

Premium Efficiency VPCS Series Vertical Stacked Water Source Heat Pumps, a Generation Installation, Operation, and Maintenance Manual



Installation Guide

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Important!

Read before proceeding!


General safety guidelines


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


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

Safety symbols

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

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

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

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

- ① **Note:** Highlights additional information useful to the technician in completing the work being performed properly.

 **WARNING**

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

 **WARNING**

This product can expose you to chemicals including formaldehyde, which is known to the state of California to cause cancer. For more information, go to <http://www.P65Warnings.ca.gov>.

Changeability of this document

In complying with the manufacturer's policy for continuous product improvement, the information contained in this document is subject to change without notice. There is no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest service office.

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

Revision notes

Affected section	Description	Date implemented
Cabinet nomenclature	Updated cabinet nomenclature	November 2020
Chassis nomenclature	Updated chassis nomenclature	November 2020

Associated literature

Manual description	Form number
Vertical Stacked Heat Pump Start-Up and Performance Checklist	145.18-CL1
Vertical Stacked Water Source Heat Pump Heating and Cooling Data Record Sheet	145.18-CL2

Cabinet nomenclature

	1,2,3	4,5	6	7	8	9	10	11	12,13	14	15	16	17
	VPB	12	M	1	D	E	A	2	2T	4	0	A	0

Product Category
 VPB = Vert. Stacked Premium Heat Pump - Standard Cabinet Assembly
 VPM = Vert. Stacked Premium Heat Pump - Master Cabinet Assembly
 VPS = Vert. Stacked Premium Heat Pump - Slave Cabinet Assembly

Unit Capacity
 09 = .75 TON
 12 = 1 TON
 15 = 1.25 TON
 18 = 1.5 TON
 24 = 2 TON
 30 = 2.5 TON
 36 = 3 TON

Customization
 0 = None
 S = Special Quote

Design Series
 A = Current

Misc. Options

	Filters: MERV (Depth)		
Option	4 (1")	8 (1")	13 (2")
Galv Drain Pan	0	F	G
SST Drain Pan	S	T	U
Sealed Openings	L	M	N
SST DP w/ Sealed	C	D	E

Control Options

2-Speed Unit Mounted Switch 3-Speed Thermostat Control	Thermostat Location			
	Remote	Whip	Surface	ADA Door
	M	W	P	A
	3	4	5	7

Horizontal Discharge Opening Orientation

00, 0T	1H, 1T	2H, 2T	3H, 3T
X = None	B = Back F = Front L = Left R = Right	1 = Left + Front 2 = Left + Back 3 = Left + Right 4 = Right + Back 5 = Right + Front 6 = Back + Front	7 = Front + Left + Right 8 = Front + Right + Back 9 = Front + Left + Back

Supply Air Configuration
 1H = Single Horizontal Supply
 2H = Double Horizontal Supply
 3H = Triple Horizontal Supply
 0T = Top Only
 1T = Single Horizontal Supply + Top
 2T = Double Horizontal Supply + Top
 3T = Triple Horizontal Supply + Top
 00 = Field Cut (No Openings)

Blower Options
 E = ECM Blower
 F = Hi-Static ECM
 G = ECM w/ Continuous Low Speed
 H = Hi-Static ECM w/ Continuous Low Speed

Electrical Connection
 0 = None (Terminal Block)
 D = Non-Fused Disconnect
 F = Disconnect w/Fuses

Voltage
 1 = 208/230-60-1

Riser Arrangement

Riser Arrangement	Risers Attached	Risers Ship Loose
Right Hand Risers	1	F
Left Hand Risers	2	G
Back Risers	3	H
R/Hand Risers with Cover	4	
L/Hand Risers with Cover	5	
Back Risers with Cover	6	

Cabinet Options

Cabinet Height	No OA Options	LEFT		RIGHT	
		Top OA Entry - 4" Round	Top OA Entry - 4" Round w/ Motorized Damper	Top OA Entry - 4" Round	Top OA Entry - 4" Round w/ Motorized Damper
88" Cabinet	A	G	L	R	W
80" Cabinet	B	H	M	T	X
88" Cabinet w/ 2" Stand	C	J	N	U	Y
80" Cabinet w/ 2" Stand	E	1	3	5	7
80" Cabinet w/ 4" Stand	D	K	P	V	Z
80" Cabinet w/ 8" Stand	F	2	4	6	8

Chassis nomenclature

	1,2,3,4	5,6	7	8	9	10	11	12	13	14
	VPCS	12	A	1	0	0	A	C	0	0

Product Category
VPCS = Vert. Stacked HP Chassis R-410

Unit Capacity
09 = .75 TON
12 = 1 TON
15 = 1.25 TON
18 = 1.5 TON
24 = 2 TON
30 = 2.5 TON
36 = 3 TON

Generation
A = Current

Voltage
1 = 208/230-60-1

Water Valve Options	Valve	
Valve Options	Only	Y-Strainer
No Water Control Valve	0	S
Motorized 2-Way Shut-Off Valve	M	Y
Motorized 3-Way Shut-Off Valve	N	V

Customization
0 = None
S = Special Quote
R = Replacement

Misc. Options
0 = None
S = Quiet Chassis
C = Washer-less hose conn
B = Quiet chassis w/ washer-less hose connection

Waterside Options
C = Std Water Coil
N = Cupro-nickel Water Coil

Air-side Options
A = Std Air-Side coil
C = Dipped Electrofin Coating

Auto-Flow Regulator
0 = No Flow Control Valve
B = 1.5 USGPM
C = 2.0 USGPM
D = 2.5 USGPM
E = 3.0 USGPM
F = 3.50 USGPM
H = 4.0 USGPM
J = 4.5 USGPM
K = 5.0 USGPM
L = 6.0 USGPM
M = 7.0 USGPM
N = 8.0 USGPM
P = 9.0 USGPM

Installation

① Note:

After installing the unit, show the user how to turn off the electricity to the unit. Point out control and switch locations for turning off the electricity.

Ensure the user understands the importance of following all safety precautions.

Notice and disclaimer

This unit contains refrigerant installed by the factory that is approved for use in the unit's intended country of installation or market. Distributors are only authorized to provide refrigerants that have been approved for use in the countries or markets they serve.

The refrigerant used in this unit is identified on the unit's nameplate and in this manual. Any additions of refrigerant into this unit must comply with the country's requirements with regard to refrigerant use and should be obtained from manufacturer approved distributors. Use of unapproved refrigerant substitutes will void all warranties and can cause injury or death.

Disclaimer

Customer modifications to certified products are prohibited. If performed without the express written approval of the manufacturer, modifications will void all warranties (expressed or implied) and may result in hazardous situations resulting in equipment damage, serious physical injury or property damage, or death.

The manufacturer has certified the product as being compliant with applicable government and/or industry standards. Product certification is designated either on the product itself or in the product literature. The certification mark identifies the applicable standards as well as the Nationally Recognized Test Lab (NRTL) or other testing facility that conducted the testing, where applicable.

If changes are made to the product, an engineering review is required to assess the impact to the product certification. In some instances, the changes may require that the NRTL or testing facility review and re-approve the product by means of a field or site inspection and certification.

Modifications may invalidate product certifications or violate country standards. Any person or entity making changes to the product is responsible for obtaining the required engineering review and approval, as well as covering certification and other related costs.

Unauthorized customer modifications to certified products are prohibited for the following reasons:

1. A. Modifications may create hazards that could result in death, serious injury, or equipment damage.
2. B. Modifications will void product warranties.
3. C. Modifications may invalidate product certifications and may violate country standards. Country standards may require that only certified products be used in certain applications, and modifications that result in the loss of product certification may violate those standards.

Pre-installation

Literature

Review this Installation, Operation, and Maintenance (IOM) manual prior to installation. After installing the unit, give this IOM to the end user. If help is needed with any of the installation instructions or matters relating to the unit, contact the sales office where you bought the unit. You may also refer to the unit rating plate for a contact name.

Shipping

Cabinets and risers ship in one of the following configurations:

- Cabinets are stacked on their side with risers attached. Chassis ship on separate skids.
- Risers ship loose, packaged in boxes and sorted by floor. Cabinets ship upright up to four per skid. Chassis ship on separate skids.
- Risers ship loose, packaged in boxes, and sorted by floor. Cabinets ship upright on skids with chassis inside the cabinet. Chassis electrical and water connections are not installed. The chassis is secured to the service panel. Remove the screws before removing the service panel and chassis.
 - The cabinet must remain standing upright. Do not place cabinets on their side with the chassis inside.

Inspection and storage

About this task:

Store cabinets, chassis, and risers the same way they were shipped. Ensure the storage area is dry and protected from the environment. Keep the units in their upright position. If the risers are stored at the job site, ensure the pipe ends are capped to prevent foreign object debris and contamination.

In areas where construction is not complete (including dry wall, plaster, paint, and where any emission of dust particulates or fumes from outgassing are present), all precautions must be taken to protect the cabinet, openings, and chassis from contamination or physical damage.

Upon delivery, perform the following inspections:

1. Inspect the unit for shipment damage. Notify the Transportation Company of any damage and note the damage on the shipping receipt.



Rough handling may dislocate and damage internal components.

