pan_Alarm_Digital_ Input	Drain Pan Alarm Digital Input Status	Alarm	Normal	21	BI	ReadCOV_ NoWrite	0	10070	Discrete	
EAD_End_Switch_Digital_ Input	Exhaust Air Damper End Switch Digital Input Status	Closed	Open	22	BI	ReadCOV_ NoWrite	0	10071	Discrete	
Exhaust_Fan_1_Status_ Digital_Input	Exhaust Fan 1 Status	On	Off	23	BI	ReadCOV_ NoWrite	0	10072	Discrete	
Freeze_Stat_Alarm_Digital_ Input	Freeze Stat Alarm Digital Input Status	Alarm	Normal	28	BI	ReadCOV_ NoWrite	0	10077	Discrete	
OAD_End_Switch_Digital_ Input	OAD End Switch Digital Input Status	Closed	Open	52	BI	ReadCOV_ NoWrite	0	10101	Discrete	
Occupancy_Digital_Input	Occupancy Digital Input Status	Occupied	Unoccupied	53	BI	ReadCOV_ NoWrite	0	10102	Discrete	

CONTROLLER

BACnet and MODBUS Points

Table 55: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Inputs – Read Only, continued.										
Outside_Filter_Alarm_Digital_Input	Outside Filter Alarm Digital Input Status	Alarm	Normal	54	BI	ReadCOV_NoWrite	0	10103	Discrete	
Shutdown_Alarm_Digital_Input	Shutdown Alarm Digital Input Status	Alarm	Normal	75	BI	ReadCOV_NoWrite	0	10124	Discrete	
Supply_Fan_1_Status_Digital_Input	Supply Fan 1 Status	On	Off	78	BI	ReadCOV_NoWrite	0	10127	Discrete	
Unit_Enable_Digital_Input	Remote Unit Enable Digital Input Status	Enabled	Disabled	82	BI	ReadCOV_NoWrite	0	10131	Discrete	
Wheel_Status_Digital_Input	Heat Wheel Status	Enabled	Disabled	83	BI	ReadCOV_NoWrite	0	10132	Discrete	
Binary Values – Read/Write – Commandable										
BMS_Watchdog	BMS Watchdog command Used to determine comm status Must heartbeat within the watchdog timeout delay to detect comm status	Active	Inactive	1	BV	Read_Commandable	0	2	Coil	
System_Enable	Master system enable	Enabled	Disabled	2	BV	Read_Commandable	0	3	Coil	
BMS_Occupancy_Command	Occupancy Command	Unoccupied	Occupied	3	BV	Read_Commandable	0	4	Coil	
Reset_All_Alarms	Alarm Reset Command	Reset	Normal	4	BV	Read_Commandable	0	5	Coil	
Outside_RH_Source_BMS	Outside RH Source Selection	BMS	Local	5	BV	Read_Commandable	0	6	Coil	
Outside_Temp_Source_BMS	Outside Temp Source Selection	BMS	Local	6	BV	Read_Commandable	0	7	Coil	
Return_RH_Source_BMS	Return RH Source Selection	BMS	Local	7	BV	Read_Commandable	0	8	Coil	
Return_Temp_Source_BMS	Return Temp Source Selection	BMS	Local	8	BV	Read_Commandable	0	9	Coil	
Space_1_CO2_Source_BMS	Space 1 CO_2 Source Selection	BMS	Local	9	BV	Read_Commandable	0	10	Coil	
Space_2_CO2_Source_BMS	Space 2 CO_2 Source Selection	BMS	Local	10	BV	Read_Commandable	0	11	Coil	
Space_RH_Source_BMS	Space RH Source Selection	BMS	Local	12	BV	Read_Commandable	0	13	Coil	
Space_Static_Source_BMS	Space Static Source Selection	BMS	Local	13	BV	Read_Commandable	0	14	Coil	
Space_Temp_Source_BMS	Space Temp Source Selection	BMS	Local	14	BV	Read_Commandable	0	15	Coil	
SF_Control_Source_BMS	Allows the BMS to control supply fan speed	BMS	Local	56	BV	Read_Commandable	0	18	Coil	
EF_Control_Source_BMS	Allows the BMS to control exhaust fan speed	BMS	Local	57	BV	Read_Commandable	0	19	Coil	
OAD_Control_Source_BMS	Allows the BMS to control OAD position	BMS	Local	59	BV	Read_Commandable	0	21	Coil	

Table 56: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Values – Read Only										
Occupied	Occupied Status	Occupied	Unoccupied	16	BV	ReadCOV_ NoWrite	0	10002	Discrete	
Unoccupied	Unoccupied Status	Unoccupied	Occupied	17	BV	ReadCOV_ NoWrite	0	10003	Discrete	
Unoccupied_Cooling_ Call	Unoccupied Cooling Call Status	On	Off	18	BV	ReadCOV_ NoWrite	0	10004	Discrete	
Unoccupied_ Dehumidification_Call	Unoccupied Dehumidification Call Status	On	Off	19	BV	ReadCOV_ NoWrite	0	10005	Discrete	
Unoccupied_Heating_ Call	Unoccupied Heating Call Status	On	Off	20	BV	ReadCOV_ NoWrite	0	10006	Discrete	
Occupied_Start	Occupied Start Command Status	Start	Stop	21	BV	ReadCOV_ NoWrite	0	10007	Discrete	
Unoccupied_Start	Unoccupied Start Command Status	Start	Stop	22	BV	ReadCOV_ NoWrite	0	10008	Discrete	
Enable_Controls	Status to indicate startup is complete and the unit is ready	Yes	No	23	BV	ReadCOV_ NoWrite	0	10009	Discrete	
Global_Alarm	General alarm point. Optionally set to indicate any alarm is active, or a shutdown alarm is active	Alarm	Normal	24	BV	ReadCOV_ NoWrite	0	10010	Discrete	
System_Shutdown_ Alarm	Shutdown alarm status. When true, System Enable will be set to false and the unit will remain off	Alarm	Normal	25	BV	ReadCOV_ NoWrite	0	10011	Discrete	
Damper_Open	Indicates there is a open air path and the supply fan can run	Open	Closed	26	BV	ReadCOV_ NoWrite	0	10012	Discrete	
Cooling_is_On	Indicates that the unit is cooling	Yes	No	27	BV	ReadCOV_ NoWrite	0	10013	Discrete	
Economizer_is_On	Indicates that the unit is economizing	Yes	No	28	BV	ReadCOV_ NoWrite	0	10014	Discrete	
Heating_is_On	Indicates that the unit is heating	Yes	No	29	BV	ReadCOV_ NoWrite	0	10015	Discrete	
Dehumidification_ Mode_Enabled	Indicates that the unit is dehumidifying	Yes	No	31	BV	ReadCOV_ NoWrite	0	10017	Discrete	
Manual_Override_ Active	Indicates that manual overrides are active	Active	Inactive	32	BV	ReadCOV_ NoWrite	0	10018	Discrete	
Cooling_Not_Locked_ Out	Indicates that cooling is allowed	Allowed	Locked Out	33	BV	ReadCOV_ NoWrite	0	10019	Discrete	
Heating_Not_Locked_ Out	Indicates that heating is allowed	Allowed	Locked Out	34	BV	ReadCOV_ NoWrite	0	10020	Discrete	
Preheat_Not_ Locked_Out	Indicates that preheat is allowed	Allowed	Locked Out	36	BV	ReadCOV_ NoWrite	0	10022	Discrete	
HGRH_Purging	Indicates that the hot gas reheat value is purging	Yes	No	37	BV	ReadCOV_ NoWrite	0	10023	Discrete	