2. Inspect the riser projections at each end of the cabinet for misalignment or end damage that would prevent making an acceptable connection.
3. Inspect the thermostats and other accessories that have been shipped separately for quantity and transit damage.

Result

Store the refrigeration chassis in the normal upright orientation to maintain oil in the compressor sump.

Preparations for installing the unit

About this task:

Before installing the unit, perform the following preparations:

1. Verify the model number on the unit nameplate with the ordering and shipping information to ensure the correct unit has been shipped.
2. Carefully inspect each unit before delivery to the installation site. All cabinets may not be equipped with the same size riser or the same air supply grille arrangement. In most cases, each cabinet is individually tagged for a specific location in the building.
3. Keep the cabinet sealed with the shipping materials until all plastering, painting, and construction work is complete.
4. Remove the inner service panel and manually check the blower wheel for free rotation.
5. Match the refrigeration chassis to the proper cabinets by referring to the cabinet and chassis nameplate and label information.
6. Remove the chassis refrigeration access panel (top cover) and inspect the unit. Ensure that the refrigerant tubing is free from obvious physical damage and kinks, and check that piping does not touch other unit components.
7. Ensure the compressor is mounted on neoprene isolators with metal spacing sleeves inside. Secured it with nuts that are snug against the metal spacer sleeves.
8. Inspect all electrical connections. Connections must be clean and tight at the terminals.

CAUTION

Do NOT use the risers to lift the cabinet assembly.

WARNING

Do NOT install this unit outdoors.

DANGER

A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure, and never open pressurized system parts.

DANGER

Before servicing, open and tag all disconnect switches.

 **DANGER**

Do NOT install units in a flammable environment due to the danger of an explosion.

 **WARNING**

Safety guards, shields, barriers, covers, and protective devices must not be removed while the compressor/unit is operating.

 **WARNING**

All safety features, disengagement, and interlocks must be in place and function correctly before the equipment is put into operation. Never bypass or wire around any safety device.

 **WARNING**

Use gloves and protective goggles where appropriate and have a gas mask close at hand. Use electrical protection equipment and tools suited for electrical operations.

 **WARNING**

Personnel must be qualified according to national safety rules and regulations.

 **WARNING**

Only manufacturer- qualified personnel should install this system. If not, it may cause water leakage, electric shock, or fire.

Rigging

WARNING

Follow all applicable regulations and safety practices during rigging and lifting.

Prepare and follow written rigging and lifting plan. Lifting must be directed by trained, professional rigger.

Spreader bars must be used and be long enough to prevent rigging from contacting unit. Use only the designated lift points according to unit's IOM, and use ALL lift points.

Locate the center of gravity through trial lifts to account for possible variations in unit configuration. Use rigging and lifting techniques that keep the unit stable and level. Keep clear of unit when lifted.

Cabinet riser installation

CAUTION

Do NOT use the risers to lift or move the cabinets.

Refer to Figure 3, which shows the correct location of the cabinet in relation to the floor sleeve and risers.

Risers are not designed to support or lift any part of the cabinet. Do not use them to lift a cabinet. Risers are attached using nylon ties to allow for slight adjustments during installation, and expansion of riser column during operation. Take care during installation to avoid damage to risers and riser stub-outs.

CAUTION

Improper handling and installation of risers could damage riser stub-outs and valves and could result in property damage, death, or serious injury.

CAUTION

Do not allow the risers to bottom out. Riser stub-out should be centrally located with the stub-out opening of the cabinet riser. Do not allow riser stub-outs or risers to contact cabinet sheet metal.

WARNING

Do not drag risers on the floor while moving the cabinet.

When the risers are shipped loose, riser installation can be completed before cabinet installation. When installing risers, ensure the riser stub-outs are centered in the the cabinet openings. Ensure that the risers cannot bottom out in swage (see Figure 1).

When risers are shipped attached to cabinets, complete the installation of risers and cabinet at the same time. Detaching the riser from the cabinet is unnecessary.

Placing the cabinet

About this task:

The correct location of the cabinet in relation to the floor sleeve and risers is shown in Figure 3. To place the cabinet correctly, perform the following steps:

1. Place the cabinet in a horizontal position on the floor adjacent to its installation location (when risers are attached to cabinet).

The units are designed to accommodate a maximum supply and return riser stub-out movement of 1-1/2 inches due to expansion and contraction (total movement of 3 inches). If the total calculated riser expansion or contraction exceeds 1-1/2 inches, the field must provide expansion compensation.
- ① **Note:** The initial positioning of the riser stub-out is correct when the top of the riser pipe is 3 inches above the top of the cabinet (applies to VPT standard riser models only).
2. Install field or factory-provided riser extensions, if required, to the unit-mounted risers prior to moving the cabinet into final position.
3. Raise the cabinet upright. Lower the risers through the floor cutout, aligning the risers into the swaged section of the unit on the floor below.

① **Note:** Take extra care not to scrape or dent risers during positioning. The riser tailpiece should insert approximately 2 inches into the 3-inch long swaged section of the unit below.

CAUTION

DO NOT allow the riser tailpiece to bottom out into the swaged section. This ensures the correct riser positioning and compensates for variations in floor-to-floor dimensions.

4. Center the risers in the pipe chase, and level the cabinet using shims as necessary.
5. Plumb risers in two planes to assure proper unit operation and condensate drainage.
6. Anchor the cabinets into place using rubber isolated sheet metal angles. Approved and tested sheet metal angles are available from factory.

CAUTION

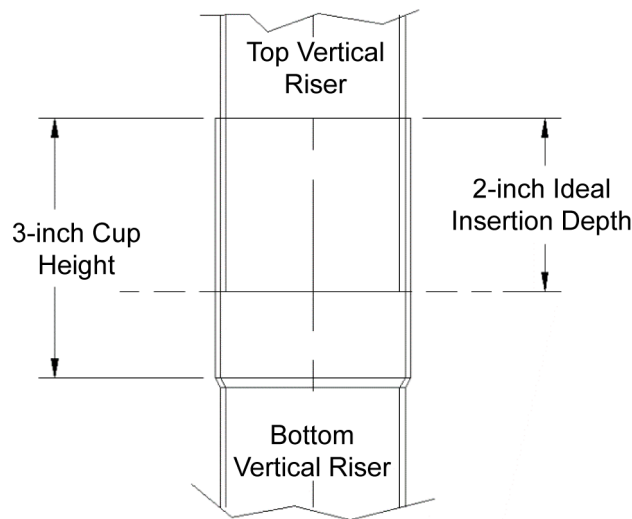
Ensure the unit has vibration isolation pads installed. These pads are required in order to reduce noise transmission into the floor. If the unit does not vibration isolation pads, order them via Source1 and install in the field. Failure to have the isolation kits installed can result in loud unit operation.

WARNING

Do not drill or drive screws into the cabinet in the area of the internal drain pan.

- Center the risers' horizontal stub-outs (complete with factory-installed shut-off valves) in the cabinet slot openings. Ensure that the stub-outs are perpendicular to the side/back panel.
- Verify all risers are vertical and that they penetrate the swaged joint at least 1 inch.
Factory provided risers come with a 3-inch deep swage. Do not allow risers to completely bottom out at 3 inches in the swage. The 3-inch swage depth is oversized to allow for adjustments if necessary to keep riser stub-outs and valves centered in the cabinet opening.
- Center the riser stub-out in cabinet opening to allow for expansion and contraction. Riser stub-outs must not contact on any sheet metal opening. Otherwise damage can occur to stub-outs, resulting in water leaks and property damage.

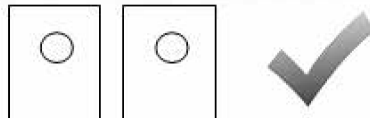
Figure 1: Ideal riser insertion depth



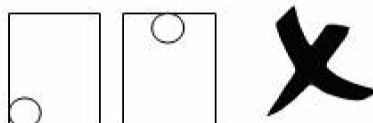
LD23535

Figure 2: Correct/incorrect stub-out positions in cabinet riser opening

Correct Position of Stub-Out in Cabinet Riser Opening:



Incorrect Position of Stub-Out in Cabinet Riser Opening:



LD19017

- Braze or solder riser joints with industry accepted solder or brazing rod material.

 **WARNING**

The riser system must be secured to building structure. Cabinets are not designed to support the riser system.

11. Secure the riser system at a minimum of one point to the building structure. Cabinets are not intended to support the riser system. If the temperature range of the system exceeds the allowed expansion and contraction limits (1-1/2 inches maximum), the installing contractor must make riser compensation provisions.
12. Ensure that individual unit shut-off valves remain closed until the circulating loop system is cleaned and flushed.

Table 1: Premium series physical data

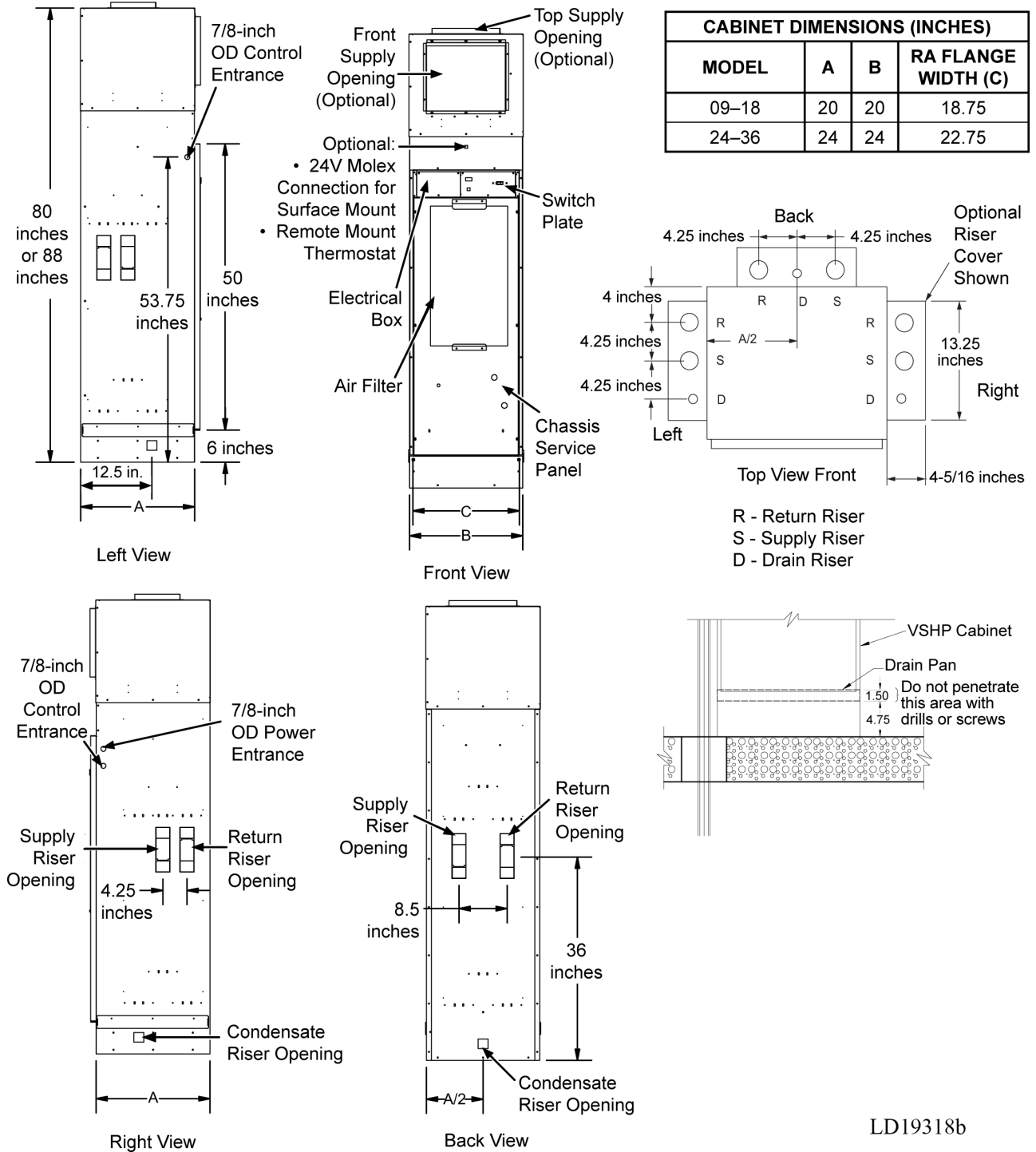
Premium series model	09	12	15	18	24	30	36
Nominal cooling (ton)*	0.75	1.0	1.25	1.5	2.0	2.5	3.0
Compressor type	Rotary			Scroll			
Refrigerant charge (oz)	33	39	45	47	51	52	58
Air coil-type	Enhanced copper tubes, enhanced aluminum fins						
Face area (sq ft)	1.83	1.83	2.72	2.72	3.14	3.38	3.38
Rows/FPI	2/14	3/14	3/14	3/14	3/14	3/14	3/14
Water coil-type	Enhanced surface co-axial						
EC blower/motor	Double width double inlet (DWDI) forward-curved centrifugal/EC motor (ECM) direct drive						
Diameter x width (inches)	9x4T	9x4T	9x7T	9x7T	10x7T	9x8	9x8
Motor HP	0.33	0.33	0.33	0.33	0.33	0.50	0.50
Filter quantity-size (inches)	1-14x25x1	1-14x25x1	1-16x30x1	1-16x30x1	1-20x30x1	1-20x30x1	1-20x30x1
Flexible hose (inches)	1/2	1/2	1/2	1/2	3/4	3/4	3/4
Condensate connection size (inches)	7/8 ID	7/8 ID	7/8 ID	7/8 ID	7/8 ID	7/8 ID	7/8 ID
Cabinet weight (lb)**	145	145	145	145	175	175	175
Chassis weight (lb)	104	110	117	137	156	165	172

ⓘ Note:

* Nominal capacity is calculated in accordance with ARI/ISO Standard 13256-1 for water loop application.

** Cabinet weight is approximate and does not include the weight of the risers.

Figure 3: Cabinet unit dimensions & floor sleeve dimensions

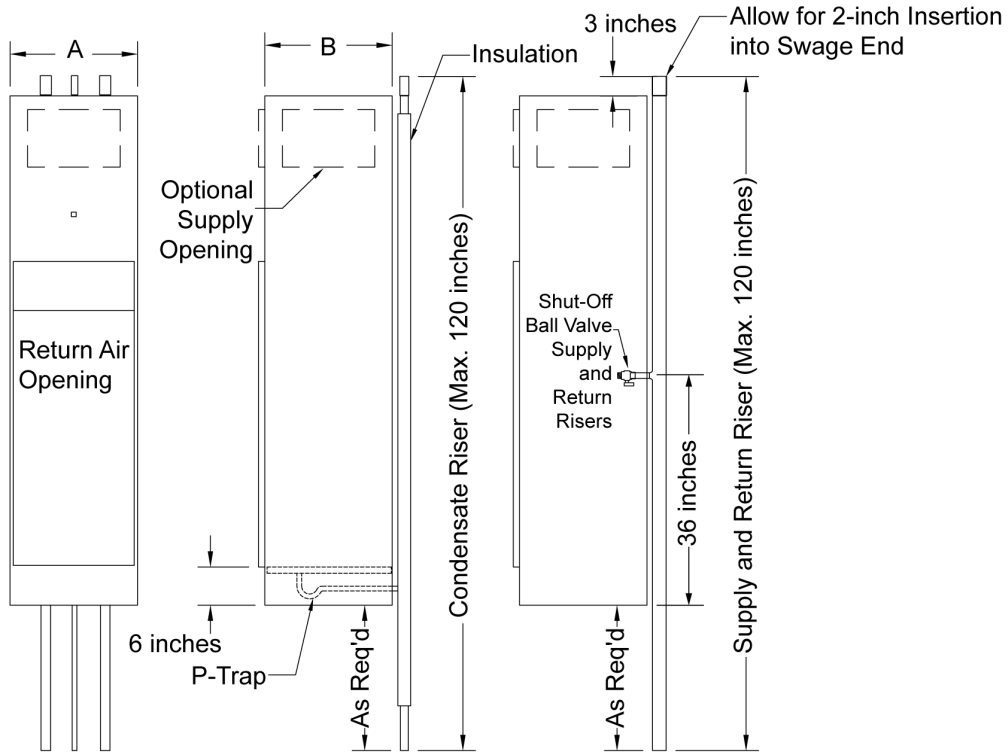


Note:

- Supply, return, and condensate riser openings are pre-punched on all sides and field convertible. Cut tabs to remove the knock-out.
- Supply and return openings are 4 inches x 2.5 inches. During riser installation, ensure the stub-out is centered in supply and return openings.

- c. Condensate P-trap is accessible from the front by removing the bottom cover plate or from the top by removing the drain pan.
- d. Riser and shut-off location is measured from base of cabinet and does not include the stand height.

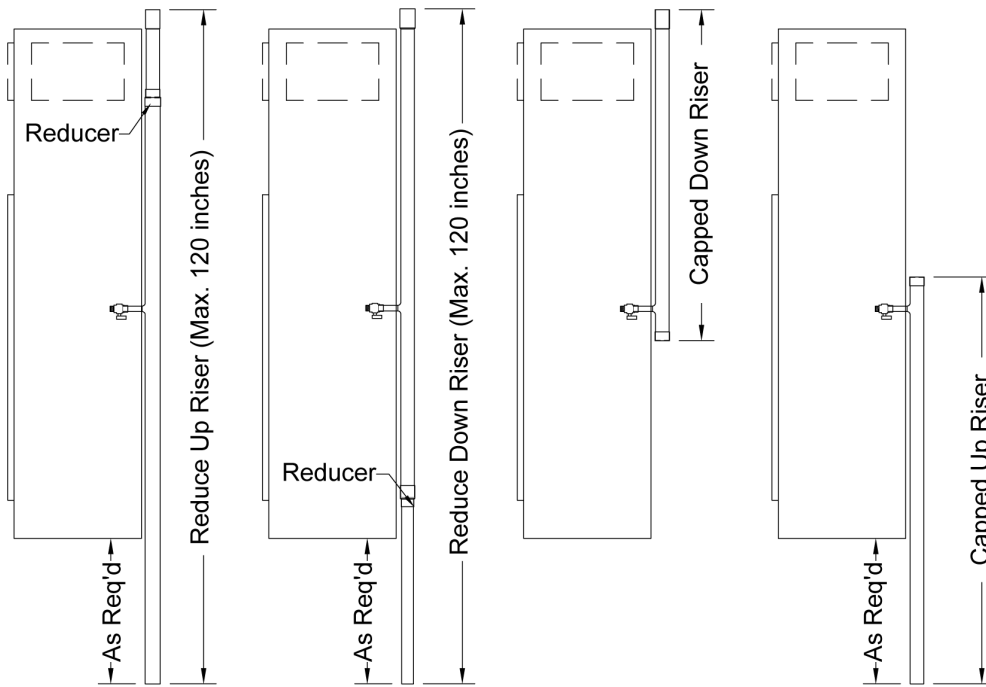
Figure 4: Cabinet riser dimensions



FRONT VIEW
(BACK RISERS)

RIGHT SIDE VIEW
CONDENSATE RISER

STANDARD
RISER



REDUCE UP
RISER

REDUCE DOWN
RISER

CAPPED DOWN
RISER

CAPPED UP
RISER

LD19330

Riser loop

About this task:

1. Install the following parts at the base of each supply and return riser to enable system flushing, balancing, and servicing:
 - Drain valve
 - Shut-off/balancing valves
 - Flow indicators
 - Drain tees
2. Install strainers at the inlet of each circulating pump.
3. Insulate loop water piping that runs through unconditioned areas of the building or outside the building.