CONTROLLER

BACnet and MODBUS Points

Table 57: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Values – Read Only, continued.										
Allow_Dampers	Startup sequence command to open dampers	Yes	No	43	BV	ReadCOV_NoWrite	0	10029	Discrete	
Allow_Exhaust_Fans	Startup sequence command to trigger exhaust fans to start	Yes	No	44	BV	ReadCOV_NoWrite	0	10030	Discrete	
Allow_Supply_Fans	Startup sequence command to trigger supply fans to start	Yes	No	48	BV	ReadCOV_NoWrite	0	10034	Discrete	
BMS_Watchdog_Active	Status of the BMS watchdog ping	Active	Inactive	49	BV	ReadCOV_NoWrite	0	10035	Discrete	
BMS_Occupancy_Status	Status of the BMS occupancy command	Unoccupied	Occupied	50	BV	ReadCOV_NoWrite	0	10036	Discrete	
Cond_Water_Pump_ Required	WSHP Water Pump Requested	On	Off	60	BV	ReadCOV_NoWrite	0	10042	Discrete	
Damper_Actuator_Power_1_ Digital_Output	Damper Actuator Power 1 Digital Output	Active	Inactive	100	BV	ReadCOV_NoWrite	0	10153	Discrete	
Compressor_1_Enable_ Digital_Output	Compressor 1 Enable	On	Off	111	BV	ReadCOV_NoWrite	0	10164	Discrete	
Compressor_2_Enable_ Digital_Output	Compressor 2 Enable	On	Off	112	BV	ReadCOV_NoWrite	0	10165	Discrete	
Compressor_3_Enable_ Digital_Output	Compressor 3 Enable	On	Off	113	BV	ReadCOV_NoWrite	0	10166	Discrete	
Compressor_4_Enable_ Digital_Output	Compressor 4 Enable	On	Off	114	BV	ReadCOV_NoWrite	0	10167	Discrete	
Condenser_Fan_1_Digital_ Output	Condenser Fan Stage 1	On	Off	119	BV	ReadCOV_NoWrite	0	10172	Discrete	
Condenser_Fan_2_Digital_ Output	Condenser Fan Stage 2	On	Off	120	BV	ReadCOV_NoWrite	0	10173	Discrete	
Condenser_Fan_3_Digital_ Output	Condenser Fan Stage 3	On	Off	121	BV	ReadCOV_NoWrite	0	10174	Discrete	
Exhaust_Fan_1_Start_Stop_ Digital_Output	Exhaust Fan 1 Start Stop	On	Off	127	BV	ReadCOV_NoWrite	0	10180	Discrete	
Furnace_1_Stage_1_Digital_ Output	Furnace 1 Stage 1	On	Off	131	BV	ReadCOV_NoWrite	0	10184	Discrete	
Furnace_2_Stage_1_Digital_ Output	Furnace 2 Stage 1	On	Off	133	BV	ReadCOV_NoWrite	0	10186	Discrete	
Heat_Wheel_Enable_Digital_ Output	Heat Wheel Enable	On	Off	163	BV	ReadCOV_NoWrite	0	10208	Discrete	
PreHeat_Enable_Digial_ Output	PreHeat Enable Digital Output	On	Off	166	BV	ReadCOV_NoWrite	0	10211	Discrete	
Reversing_Valve_Digital_ Output	Reversing Valve	Heating	Cooling	175	BV	ReadCOV_NoWrite	0	10220	Discrete	
Supply_Fan_1_Start_Stop_ Digital_Output	Supply Fan 1 Start	Start	Stop	186	BV	ReadCOV_NoWrite	0	10231	Discrete	
Bacnet_License_not_ Installed_Alarm. Active	Bacnet License not Installed Alarm	Alarm	Normal	300	BV	ReadCOV_NoWrite	0	10251	Discrete	
BMS_Offline_Alarm.Active	BMS Offline Alarm	Alarm	Normal	313	BV	ReadCOV_NoWrite	0	10264	Discrete	
Cold_Coil_1_Temperature_ Sensor_Alarm. Active	Cold Coil 1 Temperature Sensor Alarm	Alarm	Normal	387	BV	ReadCOV_NoWrite	0	10338	Discrete	

Table 58: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Values – Read Only, continued.										
Comp_Circ_A_High_Pressure_Alarm.Active	Comp Circ A High Pressure Alarm	Alarm	Normal	395	BV	ReadCOV_NoWrite	0	10346	Discrete	
Comp_Circ_A_Low_Pressure_Alarm.Active	Comp Circ A Low Pressure Alarm	Alarm	Normal	396	BV	ReadCOV_NoWrite	0	10347	Discrete	
Comp_Circ_B_High_Pressure_Alarm.Active	Comp Circ B High Pressure Alarm	Alarm	Normal	397	BV	ReadCOV_NoWrite	0	10348	Discrete	
Comp_Circ_B_Low_Pressure_Alarm.Active	Comp Circ B Low Pressure Alarm	Alarm	Normal	398	BV	ReadCOV_NoWrite	0	10349	Discrete	
Comp_Maintenance_Alarm.Active	Comp Maintenance Alarm	Alarm	Normal	411	BV	ReadCOV_NoWrite	0	10362	Discrete	
Damper_End_Switch_Alarm.Active	Damper End Switch Alarm	Alarm	Normal	420	BV	ReadCOV_NoWrite	0	10371	Discrete	
Drain_Pan_Alarm.Active	Drain Pan Alarm	Alarm	Normal	422	BV	ReadCOV_NoWrite	0	10372	Discrete	
Exhaust_Fan_1_Alarm.Active	Exhaust Fan 1 Alarm	Alarm	Normal	423	BV	ReadCOV_NoWrite	0	10373	Discrete	
Exhaust_Fan_1_CFM_Analog_Input_Alarm. Active	Exhaust Fan 1 CFM Analog Input Alarm	Alarm	Normal	424	BV	ReadCOV_NoWrite	0	10374	Discrete	
Exhaust_Temperature_Sensor_Alarm.Active	Exhaust Temperature Sensor Alarm	Alarm	Normal	433	BV	ReadCOV_NoWrite	0	10383	Discrete	
Expansion_Board_1_Alarm.Active	Expansion Board 1 Alarm	Alarm	Normal	434	BV	ReadCOV_NoWrite	0	10384	Discrete	
Expansion_Board_2_Alarm.Active	Expansion Board 2 Alarm	Alarm	Normal	435	BV	ReadCOV_NoWrite	0	10385	Discrete	
Expansion_Board_3_Alarm.Active	Expansion Board 3 Alarm	Alarm	Normal	436	BV	ReadCOV_NoWrite	0	10386	Discrete	
Freeze_Stat_Alarm.Active	Freeze Stat Alarm	Alarm	Normal	441	BV	ReadCOV_NoWrite	0	10391	Discrete	
Internal_Board_Temp_Alarm.Active	Internal Board Temp Alarm	Alarm	Normal	498	BV	ReadCOV_NoWrite	0	10448	Discrete	
Mixed_Temperature_Sensor_Alarm.Active	Mixed Temperature Sensor Alarm	Alarm	Normal	502	BV	ReadCOV_NoWrite	0	10452	Discrete	
Multi_Channel_Conf_Alarm.Active	Multi Channel Conf Alarm	Alarm	Normal	503	BV	ReadCOV_NoWrite	0	10453	Discrete	
OAD_CFM_Analog_Input_Alarm.Active	OAD CFM Analog Input Alarm	Alarm	Normal	506	BV	ReadCOV_NoWrite	0	10456	Discrete	
Outside_Air_Temperature_Sensor_Alarm. Active	Outside Air Temperature Sensor Alarm	Alarm	Normal	507	BV	ReadCOV_NoWrite	0	10457	Discrete	
Outside_Filter_Alarm.Active	Outside Filter Alarm	Alarm	Normal	508	BV	ReadCOV_NoWrite	0	10458	Discrete	
Outside_RH_Sensor_Alarm.Active	Outside RH Sensor Alarm	Alarm	Normal	509	BV	ReadCOV_NoWrite	0	10459	Discrete	
Return_RH_Sensor_Alarm.Active	Return RH Sensor Alarm	Alarm	Normal	532	BV	ReadCOV_NoWrite	0	10482	Discrete	
Return_Temperature_Sensor_Alarm.Active	Return Temperature Sensor Alarm	Alarm	Normal	533	BV	ReadCOV_NoWrite	0	10483	Discrete	

CONTROLLER

BACnet and MODBUS Points

Table 59: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Values – Read Only, continued.										
Leaving_Water_Temp_1_Alarm. Active	Return Water Temp Alarm	Alarm	Normal	534	BV	ReadCOV_NoWrite	0	10484	Discrete	
Space_CO2_1_Analog_Input_ Alarm.Active	Space CO2 1 Analog Input Alarm	Alarm	Normal	535	BV	ReadCOV_NoWrite	0	10485	Discrete	
Space_High_Static_Alarm. Active	Space High Static Alarm	Alarm	Normal	537	BV	ReadCOV_NoWrite	0	10487	Discrete	
Space_RH_Sensor_Alarm. Active	Space RH Sensor Alarm	Alarm	Normal	538	BV	ReadCOV_NoWrite	0	10488	Discrete	
Space_Setpoint_Slider_Alarm. Active	Space Setpoint Slider Alarm	Alarm	Normal	539	BV	ReadCOV_NoWrite	0	10489	Discrete	
Space_Static_Pressure_ Analog_Input_ Alarm.Active	Space Static Pressure Analog Input Alarm	Alarm	Normal	540	BV	ReadCOV_NoWrite	0	10490	Discrete	
Space_Temperature_Sensor_ Alarm.Active	Space Temperature Sensor Alarm	Alarm	Normal	541	BV	ReadCOV_NoWrite	0	10491	Discrete	
Shutdown_Input_Alarm.Active	Shutdown Input Alarm	Alarm	Normal	546	BV	ReadCOV_NoWrite	0	10496	Discrete	
Supply_Air_Temp_Low_Limit. Active	Supply Air Temp Low Limit Alarm	Alarm	Normal	551	BV	ReadCOV_NoWrite	0	10501	Discrete	
Supply_Air_Temperature_ Sensor_Alarm. Active	Supply Air Temperature Sensor Alarm	Alarm	Normal	552	BV	ReadCOV_NoWrite	0	10502	Discrete	
Supply_Duct_Static_Pressure_ Analog_ Input_Alarm.Active	Supply Duct Static Pressure Analog Input Alarm	Alarm	Normal	553	BV	ReadCOV_NoWrite	0	10503	Discrete	
Supply_Fan_1_Alarm.Active	Supply Fan 1 Alarm	Alarm	Normal	554	BV	ReadCOV_NoWrite	0	10504	Discrete	
Supply_Fan_1_CFM_Analog_ Input_Alarm. Active	Supply Fan 1 CFM Analog Input Alarm	Alarm	Normal	558	BV	ReadCOV_NoWrite	0	10508	Discrete	
Supply_High_Duct_Static_ Alarm.Active	Supply High Duct Static Alarm	Alarm	Normal	563	BV	ReadCOV_NoWrite	0	10513	Discrete	
Supply_RH_Sensor_Alarm. Active	Supply RH Sensor Alarm	Alarm	Normal	564	BV	ReadCOV_NoWrite	0	10514	Discrete	
Supply_Temp_High_Limit_ Alarm.Active	Supply Temp High Limit Alarm	Alarm	Normal	565	BV	ReadCOV_NoWrite	0	10515	Discrete	
Entering_Water_Temp_1_Alarm. Active	Entering Water Temp Alarm	Alarm	Normal	566	BV	ReadCOV_NoWrite	0	10516	Discrete	
TMem_Error.Active	TMem Error Alarm	Alarm	Normal	567	BV	ReadCOV_NoWrite	0	10517	Discrete	
Wheel_Rotation_Alarm.Active	Wheel Rotation Alarm	Alarm	Normal	576	BV	ReadCOV_NoWrite	0	10526	Discrete	
AI_Batt_EVD_1.Active	EVD Battery Alarm	Alarm	Normal	589	BV	ReadCOV_NoWrite	0	10539	Discrete	
AI_ConfigErr_EVD_1.Active	EVD Configuration Alarm	Alarm	Normal	590	BV	ReadCOV_NoWrite	0	10540	Discrete	

Table 60: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Values – Read Only, continued.										
AI_DscgHiP_COMP.Active	Compressor Envelope - High Discharge Pressure Alarm	Alarm	Normal	591	BV	ReadCOV_NoWrite	0	10541	Discrete	
AI_DscgHiTemp_COMP.Active	Compressor Envelope - High Discharge Temperature Alarm	Alarm	Normal	592	BV	ReadCOV_NoWrite	0	10542	Discrete	
AI_DscgLowP_COMP.Active	EVD Low Discharge Pressure Alarm	Alarm	Normal	593	BV	ReadCOV_NoWrite	0	10543	Discrete	
AI_EEPROM_EVD_1.Active	EVD EEPROM Alarm	Alarm	Normal	594	BV	ReadCOV_NoWrite	0	10544	Discrete	
AI_EEV_A_EVD_1.Active	ExV Motor Alarm - Valve A	Alarm	Normal	595	BV	ReadCOV_NoWrite	0	10545	Discrete	
AI_EmergencyClosing_EVD_1.Active	EVD Emergency Closing Alarm	Alarm	Normal	597	BV	ReadCOV_NoWrite	0	10547	Discrete	
AI_EVD_Offline_EVD_1.Active	EVD Offline Communication Alarm	Alarm	Normal	598	BV	ReadCOV_NoWrite	0	10548	Discrete	
AI_FW_CompatibErr_EVD_1.Active	EVD Firmware Compatibility Alarm	Alarm	Normal	599	BV	ReadCOV_NoWrite	0	10549	Discrete	
AI_HiCurr_COMP.Active	Compressor Envelope - High Current Alarm	Alarm	Normal	600	BV	ReadCOV_NoWrite	0	10550	Discrete	
AI_HiRatioP_COMP.Active	Compressor Envelope - High Pressure Ratio Alarm	Alarm	Normal	601	BV	ReadCOV_NoWrite	0	10551	Discrete	
AI_HiT_Cond_EVD_1.Active	AI_HiT_Cond_EVD_1	Alarm	Normal	602	BV	ReadCOV_NoWrite	0	10552	Discrete	
AI_IncompleteClosing_EVD_1.Active	EVD Incomplete Closing Alarm	Alarm	Normal	603	BV	ReadCOV_NoWrite	0	10553	Discrete	
AI_LOP_A_EVD_1.Active	EVD Low Operating Pressure Alarm - Valve A	Alarm	Normal	604	BV	ReadCOV_NoWrite	0	10554	Discrete	
AI_Low_SH_A_EVD_1.Active	"EVD Low SuperHeat Alarm - Circuit A"	Alarm	Normal	606	BV	ReadCOV_NoWrite	0	10556	Discrete	
AI_LowDeltaP_COMP.Active	Compressor Envelope - Low Pressure DeltaAlarm	Alarm	Normal	608	BV	ReadCOV_NoWrite	0	10558	Discrete	
AI_LowRatioP_COMP.Active	Compressor Envelope - Low Pressure Ratio Alarm	Alarm	Normal	609	BV	ReadCOV_NoWrite	0	10559	Discrete	
AI_LowSuct_A_EVD_1.Active	Low Suction Refrigerant Temperature - Circuit A	Alarm	Normal	610	BV	ReadCOV_NoWrite	0	10560	Discrete	
AI_MOP_A_EVD_1.Active	EVD Max Operating Pressure Alarm - Valve A	Alarm	Normal	612	BV	ReadCOV_NoWrite	0	10662	Discrete	
AI_S1_EVD_1.Active	EVD-S1 Suction Pressure Sensor Alarm	Alarm	Normal	614	BV	ReadCOV_NoWrite	0	10564	Discrete	
AI_S2_EVD_1.Active	EVD-S2 Suction Temperature Sensor Alarm	Alarm	Normal	615	BV	ReadCOV_NoWrite	0	10565	Discrete	
AI_S4_EVD_1.Active	EVD-S4 Discharge Temperature Sensor Alarm	Alarm	Normal	617	BV	ReadCOV_NoWrite	0	10567	Discrete	

CONTROLLER

BACnet and MODBUS Points

Table 61: BACnet and MODBUS Points List, continued.