When the loop water temperature is maintained between nominal operating limits of 60.0–90.0°F, piping does not sweat or suffer undue heat loss at conditioned space temperatures.
4. Install vents in piping loop as required to bleed residual air from the piping system during filling and servicing.
5. Determine the riser shut-off valves and hose kits required for job specific site conditions:
 - a. Factory-supplied risers come with the appropriate hose kits with NPSH or JIC type fittings (see Figure 5 and Figure 7). Before attaching NPSH type hoses, check that the female end gasket is not missing and is free of damage or debris. See Table 3 for information on replacement gaskets for NPSH hose kits.
 - b. For field-supplied risers, it is recommended to order the appropriate NPSH or JIC type field hose kits from the factory, complete with shut-off valves. Shut-off valves are to be field sweat connected to risers (see Figure 6 and Figure 8).

Hoses

About this task:

Ensure the correct hose set is matched with the compatible unit size (see Table 2). Install the NPSH or JIC factory-provided hoses by completing the following steps:

1. Inspect for missing or damaged hose gasket. See Table 3 for replacement gasket part numbers.
2. Tighten by hand the screw connections to the male NPSH or JIC fitting on the shut-off valve. Hold the ferrule stationary when tightening.
3. Tighten using a backup wrench a 1/4 turn further. Do not overtighten.

WARNING

When installing hoses, do not apply a twist or torque load on the hose.

 **WARNING**

When tightening hoses, hold the ferrule stationary by hand while tightening the screw connections. Avoid tight bends, or water flow and high pressure drops may occur.

 **WARNING**

Hose gasket does not require extreme tightening to obtain a seal. DO NOT OVERTIGHTEN, or damage to gasket or sealing surface will occur. Do not apply thread sealant.

 **WARNING**

Hoses must be hand tightened, then further tightened for roughly another 1/4 turn. Check for leaks before tightening any further. Do not apply excessive force; rubber gaskets might get damaged.

 **WARNING**

Always use a back-up wrench when tightening hoses to valves. Otherwise, valve solder joint may fail, leading to property damage or serious injury.

Table 2: Chassis hoses

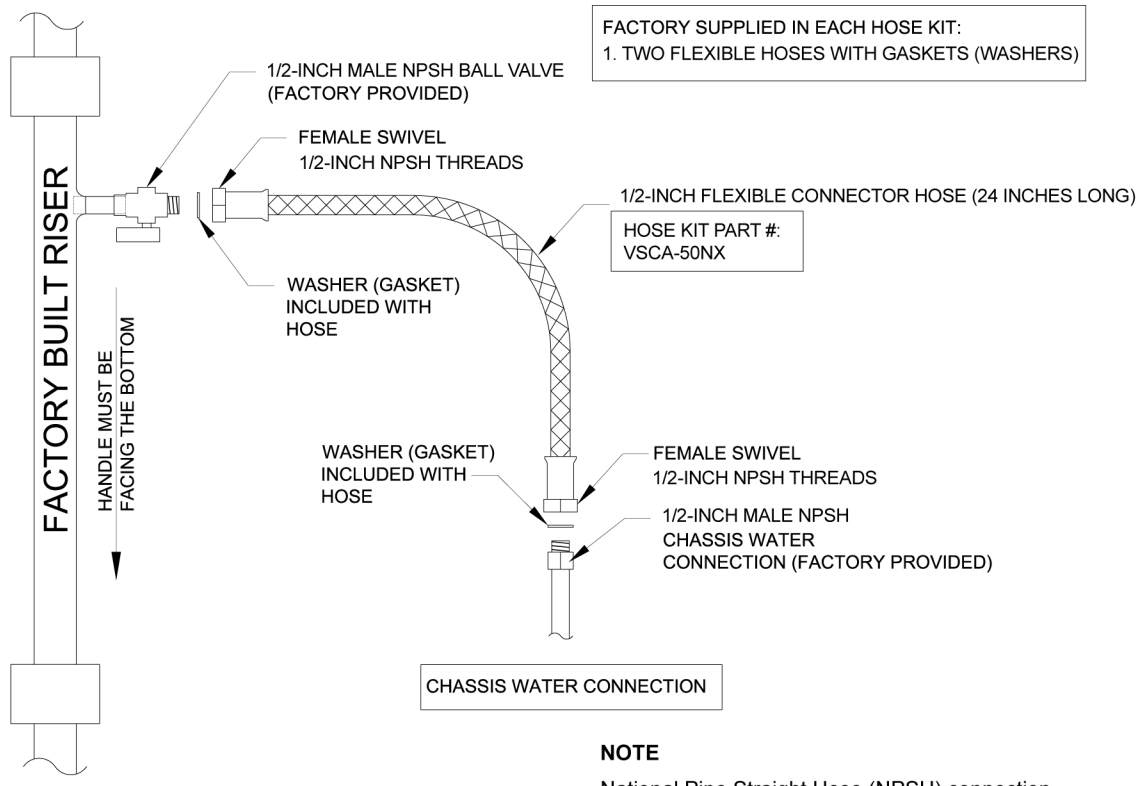
Chassis model	Hose type
09-18	1/2-inch NPSH or JIC Female-Female
24-36	3/4-inch JIC Female-Female