Variable	Description	Active Text	Inactive Text	BACnet				MODBUS		
				Object Instance	Object Type	Access	Hyst	Index	Register Type	Size
Binary Values – Read Only, continued.										
Al_SuctHiP_COMP.Active	Compressor Envelope - SuctHiP_COMP	Alarm	Normal	618	BV	ReadCOV_NoWrite	0	10568	Discrete	
Al_SuctLowP_COMP.Active	Compressor Envelope - SuctLowP_COMP	Alarm	Normal	619	BV	ReadCOV_NoWrite	0	10569	Discrete	
High_Ent_Water_Temp_CircA. Active	High Entering Water Temp Alarm - Circuit A	Alarm	Normal	620	BV	ReadCOV_NoWrite	0	10570	Discrete	
High_Ent_Water_Temp_CircB. Active	High Entering Water Temp Alarm - Circuit B	Alarm	Normal	621	BV	ReadCOV_NoWrite	0	10571	Discrete	
Low_Ent_Water_Temp_CircA. Active	Low Entering Water Temp Alarm - Circuit A	Alarm	Normal	623	BV	ReadCOV_NoWrite	0	10573	Discrete	
Low_Ent_Water_Temp_CircB. Active	Low Entering Water Temp Alarm - Circuit B	Alarm	Normal	624	BV	ReadCOV_NoWrite	0	10574	Discrete	
Return_Water_Temp_2_Alarm. Active	Return Water Temp 2 Alarm	Alarm	Normal	626	BV	ReadCOV_NoWrite	0	10576	Discrete	
Supply_Water_Temp_2_Alarm. Active	Supply Water Temp 2 Alarm	Alarm	Normal	627	BV	ReadCOV_NoWrite	0	10577	Discrete	
Water_Leak_Detector_Alarm. Active	Water Leak Detector Alarm	Alarm	Normal	628	BV	ReadCOV_NoWrite	0	10578	Discrete	
HP_Defrost_Active.Active	Heat Pump Defrost Alarm	Alarm	Normal	631	BV	ReadCOV_NoWrite	0	10579	Discrete	
Comp_Staging_Order_ Skipped.Active	Compressor Staging Order is Skipped Warning	Alarm	Normal	632	BV	ReadCOV_NoWrite	0	10580	Discrete	
Heat_Pump_Heating_Lock_ Out_Alarm. Active	Heat Pump Heating Locked Out Alarm	Alarm	Normal	633	BV	ReadCOV_NoWrite	0	10581	Discrete	
EVD_PrePosition_Alarm.Active	Unexpected EEV Position	Alarm	Normal	634	BV	ReadCOV_NoWrite	0	10582	Discrete	
Integer Values – Read Only										
Allow_Fan_Delay_Remaining	Startup Sequence Fan Damper Delay. Time before enabling Fan startup sequence.			1	IV	ReadCOV_NoWrite	1	30182	Input	2
Supply_Fan_Delay_Remaining	Supply Fan startup sequence. Time before starting supply fan.			2	IV	ReadCOV_NoWrite	1	30184	Input	2
Exhaust_Fan_Delay_ Remaining	Exhaust Fan startup sequence. Time before starting exhaust fan.			3	IV	ReadCOV_NoWrite	1	30186	Input	2
LatestAlm	Most recent alarm. See Alarm Table.			7	IV	ReadCOV_NoWrite	1	30194	Input	2

Table 62: Unit Status Modes.

Status Mode	Description	Status Mode	Description
0	Off/Standby	16	Emergency Exhaust
1	Unoccupied Start	17	Emergency Purge
2	Occupied Start	18	Unassigned
3	Opening Dampers	19	Fans Only
4	End Switch	20	Economizing
5	Dampers Open	21	Cooling
6	Fan Start Delay	22	Heating
7	Fans Starting	23	Dehumidifying
8	Fans Starting	24	Humidifying
9	Heat/Cool Delay	25	HGRH Purging
10	System On	26	Defrost Active
11	Soft Shutdown	27	Pool Purge
12	System Disabled	28	Cooling & Heating
13	Remote Off	29	Dehum w/Heat
14	Shutdown Alarm	30	Overrides Active
15	Emergency Pressurization	31	Expansion Offline

CONTROLLER

LonTalk Points

Table 63: LonTalk Points List.

Access	NV Name	SNVT Type	Description	Notes
Read-Only Points				
nvo	LatestAlm	count (8)	Most recent alarm	See Alarms Data Table
nvo	UnitStatus	count (8)	Startup and Operation Information	See Unit Status Mode Table
nvo	ExhCFM	flow_p (161)	Total Exhaust Fan CFM	Multiply by 100 for CFM.
nvo	OACFM	flow_p (161)	OAD CFM	Multiply by 100 for CFM.
nvo	SupCFM	flow_p (161)	Total Supply Fan CFM	Multiply by 100 for CFM.
nvo	CoolingRamp1	lev_percent (81)	Cooling Ramp 1 Status Value	Compressor Capacity
nvo	CWV1Out	lev_percent (81)	Chilled Water 1 Valve Analog Output	
nvo	ElecHeat1Out	lev_percent (81)	Electric Heater 1 Analog Output	
nvo	ERecoveryOut	lev_percent (81)	Energy Recovery Analog Output	
nvo	ExhFan1Out	lev_percent (81)	Exhaust Fan Speed Analog Output	
nvo	HeatingRamp	lev_percent (81)	Heating Ramp	
nvo	HGROut	lev_percent (81)	Hot Gas Reheat Analog Output	
nvo	HPumpHeatRamp	lev_percent (81)	Heat Pump Heating Ramp	Compressor Capacity
nvo	HWV1Out	lev_percent (81)	Hot Water Valve 1 Analog Output	
nvo	ModCompOutBMS	lev_percent (81)	Modulating Compressor Analog Output BMS	
nvo	ModFurn1Out	lev_percent (81)	Mod Gas Furnace 1 Analog Output	
nvo	OADOutput	lev_percent (81)	Outside Air Damper Analog Output	
nvo	OutsideRH	lev_percent (81)	Outside % Relative Humidity	
nvo	SpaceRH	lev_percent (81)	Space % Relative Humidity	
nvo	SupFan1Out	lev_percent (81)	Supply Fan Speed Analog Output	
nvo	Space1CO2	ppm (29)	Space 1 CO_2 ppm	
nvo	SpacePress	press_p (113)	Space Static Pressure	
nvo	SupDuctPress	press_p (113)	Supply Duct Static Pressure	
nvo	DigAlarms	state (83)	Digital Alarm States	16 bit packed
nvo	DigAlarms.bit00	state.bit00	Circuit A High Pressure Switch	0=Normal 1=Alarm
nvo	DigAlarms.bit01	state.bit01	Circuit A Low Pressure Switch	0=Normal 1=Alarm
nvo	DigAlarms.bit02	state.bit02	Circuit B High Pressure Switch	0=Normal 1=Alarm
nvo	DigAlarms.bit03	state.bit03	Circuit B Low Pressure Switch	0=Normal 1=Alarm
nvo	DigAlarms.bit04	state.bit04	Drain Pan Alarm	0=Normal 1=Alarm
nvo	DigAlarms.bit05	state.bit05	Freeze Stat Alarm	0=Normal 1=Alarm
nvo	DigAlarms.bit06	state.bit06	Outside Filter Alarm (Dirty Filter)	0=Normal 1=Alarm
nvo	DigAlarms.bit07	state.bit07	Shutdown alarm status	0=Normal 1=Alarm
nvo	DigStatus	state (83)	Digital Status States	16 bit packed
nvo	DigStatus.bit00	state.bit00	Compressor 1 Enable Digital Output	0=Off 1=On
nvo	DigStatus.bit01	state.bit01	Compressor 2 Enable Digital Output	0=Off 1=On
nvo	DigStatus.bit02	state.bit02	Compressor 3 Enable Digital Output	0=Off 1=On
nvo	DigStatus.bit03	state.bit03	Compressor 4 Enable Digital Output	0=Off 1=On
nvo	DigStatus.bit04	state.bit04	Condenser Fan 1 Digital Output	0=Off 1=On
nvo	DigStatus.bit05	state.bit05	Condenser Fan 2 Digital Output	0=Off 1=On
nvo	DigStatus.bit06	state.bit06	Condenser Fan 3 Digital Output	0=Off 1=On
nvo	DigStatus.bit07	state.bit07	Furnace 1 Stage 1 Digital Output	0=Off 1=On
nvo	DigStatus.bit08	state.bit08	Furnace 2 Stage 1 Digital Output	0=Off 1=On

Table 64: LonTalk Points List.