Table 3: Replacement hose gaskets

Part number	Description
VSGK-UFHW-050	1/2-inch Rubber Gasket

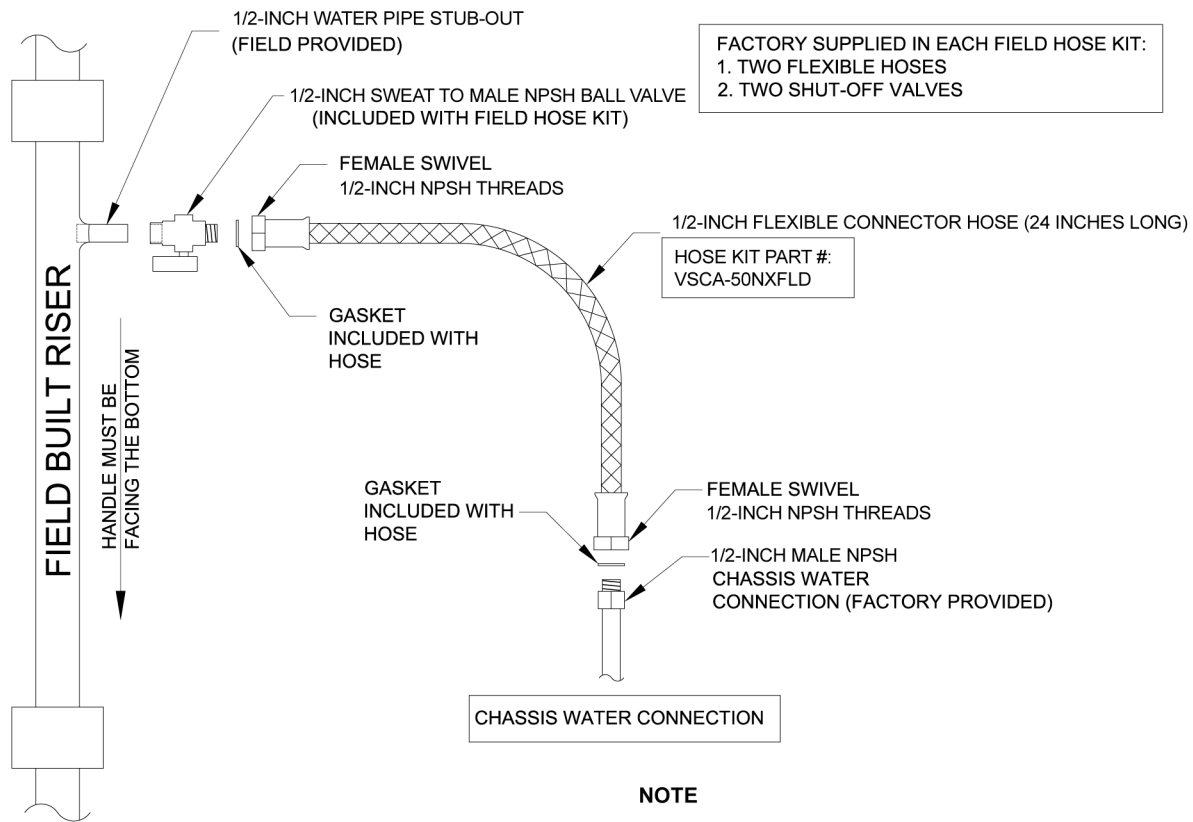
Result

Figure 5: Standard factory supplied npsH hose kits and risers



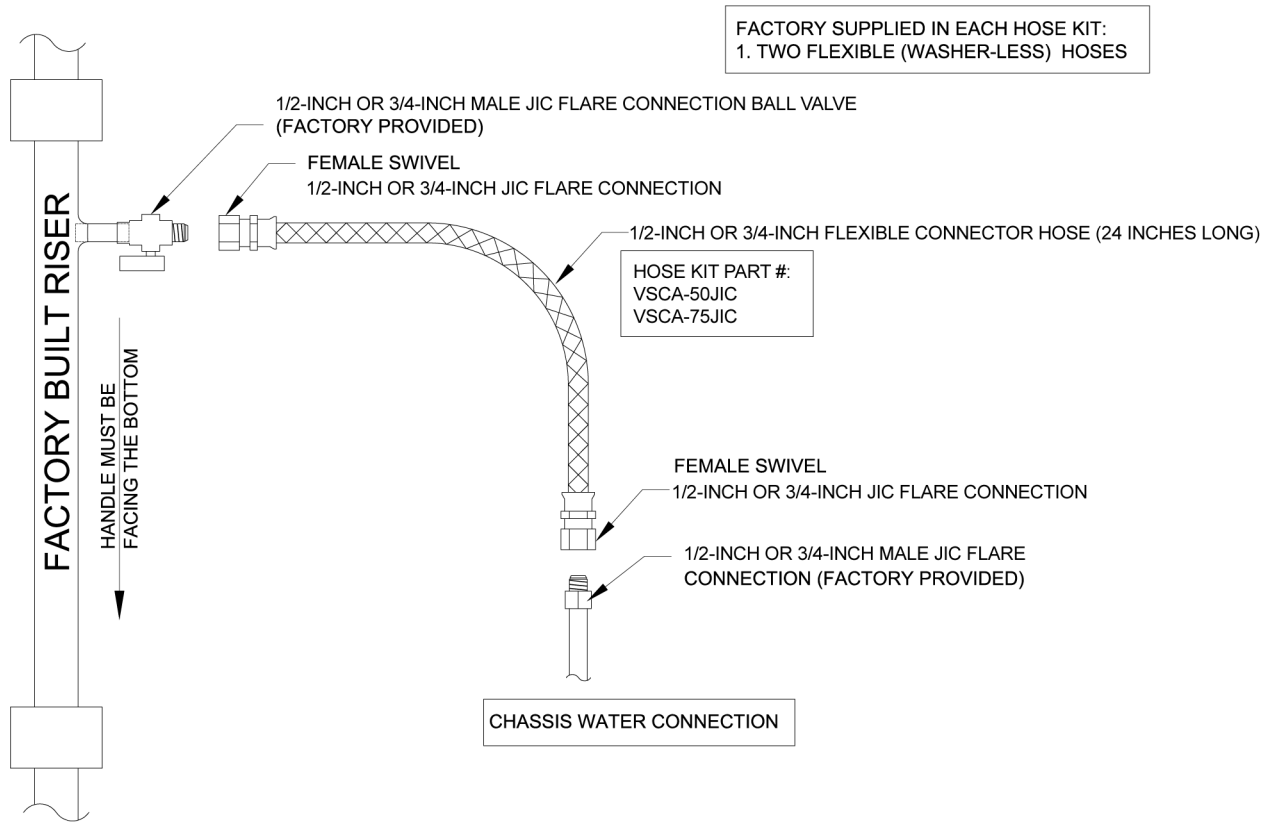
LD18126

Figure 6: Optional field supplied risers with factory supplied npsH hose kits and shut-off valves



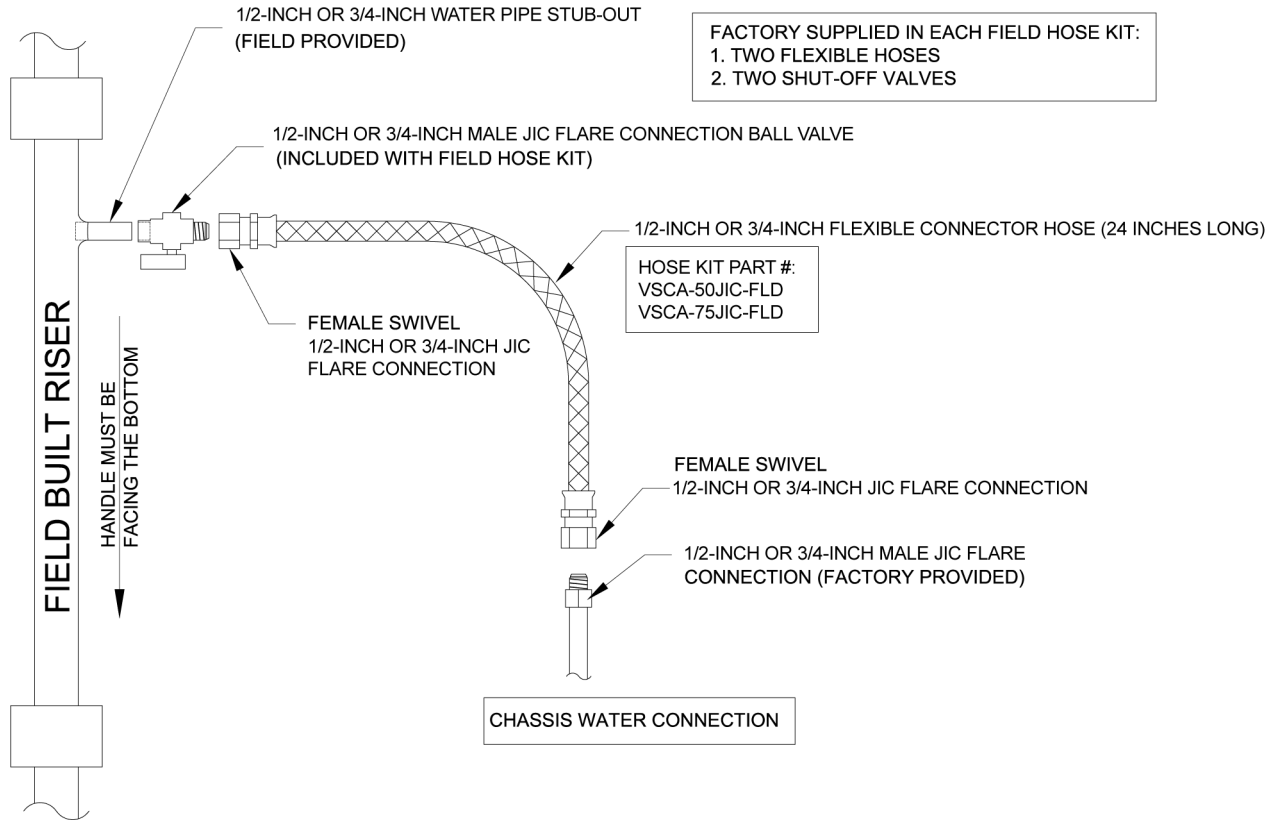
LD18127

Figure 7: Standard factory supplied jic hose kits and risers



LD19518

Figure 8: Optional field supplied risers with factory-supplied jic hose kits and shut-off valves



LD19518

Electrical wiring

WARNING

Lock all electrical power supply switches in the OFF position before installing the unit. Failure to disconnect power supply may result in electrical shock or even death.

Field-installed power wiring

Power wiring to the equipment must conform to National Electrical Codes (NEC), local electrical codes, and must be performed by a licensed electrician.

Provide each unit with its own separate electrical circuit, means of circuit protection, and electrical disconnect switch. Follow current NEC ANSI/NFPA 70, CSA C22.1 C.E.C. Part 1, and state and local codes.

WARNING

Failure to provide these shut-off means could cause electrical shock or fire, resulting in damage, injury, or death.

 **CAUTION**

Use copper conductors only! Failure to use copper conductors can result in equipment damage.

Verify that the available unit power supply is compatible with the unit's nameplate rating. Ensure the breaker is properly sized as per the nameplate. The line voltage supply enters through the right side of the cabinet at the 7/8-inch power entrance knock-out.

Connect to the line side of the factory-installed terminal block. Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

Field-installed low voltage wiring

Select a location for room thermostat, away from supply air registers, on draft-free interior wall that is far from lights, television, direct sunlight, or other heat sources.

 **CAUTION**

Locate thermostat away from supply drafts. Ensure the back of the thermostat is sealed and protected from air drafts. Short cycling can result in damage to the unit.

Install the thermostat by connecting the remote thermostat wiring to microprocessor board low voltage terminal strip. See Figure for typical wiring connections.