Access	NV Name	SNVT Type	Description	Notes
Read-Only Points, continued.				
nvo	DigStatus.bit09	state.bit09	Supply Fan Status	0=Off 1=On
nvo	DigStatus.bit10	state.bit10	Exhaust Fan Status	0=Off 1=On
nvo	DigStatus.bit11	state.bit11	Heat Wheel Status	0=Off 1=On
nvo	DigStatus.bit12	state.bit12	PreHeat Enable Digital Output	0=Off 1=On
nvo	DigStatus.bit13	state.bit13	Reversing Valve Digital Output	0=Cooling 1=Heating
nvo	DigStatus.bit14	state.bit14	Occupied Status	0=Unoccupied 1=Occupied
nvo	DigStatus.bit15	state.bit15	Damper Status (OAD or RAD indicating a path of airflow)	0=Closed 1=Open
nvo	GlobalAlarm	switch (95)	General alarm output	0=No Alarms 1=Active Alarms
nvo	ActTmpSpt	temp_p (105)	Active Temperature Set-point	Heating or Cooling Set-point
nvo	CirA_SatDschT	temp_p (105)	Circuit A Saturated Discharge Temperature	
nvo	CirB_SatDschT	temp_p (105)	Circuit B Saturated Discharge Temperature	
nvo	ColdCoil1Temp	temp_p (105)	Cold Coil Temperature	
nvo	EntWterTempA	temp_p (105)	Leaving Water Temperature Circuit A	
nvo	EntWterTempB	temp_p (105)	Leaving Water Temperature Circuit B	
nvo	ExhaustTemp	temp_p (105)	Exhaust Temperature	
nvo	LeavWterTempA	temp_p (105)	Entering Water Temperature Circuit A	
nvo	LeavWterTempB	temp_p (105)	Entering Water Temperature Circuit B	
nvo	MixedTemp	temp_p (105)	Mixed Temperature	
nvo	OutsideTemp	temp_p (105)	Outside Air Temperature	
nvo	SpaceTemp	temp_p (105)	Space Temperature	
nvo	SupplyTemp	temp_p (105)	Supply Temperature	
Write-Only Points				
nvi	EconEnthTrig	enthalpy (153)	Economizer Enthalpy Enable Se-tpoint	Allow Econ when OA Enthalpy<Spt
nvi	ExhCFMSetpt	flow_p (161)	Exhaust Fan CFM Set-point	Divide desired CFM by 100.
nvi	OACFMSetpt	flow_p (161)	OAD CFM Set-point	Divide desired CFM by 100.
nvi	SupCFMSetpt	flow_p (161)	Supply Fan CFM Set-point	Divide desired CFM by 100.
nvi	DehumSetpt	lev_percent (81)	Dehumidification Set-point	%RH for Space or Return control
nvi	OADMinSetpt	lev_percent (81)	Outside Air Damper Minimum Set-point	
nvi	UnocRHSetpt	lev_percent (81)	Unoccupied Dehumidification %RH Set-point	
nvi	SpaceCO2Setpt	ppm (29)	Space CO2 Set-point	
nvi	SpacePressSpt	press_p (113)	Space Static Pressure Set-point	
nvi	SupPressSetpt	press_p (113)	Supply Duct Static Pressure Set-point	
nvi	OccUnocc	switch (95)	Occupancy Command	0=Occupied 1=Unoccupied
nvi	ResetAlarms	switch (95)	Alarm Reset Command	
nvi	SystemEnable	switch (95)	Master system enable/disable point	
nvi	TempDeadband	temp_diff_p (147)	Heat/Cool Spt Deadband (Space or Return control is active)	Divided by 2. Add/subtract to/from the set-point
nvi	EconTempTrig	temp_p (105)	Economizer Ambient Temp Enable Set-point	Allow Econ when OAT<Spt
nvi	IADewptTrig	temp_p (105)	Inside Dewpoint Dehumidification Set-point	
nvi	TempSetpt	temp_p (105)	Main Temperature Set-point	Supply, Space, or Return target
nvi	UnocCoolSetpt	temp_p (105)	Unoccupied Cooling Set-point	
nvi	UnocHeatSetpt	temp_p (105)	Unoccupied Heating Set-point	

Troubleshooting

Motors

Table 65: Troubleshooting Motors Table.

Motor Symptom	Probable Cause	Action
Motor doesn't start	Blown fuse or open circuit breaker.	Replace fuse or reset circuit breaker.
	Overload trips.	Check and reset overload.
	Improper line connections.	Check connections on diagram supplied with motor.
	Open circuit in winding or starting switch; humming sound from motor when switch is closed.	Replace motor.
	Improper current supply.	Check that power supply agrees with motor specifications listed on nameplate.
	Mechanical failure.	Determine that motor turns freely; if not, replace motor.
	Motor overload.	Reduce load.
	Power source (3-phase) may have one phase open.	Check line for open phase.
	Power may have phase reversed.	Check phase volt monitor and reverse the phase wiring.
	Fan VFD in OFF or HAND position.	Check VFD display screen and set VFD to "Auto".
Motor doesn't come up to speed	Motor under-designed for the application.	Replace with larger motor.
	Voltage too low at motor terminals.	Check across AC line and correct if possible.
	Line wiring to motor too small.	Install larger wiring.
	60-Hz motor connected to 50-Hz line supply.	Replace unit with 50-Hz motor.
	Motor wired for wrong voltage.	Check wiring.
Motor takes too long to accelerate to speed.	Excessive load.	Consult the factory.
	Loose connection(s).	Check connection and tighten where necessary.
Motor rotates in wrong direction	Improperly wired to AC line; wrong sequence of phases.	Check wiring diagram on motor nameplate and correct; reverse any two motor leads at line connection.
Motor vibrates excessively.	Motor mounting bolts are loose.	Tighten mounting bolts.
	Impeller is unbalanced.	Replace impeller.
Motor overheats	Motor overloaded.	Replace with larger motor.
	Motor fan may be clogged with dirt, preventing proper ventilation.	Remove fan cover and clean; replace fan cover.
	Motor (3-phase) may have one phase open.	Check that all connections are tight.
	Line voltage too high.	Check across AC line. Consult power company; step-down transformer may be required.
	Line voltage too low.	Check across AC line. Consult power company; step-up transformer may be required.

Blowers

Table 66: Troubleshooting Blowers Table.

Blower Symptom	Probable Cause	Action
Excessive noise	Impeller hitting inlet ring.	Check that impeller is centered on inlet ring.
		Check for damage on inlet ring; replace inlet ring.
		Check for crooked or damaged impeller; replace impeller.
		Check if shaft is loose in bearing; replace motor.
		Check if impeller is loose on shaft; tighten impeller set screw.
	Defective bearing.	Replace motor
	Shaft seal squeals.	Replace motor
	Impeller	Check if impeller is loose on shaft; tighten impeller.
		Defective impeller: ⃠ DO NOT RUN. Contact the unit manufacturer.
		Check if impeller is unbalanced; replace impeller
		Check if impeller is worn because abrasive or corrosive material is moving through flow passages.
	Housing	Check for foreign material in housing.
		Check if block-off or other part is loose (rattling during operation).
	Electrical	Confirm that lead-in cable is secure.
		Check for AC hum in motor or relay.
		Check for starting relay chatter.
		Check if 3-phase motor is wired for single phase.
	High air velocity	Check if duct work is too small for application.
		Check if fan selection is too large for application.
		Check if registers or grilles are too small for application.
		Check if heating or cooling coil has insufficient face area for application.
	Obstruction in high-velocity gas stream (rattle or pure-tone whistles).	Check damper sizing.
		Check register sizing.
		Check grille sizing.
		Check for sharp elbows.
		Check for sudden expansion or contraction in ductwork.
		Check turning vanes.
	Pulsation or surge.	Check if restricted system causes fan to operate at a poor point of rating.
		Check if fan is too large for application.
		Check if ducts vibrate at same frequency as fan pulsations.
	Gas velocity through cracks or holes, or past obstructions.	Check for leaks in duct work.
		Check the fins on coils.