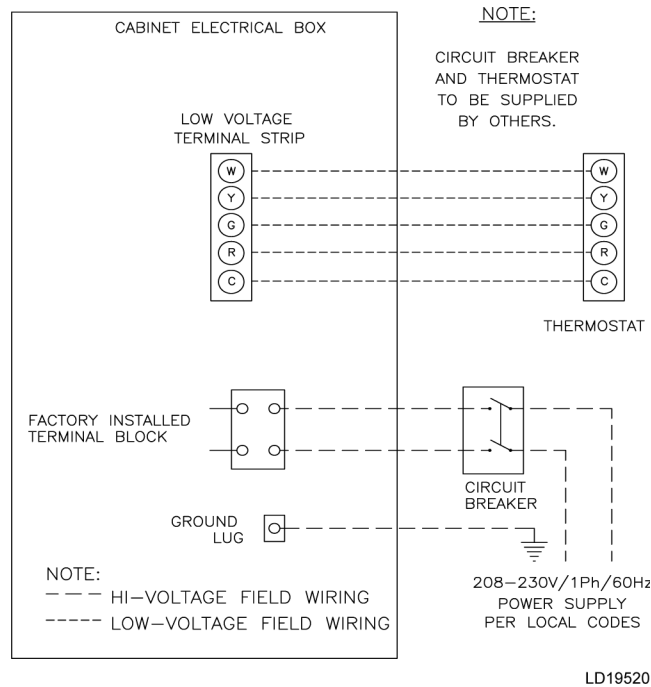
Ensure that the control wiring between the thermostat and the unit's terminations does not exceed 1 ohm.

- ① **Note:** Resistance in excess of 1 ohm may cause component damage due to insufficient AC voltage supply.
- ① **Note:** Check all loads and conductors for grounds, shorts, or miswiring. Do not run the low voltage wiring in the same conduit with the high voltage power wiring.

Table 4: Typical wire connections

Recommended wire size (gauge)	Maximum low voltage wire length (feet)
20	50
18	75
16	125

Figure 9: Field wiring diagram



Optional surface mount thermostat connection wiring

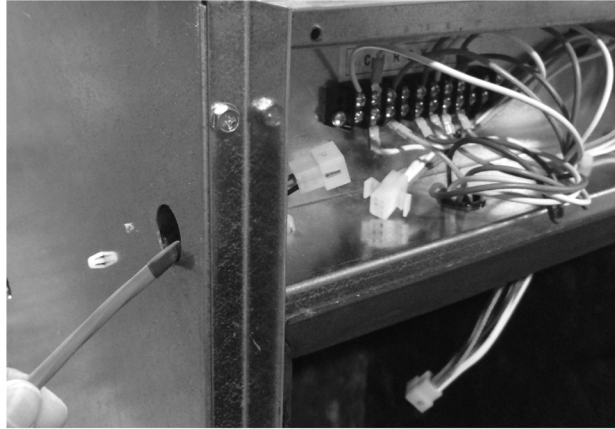
For applications where the thermostat is mounted directly above the return air (RA) panel, select cabinet control option P (for example, VPB12P). The thermostat Molex pigtail harness (shipped loose) is field wired to thermostat terminals. The Molex connector clips to the panel-mounted, mating Molex connector on unit cabinet that is located 7 inches above the electrical box. See optional 24V surface mount connection in Figure 3.

Optional remote mounted thermostat wiring

For units ordered with an extended thermostat harness option, the thermostat is remote mounted. A specific, plenum rated extended harness length can be ordered.

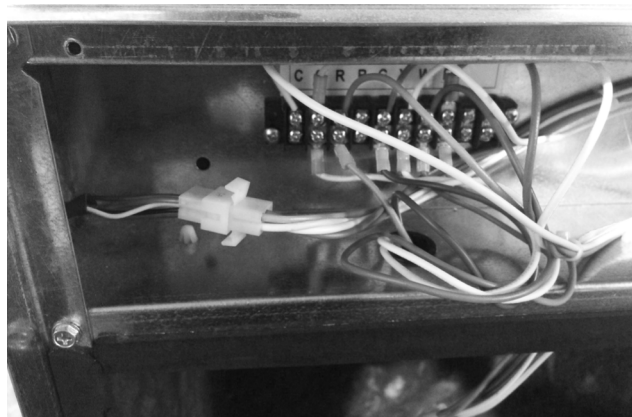
Use low voltage 7/8-inch knock-out on the side of the unit at the electrical box to field wire the low voltage thermostat wiring. Using a plastic bushing to pass the harness inside electrical box to the factory wired mating Molex harness. See Figure 10 and Figure 11.

Figure 10: Remote thermostat wiring



LD19023

Figure 11: Remote thermostat wiring



LD19894

Figure 12: Unit switch plate with ada thermostat connection



LD19895

Optional ADA door mounted thermostat

For units ordered with the Americans with Disabilities Act (ADA) thermostat option to meet ADA requirements, the thermostat is located on the RA panel door at a height of 48 inches from the base of the cabinet. Unit is supplied with a custom RA door panel with thermostat mounting holes, unit switch plate with a Molex connector, and an ADA Molex pigtail harness. See Figure 15.

Wire leads from the ADA thermostat harness are field wired to thermostat terminals. The Molex end of the ADA thermostat harness is field connected to the surface mounted Molex connector at unit switch plate.

Mount the thermostat using the factory provided 1/4-inch number 8 screws. The ADA thermostat harness is plenum rated. It hangs behind the RA door. For chassis servicing, unclip harness from unit switch plate.

EC motor (ECM) continuous fan

This option features a factory wired continuous low speed fan circuit. Because of the five available motor speed taps, the EC motor (ECM) offers an ideal range for supporting continuous low speed fan.

The fan runs continuously on the low fan speed setting even if there is no demand for cooling or heating. The continuous fan is controlled by a dry contact to provide interlocking to energy recovery ventilator (ERV) or room occupancy control. See Figure 31 and Figure 32 for electrical schematics.

Closet and drywall installation

Note: To avoid potential vibration and noise issues, the RA panel should not contact any part of the unit cabinet or sleeve. Maintain a sufficient gap between RA panel frame and cabinet.

Build a closet enclosure for the cabinet that incorporates the RA panel size while maintaining a sufficient gap between the closet and cabinet. This prevents the cabinet from contacting the RA panel and closet enclosure. Refer to Acoustic Return Air (RA) Panel on page , Figure 13, and Figure 14.

1. Cover the supply and return openings with plastic or cardboard before installing drywall around cabinet. This prevents dust or debris from entering the unit components.
2. Install the drywall using conventional construction methods. Do not fasten studs or drywall directly to the cabinet surface. Space the framing members according to the RA access and the type/quantity of supply air (SA) outlets. See Figure 13 and Figure 14.
3. Install sheetrock around unit cabinet by securing the drywall to the building construction studs.
4. Cut holes around the SA and RA openings to allow access to the unit chassis, unit controls, and the SA connection.
5. Vacuum all dust and construction debris from the unit drain pan, electrical box, and discharge plenum after cutting out the supply/returns openings.

WARNING

To prevent electrical shorts and drain pan leaks, DO NOT penetrate unit components when driving screws near the unit control box or drain pan. Do not allow screws or nails to penetrate chassis, risers, electrical junction boxes, conduits, or to interfere with chassis removal.

Acoustic return air (RA) panel

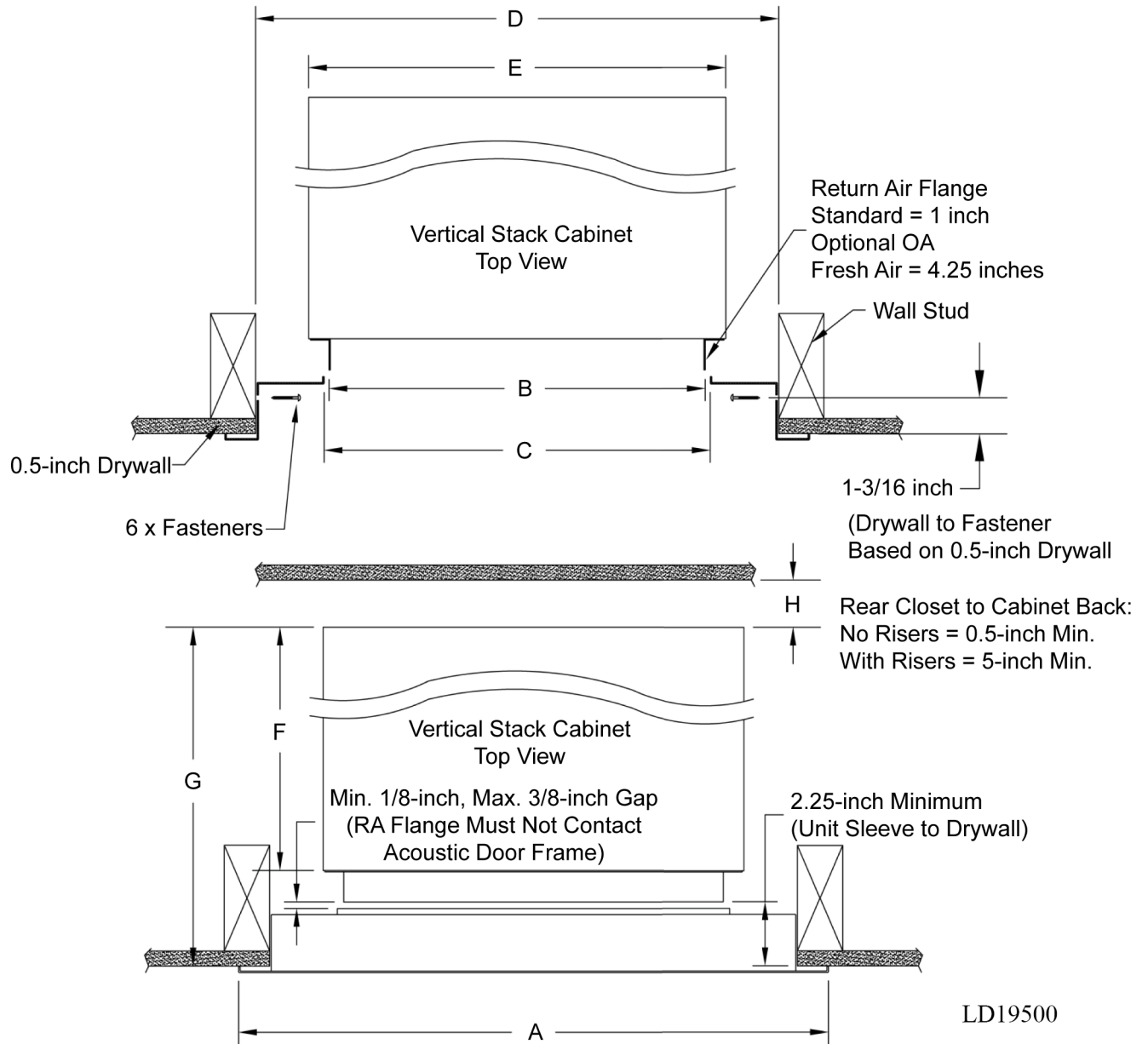
RA panels are painted standard appliance white. Carefully unpack RA panels from their shipping box. RA panels with optional key locks require the key locks to be field installed to the slot in the panel door. ADA RA door panels come with an opening and pilot holes mounting a thermostat.

The ADA harness for wiring the thermostat and connecting to the unit is shipped loose with the thermostats.

1. Locate the drywall opening at a distance from the unit so that it prevents the RA panel from contacting the unit sleeve. See Figure 13 and Figure 14.
2. Center the RA panel throat opening to the unit cabinet RA flange opening.
3. Fasten the RA panel to frame opening using the screws provided. See Figure 13.

Figure 16 shows the opening for mounting an ADA compliant thermostat at 48 inches above floor. Note that location of the opening on the door changes if the cabinet is ordered with a stand. A left hand opening door is shown. The RA panel with ADA is not reversible. It must be ordered in either a left or right-hand opening configuration, determined by the location of the door hinge.

Figure 13: Critical return air (RA) panel with unit cabinet installation dimensions



Unit size	A (panel width)	B (sleeve width)	C (R/A panel opening)	D (rough in width)	E (unit width)	F (unit depth)	G (no OA option)	G (OA option)
09/12/15/18	25 3/4	19	19 1/4	23 3/4 ± 1/8	20	20	23 1/4 min 23 1/2 max	27 1/4 min 27 1/2 max
24/30/36	29 3/4	23	23 1/4	27 3/4 ± 1/8	24	24	27 1/4 min 27 1/2 max	31 1/4 min 31 1/2 max

① **Note:** All dimensions are in inches.

Figure 14: RA panel cross section installation at floor level

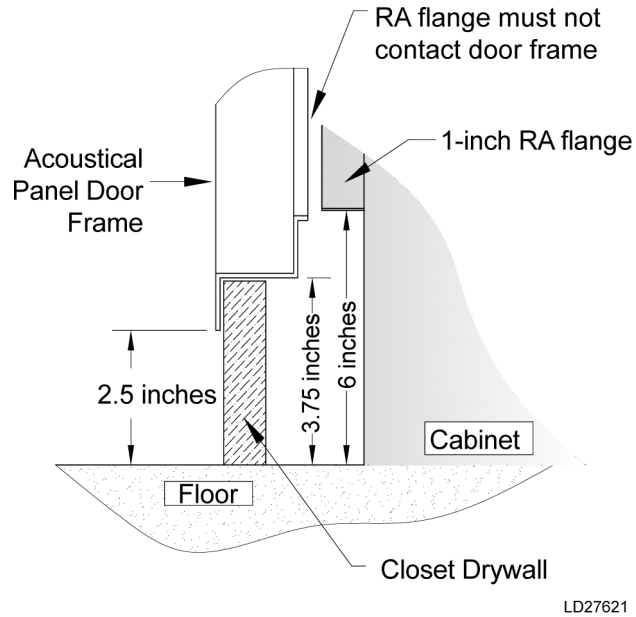
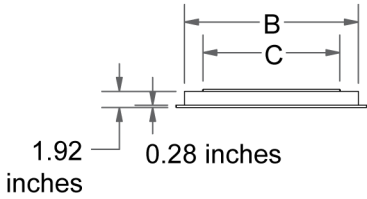


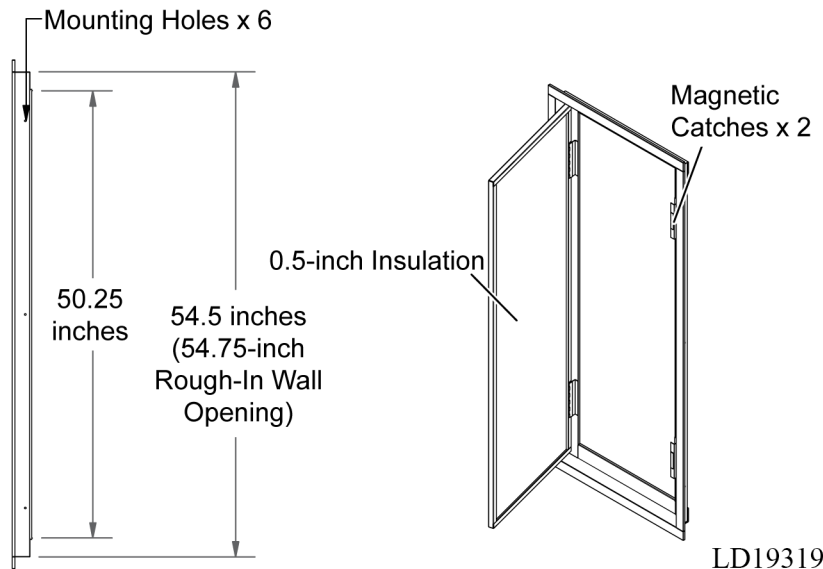
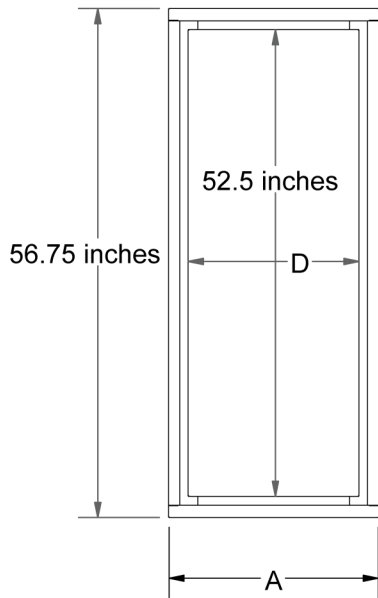
Figure 14 shows a cutaway view for a standard cabinet with no stand. Add the stand height to the cabinet to obtain the correct dimension of the RA panel from floor.

- ① **Note:** For maximum return airflow, the flush mounted acoustic panel must be centered vertically and horizontally over the RA opening of the cabinet. SA duct collar extensions may be required to prevent short cycling.

Figure 15: RA panel dimensions



ALL DIMENSIONS ARE IN INCHES							
RA PANEL	CABINET SIZE	A	B	C	D	ROUGH-IN WIDTH	ROUGH-IN HEIGHT
VSPE-S1	VPB09-18	25.75	23.50	19.25	21.50	23.75	54.75
VSPE-S2	VPB24-36	29.75	27.50	23.25	25.50	27.75	54.75