TROUBLESHOOTING

Table 67: Troubleshooting Blowers Table, continued.

Blower Symptom	Probable Cause	Action
Insufficient airflow.	Fan	Check if the fan is running backwards.
		Check if the impeller is not centered in inlet collars.
		Check if the fan speed is too slow.
	Duct system	Check if the actual system is more restrictive (there is more resistance to flow) than expected.
		Check if the dampers are closed.
		Check if the registers are closed.
		Check for leaks in supply duct.
	Filters	Check if filter is dirty or clogged.
	Coils	Check if coil is dirty or clogged.
	Recirculation	Check for internal cabinet leaks in the bulkhead that separates the fan outlet (pressure zone) from fan inlets (suction zone).
	Obstructed fan inlets.	Elbows, cabinet walls, or other obstructions are restricting air flow. Inlet obstructions cause more restrictive systems but do not cause increased negative pressure readings near the fan inlet(s). Fan speed may be increased to counteract the effect of restricted fan inlet(s).
Excessive airflow.	System	Check for oversized duct work.
		Check if access door is open.
		Check if registers or grilles are not installed.
		Check if filters are not in place.
	Fan	Check if backward-inclined impeller is installed backward; horsepower will be high.
		Check if fan speed is too fast; reduce fan speed
	System, fan, or interpretation of measurements.	The static pressure measured in a “loose” or oversized system will be less than the static pressure in a “tight” or undersized system for the same airflow rate.
		In most systems, pressure measurements are indicators of how the installation is operating. These measurements are the result of airflow and are useful indicators in defining system characteristics.
High airflow, low static pressure.	System	System has less resistance to flow than expected. Fan speed may be reduced to obtain the desired flow rate. This will reduce horsepower (operating cost).
	Air density	Pressures will be less with high-temperature gasses or at high altitude.
	Fan	Check if backward-inclined impeller is installed backward; horsepower will be high.
		Check if the fan speed is too high.
Low airflow, low static pressure.	System	Check if the fan inlet or outlet conditions are not the same as tested
Low airflow, high static pressure.	System	Check for obstruction in system

Refrigeration

Table 68: Troubleshooting Refrigeration Table.

Refrigeration Symptom	Probable Cause	Action
High superheat and low subcooling.	Undercharged.	Add refrigerant to the system in small increments (0.5 to 1 lb.).
Low superheat and high subcooling.	Overcharged.	Remove refrigerant from the system in small increments (0.5 to 1 lb.).
Normal superheat and low subcooling.	Undercharged.	Add refrigerant to the system in small increments (0.5 to 1 lb.).
Normal superheat and high subcooling.	Overcharged.	Remove refrigerant from the system in small increments (0.5 to 1 lb.).
High superheat and normal subcooling.	Over-restricted.	Loosen TXV adjustment screw by one (1) or two (2) turns.
Low superheat and normal subcooling.	Under-restricted.	Tighten TXV adjustment screw by one (1) or two (2) turns.
High superheat and high subcooling.	Over-restricted.	Loosen TXV adjustment screw by one (1) or two (2) turns.
Low superheat and low subcooling.	Under-restricted.	Tighten TXV adjustment screw by one (1) or two (2) turns.

Controls

Table 69: Troubleshooting Controls Table.

Controls Symptom	Probable Cause	Description
Cannot connect computer to web UI. Lights on controller are not on when unit is powered up.	Phases are reversed.	Check lights on phase voltage monitor to see if power phase is reversed. Correct the power wiring to remove the reverse phase error
Fan output does not operate.	Shutdown input.	Input U16 on the DDC1 must have continuity with input 0V (closed contact) for the unit to run. If the contact is open, the unit will be in shutdown mode and the fan will not run. The unit will reset when the contact is closed. The BAS can also command a shutdown. Check the BMS Interface page of the handheld LCD to see if a command is currently being written.
	Unoccupied mode.	The supply fan is normally on in the occupied mode and off during the unoccupied mode. Verify the occupancy.
	Damper failure.	Outdoor Air Damper is generally commanded open before supply fan start. See Troubleshooting for Outdoor Air Damper.
	Fan status.	A fan shutdown alarm will be generated if fan status is not confirmed within one minute after commanding the supply fan to run. This alarm must be manually reset from the handheld LCD before normal fan operation is enabled. Fan Status comes from the supply fan proving switch. Also check the variable frequency drive VFD11 and any motor overloads tagged OL11.
	Low limit alarm.	The supply fan is controlled off whenever the supply air temperature is less than the low limit (35°F, adjustable) for 5 minutes. This alarm must be manually reset from the handheld LCD before normal fan operation is enabled.
	Duct static high limit.	The supply fan is controlled off whenever the duct static pressure exceeds the duct static high limit setpoint (2.5 in. w.c., adjustable). This alarm must be manually reset from the handheld LCD before normal fan operation is enabled.
Compressor output does not energize.	Ambient lockout.	Compressors are allowed to operate whenever the outdoor air temperature is greater than the outdoor air lockout temperature (55°F, adjustable).
	Coil temperature lockout.	When running in cooling or dehumidification, compressor staging will be limited as the cooling coil temperature approaches 46°F. Compressors are not allowed to operate when the cooling coil is below 42°F. This does not apply to heat pumps in heating mode.
	Unoccupied mode.	Compressors are normally controlled off during unoccupied mode. Compressor operation is enabled when space temperature or dewpoint conditions exceed unoccupied set-points.
	Inter-stage delays.	Compressors are subject to inter-stage delays that prevent concurrent starting of multiple compressors.
	Low pressure cutout.	Compressors are prevented from operating when a low pressure cutout alarm is present on that circuit. A low pressure alarm must be manually reset from the handheld LCD if it has tripped three (3) times in one hour.
	High pressure cutout.	Compressors are prevented from operating when a high pressure cutout alarm is present on that circuit. A high pressure alarm must be manually reset by pressing the button on the cutout device (in the compressor section of the unit). It also must be manually reset from the handheld LCD if it has tripped three (3) times in one hour.

TROUBLESHOOTING

Table 70: Troubleshooting Controls Table, continued.

Controls Symptom	Probable Cause	Description
Outdoor air damper does not open.	Occupancy.	The outdoor air damper is controlled closed during the unoccupied mode. On units with return air, the return air damper is controlled open (recirculation) in the unoccupied mode. Verify the occupancy mode.
	Morning warmup and cooldown.	On units equipped with this feature and return air dampers, the outdoor air damper may close and the return air damper may open for up to 30 minutes upon entering occupied operation. Check the Morning Warmup page of the handheld LCD.
	Energy recovery wheel failure.	On units equipped with return air dampers, energy recovery wheels, and energy recovery rotation sensors, the outdoor air damper may close and the return air damper may open to raise (heating) or lower (cooling) discharge temperature. This only occurs if heating / cooling capacity is insufficient and the energy recovery wheel rotation sensor does not detect motion.
	End switch failure.	When the outdoor air damper is commanded open, the controller waits for the end switch of the damper actuator(s) to confirm that there is an airflow path. If, after two (2) minutes, end switch closure is not confirmed, a damper switch (end switch) alarm is generated. It must be manually reset from the handheld LCD. Check the damper actuators are properly configured. Set Mode dial = 3. If actuator is equipped, set outdoor air damper AUC dial = 0.25 and return air damper AUX = 0.75.
Dehumidification not enabled.	Space relative humidity sensor / value.	Occupied dehumidification is enabled when the space relative humidity or outdoor dewpoint temperature is greater than setpoint. If the space relative humidity sensor is not connected or operating properly, dehumidification will be determined by the outdoor air dewpoint. The space relative humidity reading may be sent by the BAS.
	Outdoor air dewpoint setpoint.	Occupied dehumidification is enabled when the space relative humidity or outdoor dewpoint temperature is greater than setpoint. The outdoor dewpoint is calculated from the outdoor air temperature and relative humidity. If either the outdoor air temperature or relative humidity sensor is not connected or operating properly, dehumidification may not operate. The outdoor air temperature and relative humidity may be sent by the BAS.
	Space dewpoint dehumidification cutout.	Dehumidification of the space is disabled when the space dewpoint falls below this threshold Check the space temperature and relative humidity sensors for proper operation. Space temperature and relative humidity reading may be sent by the BAS.
	Unoccupied space dewpoint setpoint.	Unoccupied dehumidification is enabled when the space humidity is greater than setpoint. Check the space relative humidity sensors. The space relative humidity reading may be sent by the BAS.
Gas furnace does not operate.	Electric heat inter-stage delay.	For units with both gas and electric heat (Temperator option), the electric heat is the first stage of heat, followed by gas heat. For gas heat operation to be enabled, the electric heat must be at 100% capacity for five (5) minutes.
	High limit output.	Both gas and electric heaters are equipped with high temperature limit switches, both manua and automatic reset. Check schematics for locations and operation type.
Occupied / unoccupied control not operating properly.	Local (internal) schedule.	Unit default is 24 / 7 occupied by internal schedule, which is edited using the Schedule menu of the handheld LCD. Be sure to set the controller time and date.
	Hardwired occupancy input.	To allow hardwired input to determine occupancy set local schedule to 24/7 unoccupied. Input U15 on the DDC1 must have continuity with input 0V closed contact) for occupied operation. When input U15 is open, the unit is unoccupied.
	Controller time and date.	The local time and date must be set for the local schedule to correctly determine the occupancy mode. These values are stored in the controller for several months with battery backup. Use the System Settings menu of the handheld LCD.
	Network (BAS) schedule / command.	The two occupancy points are BAS occupancy enable and BAS occupancy command. When BAS control of occupancy is enabled, the BAS occupancy command point determines occupancy. Check the BMS Interface page of the handheld LCD to see the status of these points.
Compressor does not cycle off.	Coil temperature setpoint not satisfied.	In the dehumidification mode the compressors cycle to maintain the evaporator coil temperature setpoint (53°F, typical). At least one compressor will remain on while dehumidification is active.
	Supply air temperature setpoint not satisfied.	During the normal control sequence (dehumidification not enabled) the compressors cycle to maintain the supply air temperature setpoint. The compressor(s) will remain on until the supply air setpoint is satisfied.

Maintenance

Access Doors

When working on the unit, use the tie-back rods to fasten the door open for convenience and safety. Tie-back rods are located on these doors:

- Exterior door in front of the compressors.
- Exterior door in front of the electrical panel.
- Interior door at the electrical panel.

Find the tie-back rod on the lower inside door lip. Pull up on the inner end. Swing the rod toward the unit and insert the end of the rod into the hole in the sheet metal, as shown.

Figure 93: Replacing the Tie-Back Rod into the Door Lip Before Closing the Door.

Checking the Seals on Access Doors

To prevent air or water leaks around access doors, the door handles can be adjusted to tighten the door seal. To test if the door is properly sealed, close the access door on a dollar bill with the end of the bill protruding from the unit, then tug on the bill. If the bill is taut and doesn't slip when pulling on it, then the door handles are adequately tight.

If the bill can easily slide out of the seal, then the door handles are not tight enough. To tighten the door handles, adjust the nuts on the latch assembly, as shown in the following photo, and move the latch closer to the door.

Figure 94: Checking the Access Door Seals.

Cooling Coil

Coils need to be periodically cleaned to operate at design efficiency. Soiled fins reduce the capacity of the coil, demand more fan energy, and provide an environment for odor and bacteria to grow and to be spread throughout the conditioned zone.

High pressure water can be used to clean coils. Spray in the direction opposite the airflow to push dirt out the front of the coil.

Test the spray pressure on a small area on a corner of the coil to see how well the fins withstand the high pressure. Foaming chemical sprays and washes are available and should be used instead of high-pressure water on more fragile fins or when high fin density does not allow high-pressure water cleaning.

Figure 95: Adjusting the Door Handles.

Drain Pan

Clean the condensate drain pans regularly. Algaecide tablets or similar products can be used to prevent any algae growth in the drain pans. Remove any foreign objects that may obstruct drainage.

Check the drain trap for any sediment that may have accumulated in the bottom of the trap and could prevent drainage.

Winterize the drain trap each year before the drain piping or drain pan is exposed to freezing air. Return the trap to operating position before the cooling season starts.

MAINTENANCE

Dampers

Inspect the dampers periodically. Check that all linkages are operating smoothly and that the damper blade seals are in good condition. Clean the damper rod bushings.

Interior and Exterior

Clean the inside of the unit regularly with a disinfectant to prevent the buildup of dirt and the growth of microorganisms that can negatively affect the indoor air quality. Clean all metal surfaces including walls, racks, partitions, floors, and heat transfer surfaces.

Clean the exterior casing occasionally to prevent buildup of foreign material that can cause corrosion. The required frequency of cleaning depends on the location of the unit. If the paint is damaged, remove any corrosion and repaint the surface.

Check the condition of gaskets around doors.

Blower

When the unit is operating, a routine maintenance schedule should be carried out and include:

- Tighten the fan's wheel, bolts, and set screws.
- Clean dirt from the wheel to prevent imbalance and possible damage.
- Tighten motor mounting bolts and blower/motor assembly support bolts.
- Check rubber isolators (if applicable) for deterioration.

Blower Motor Lubrication

The ball bearings in the blower motor have been lubricated at the factory. Motors that cannot be re-greased are factory lubricated for the normal life of the bearings.

For motors that can be re-greased, lubrication is recommended at the following intervals. New motors that have been stored for a year or more should also be re-lubricated.

For information about bearing lubrication, refer to the motor manufacturer's documentation. Blower motors are pre-greased.

Motors can be re-greased while stopped (at less than 176°F) or running.

1. Clean the grease fitting.
2. If the motor has a purge plug, remove it.
3. Slowly apply grease to the fitting. Refer to the following table for the recommended amount of grease to add. Too much grease or injecting grease too quickly can cause premature bearing failure. Take a minute or more to apply the grease.
4. Operate the motor for twenty (20) minutes, then reinstall the purge plug if it was previously removed.

Table 71: Blower Motor Lubrication.

Lubrication Intervals		
Frame Size NEMA (IEC)	Rated Speed (RPM)	
	1,200	1,800
56 (80)	5,000 hours	N/A
Up to 210 incl. (132)	18,000 hours	12,000 hours
Over 210 to 280 incl. (180)	15,000 hours	9,500 hours

Table 72: Blower Motor Grease.

Amount of Grease to Add			
Frame Size NEMA (IEC)	By Weight ounces (grams)	By Volume	
		Inches	Teaspoons
56 (80)	0.14 (4.0)	0.25	0.8
Up to 210 incl. (132)	0.30 (8.4)	0.6	2
Over 210 to 280 incl. (180)	0.61 (17.4)	1.2	3.9

Note:

Keep grease clean. Mixing dissimilar greases is not recommended and may cause product malfunction.

Gas Furnace

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

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

3. Clean burners, heat exchanger, induced draft fan and vent ducts.

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

5. Check the attachment point of the duct furnace to the cabinet to verify that they are air tight.

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

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

⚠WARNING

If any of the original wiring needs to be replaced, it must be replaced with wiring material suitable for 221°F (105°C). Improper wiring may generate heat, cause a fire, and physical injury or death.

8. Label all wires prior to disconnection when servicing the unit.

⚠WARNING

Verify proper operation after servicing. Wiring errors can cause dangerous operation, may generate heat, cause a fire, and physical injury or death.

Note:

Verify proper operation after servicing. Wiring errors can cause improper operation.

Energy Recovery Wheel

See the “Energy Recovery Wheel” section.

Filters

Inspect the filters quarterly. Pressure drop readings can be used to determine when a filter should be replaced. Pre-filters should be replaced according to the following chart or as required by system design.

All filter sections can be accessed by a door. Filters can be removed by sliding them out of the rack. Some filters are secured to the frame using a clip. Aluminum filters can be removed and cleaned using high-pressure water

MAINTENANCE / STARTUP DOCUMENTATION

Filter Media Type

Table 73: Filter Media Type Table.

Filter Media	Quantity		
	Outdoor Air	Exhaust Air	Supply Air
2" Aluminum	X	X	
2" MERV 8	X	X	X
4" MERV 8			X
4" MERV 11			X
4" MERV 14			X

Filter Resistance

Table 74: Filter Resistance Table.

Filter Size	Final Resistance
2"	1.0" W.G.
4"	1.0" W.G.
2" + 4"	1.25" W.G.

Filter Media Sizes and Quantities

Table 75: Filter Media Sizes and QuantitiesTable.

Chassis	Quantity		
	Outdoor Air	Exhaust Air	Supply Air
11-XX	(4) 20 x 20	(2) 20 x 20	(4) 20 x 20
21-XX	(6) 16 x 25	(3) 16 x 25	(6) 16 x 25
31-XX	(6) 20 x 24	(4) 16 x 25	(9) 20 x 24
35-XX (30, 40 tons)	(9) 20 x 24 + (3) 20 x 20	(6) 20 x 24 + (2) 20 x 20	6-row DX coil: (4) 20 x 24 + (4) 20 x 20 4-row DX coil: (6) 20 x 24 + (6) 20 x 20
35-XX (50, 60 tons)	(9) 20 x 24 + (3) 20 x 20	(6) 20 x 24 + (2) 20 x 20	(6) 20 x 24 + (6) 20 x 20

Startup Documentation

See the following pages for Job Information and Startup Forms, and Startup Checklists. Complete all forms for each DOAS unit and return to LG through “B2B GERP”.

Job Information Sheet

Date: _____

Jobsite

Project Name: _____

Jobsite Address: _____

City: _____ State: _____ Zip: _____

Startup Contractor

Company Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____

Startup Technician

Name (Print): _____

Phone: _____ E-Mail: _____

Unit Information

Sales Order: _____ Tag/ Mark: _____

Model Number: _____ Serial Number: _____

Pre-Startup Checklist

The following items should be checked on all units before startup.

Exterior and Interior Inspection

- ☐ Unit is inspected for rigging or shipping damage.
- ☐ Report any damage to the installing contractor or shipping company and to the manufacturer.
- ☐ Unit is installed correctly, is level, and all doors are operable.
- ☐ Unit is secured to curb or mounting supports.
- ☐ Doors operate smoothly and gaskets are in place.
- ☐ Door handles are tightened to ensure complete gasket seal.
- ☐ All shipping blocks, tie downs, and bolts are removed.
- ☐ Condensate drain is piped and trapped.
- ☐ Condensate drains are primed.
- ☐ External ductwork is completed and correctly installed.
- ☐ Outdoor air intake hood is installed, bird screen is in place, and opening is unobstructed.
- ☐ Copper tubing is secured and not rubbing.
- ☐ Filters are installed correctly.

Fans and Motors

- ☐ Fan inlets and outlets are unobstructed.
- ☐ Fasteners, setscrews, and locking collars on the fan are secure.
- ☐ Fasteners on the motor and base are secure.
- ☐ Fan wheel rotates freely by hand and no parts are rubbing.
- ☐ Electrical connections are properly secured.
- ☐ Housing and ductwork, if accessible, are cleared of obstructions and foreign material that may damage the fan wheel.

Compressors

- ☐ Compressor shipping brackets are removed.
- ☐ Crankcase heaters must be energized for a minimum of twelve (12) hours before startup.

IG Furnace

- ☐ Gas piping is complete and gas lines are purged.
- ☐ Gas venting is in place.

Controls and Electrical

- ☐ The main disconnect is off.
- ☐ All field-mounted sensors and instruments are installed and wired.
- ☐ Unit controls are off.
- ☐ Electrical service matches unit voltage.
- ☐ Electrical field wiring is complete.
- ☐ All electrical connections are tightened.
- ☐ Compressor and motor breakers or fuses are open (disabled).
- ☐ Main power is wired to the disconnect.
- ☐ Discharge air sensor is installed per the Wiring instructions in the Rooftop DOAS Installation Manual.
- ☐ Space temperature and humidity sensors are installed per the Wiring instructions in the Rooftop DOAS Installation Manual.
- ☐ Turn on power, check phase voltage monitor to make sure indicator light is green. If indicator light is red, verify voltage and phase is not reversed.

Startup Form

Before starting the unit, ensure that all applicable items in the Pre-Startup Checklist have been completed and verified. Compressor crankcase heaters must be energized for a minimum of twelve (12) hours before operating the unit.

Electrical

Unit Voltage: _____ Line Voltage: _____

L1 - L2: _____ L2 - L3:_____L3 - L1: _____

Supply and Exhaust Fans

Component	Nameplate Amps	Running Amps			Rotation Direction	VFD Speed (Hz)	Shaft Speed (RPM)
		L1	L2	L3			
Supply Fan No. 1							
Supply Fan No. 2							
Supply Fan No. 3							
Exhaust Fan No. 1							
Exhaust Fan No. 2							
Exhaust Fan No. 3							

Refrigeration

Component	Nameplate Amps	Running Amps			Rotation Direction
		L1	L2	L3	
Condensing Fan No. 1					
Condensing Fan No. 2					
Condensing Fan No. 3					
Condensing Fan No. 4					
Condensing Fan No. 5					
Condensing Fan No. 6					
Condensing Fan No. 7					
Condensing Fan No. 8					
Compressor A1 Crankcase Amps = _____					
Compressor A2 Crankcase Amps = _____					
Compressor B1 Crankcase Amps = _____					
Compressor B2 Crankcase Amps = _____					

Other

Component	Nameplate Amps	Running Amps		
		L1	L2	L3
Energy Recovery Wheel				

Cooling

Parameter	Test C1	Test C2	Test C3	Test C4*
Circuit A	100%	100%	0%	0%
Circuit B	0%	0%	100%	25%
Hot Gas Reheat	0%	100%	0%	0%
Outdoor Air Temp. (°F)				
Evaporator Coil Leaving Air Temp. (°F)				
Discharge Air Temp. (°F)				
Subcooling (°F)	Expected = 10 to 15°F	Expected = 2 to 10°F	Expected = 10 to 15°F	N/A
Superheat (°F)	Expected = 10-20°F	Expected = 10-30°F	Expected = 10-20°F	N/A
Head Pressure (psi) Expected = 250 to 500 psi				
Suction Pressure (psi) Expected = 96 to 155 psi				

*Test C4 only applies to units with modulating compressors.

For charge adjustment guidelines, see the Refrigeration section of Troubleshooting.

Heating – IG Furnace

Nominal Heating Capacity (MBH): _____ Gas Type: _____

F1 Capacity (MBH): _____ F2 Capacity (MBH): _____

☐ Verify pilot spark.

Parameter	Low Fire 0%	High Fire 100%
Outdoor Air Temperature (°F)		
Discharge Air Temperature (°F)		
Natural Gas IDF Furnace Manifold Pressure [InWc]		
Set to: Low Fire (0%) .355 InWc – High Fire (100%) 3.5 InWc		
LP Gas IDF Furnace Manifold Pressure [InWc]		
Set to: Low Fire (0%) 1.0 InWc – High Fire (100%) 10 InWc		
Flue Stack Temperature (°F)		

Heating – Electric

Nameplate Amps: _____ Running Amps (L1/L2/L3): _____

Parameter		Observed Value
Outdoor Air Temperature (°F)		
Low (25%)	Discharge Air Temp. (°F)	
High (100%)	Discharge Air Temp.(°F)	

Note:

⃠ Do not allow supply temperature to exceed 110°F. If supply temperature approaches 110°F during startup, turn off heater and record 110°F in the Discharge Air Temperature field.

LG Electronics, U.S.A., Inc.
Commercial Air Conditioning Division
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lghvac.com

IM_LG_Rooftop_DOAS_02_19
Supersedes: IM_LG_Rooftop_DOAS_11_17
IM_LG_Rooftop_DOAS_07_17