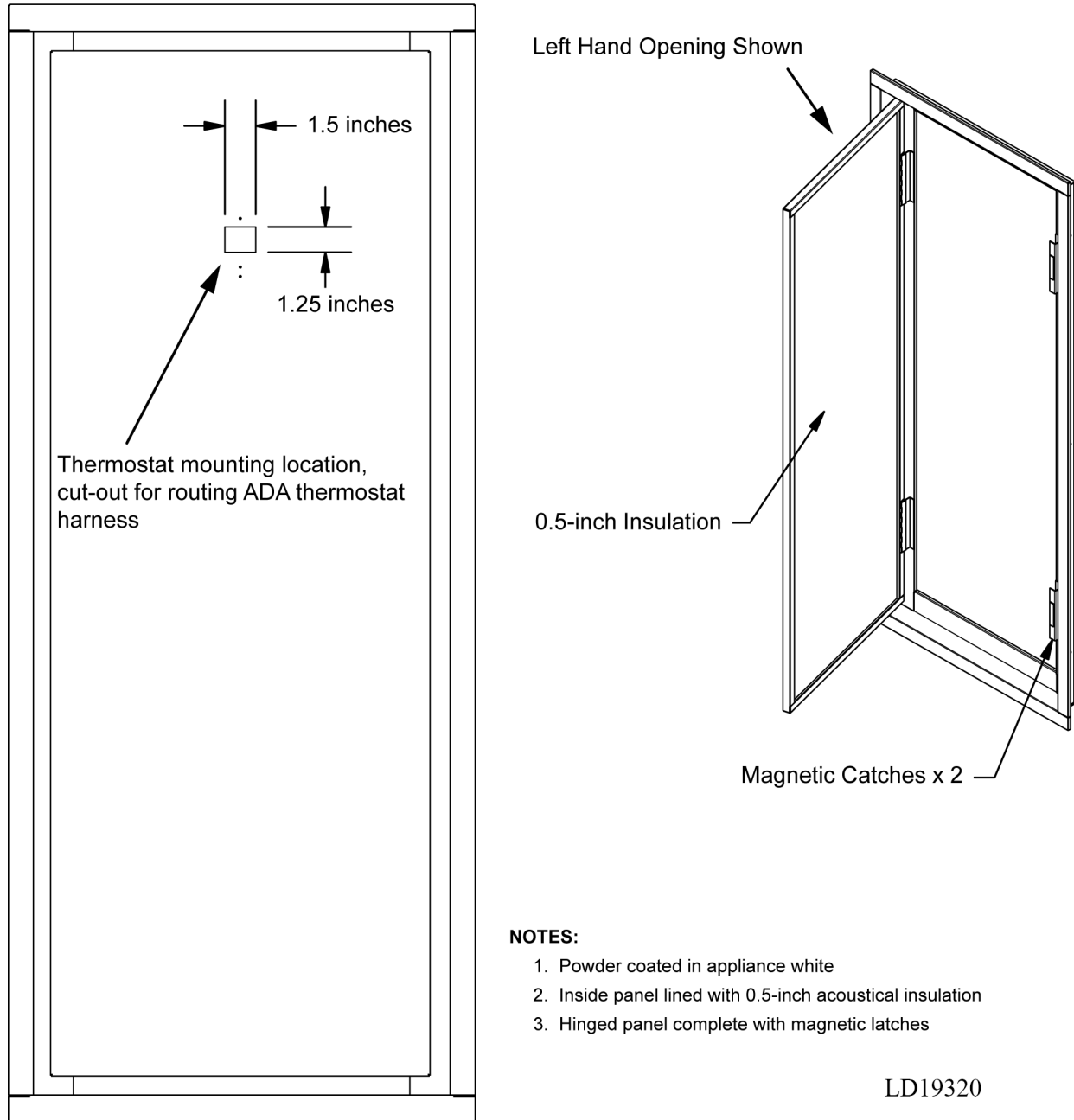


LD19319b

① Note:

1. Powder coated in appliance white.
2. Inside panel lined with 0.5-inch acoustical insulation.
3. Hinged panel complete with magnetic latches.

Figure 16: Optional RA panel with ADA mounted thermostat



Supply air (SA) ductwork

- ① **Note:** Ensure there is no direct contact between cabinet sheet metal parts and drywall enclosure. This includes RA and SA flanges. Failure to follow these instructions will negatively affect unit sound performance.

Horizontal supply air

A 2-inch duct flange (field provided) may be required to eliminate supply air recirculation when shallow profile, single deflection supply grilles are installed at the cabinet discharge openings. If the discharge from the cabinet is not ducted completely into the conditioned space, air can recirculate into the RA opening from the space inside the drywall enclosure.

Manufacturer supplied grilles have a clearance of a 1/4 inch around the perimeter to fit inside the unit supply flange. Other grille manufacturers could have different clearances that should be verified.

Field supplied gasket must be applied in order to prevent air recirculation and vibration transfer when supply grilles are mounted to unit supply opening. When mounting supply grilles with optional volume damper directly to cabinet supply flange, the volume damper fits inside the cabinet supply flange. It is recommended to apply 1/8-inch neoprene tape (field supplied) around the perimeter of the volume damper prior to inserting it into the supply opening. See Figure 17 for an example. This assists in reducing noise transmission and air recirculation into the unit closet.

For ducted openings, connect the unit supply opening to the supply ductwork using a watertight flexible duct connector. This minimizes the transmission of operating sounds through the supply ductwork. Elbows with turning vanes or splitters are recommended to minimize air noise due to turbulence and to help reduce static pressure.

Top discharge supply air

Units that are installed with a top discharge should be connected to the supply ductwork with a watertight flexible connector. This minimizes the transmission of operating sounds through the supply ductwork. Elbows with turning vanes or splitters are recommended to minimize air noise due to turbulence and to help reduce static pressure.

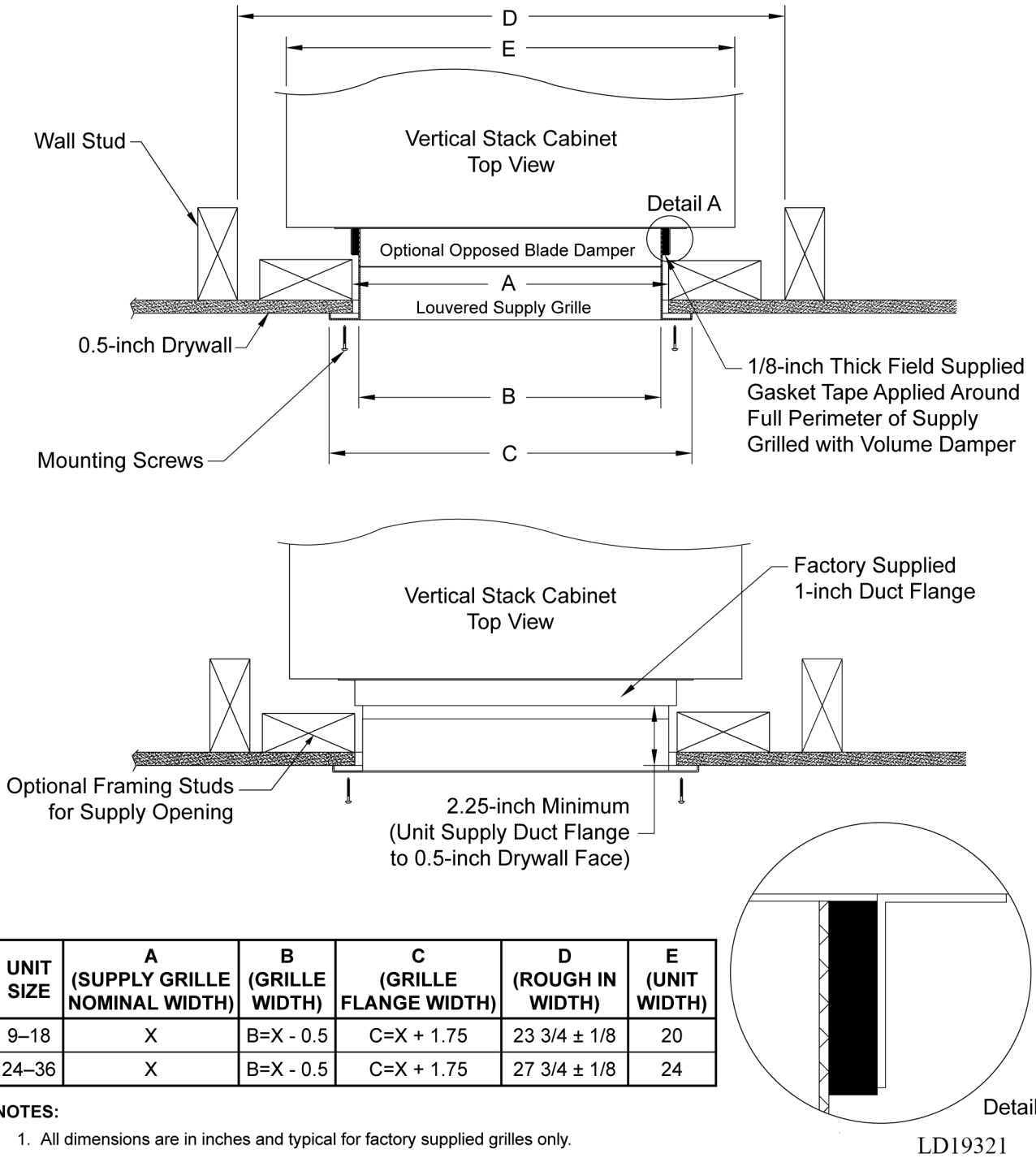
For information on available unit horizontal and top supply openings see Table and Table . Recommended face velocity at the outlet supply grille is 300–500 FPM. Table gives face velocity at the unit supply openings in relation to Table . To calculate the face velocity at the supply grille, take the FPM from Table and divide by the supply grille area factor.

Figure 17: Supply grille with volume damper and 1/8-inch neoprene tape applied to perimeter



LD27622

Figure 18: Unit mounted supply grille installation



NOTES:

1. All dimensions are in inches and typical for factory supplied grilles only.
2. Check dimensions for field-supplied grilles because dimensions can be different.

Table 5: Unit supply opening sizes

Model	Horizontal openings					Top opening
	Single horizontal		Double horizontal		Triple horizontal	
	No top opening	Top opening	No top opening	Top opening	No top opening	
9	16W x 12H	14W x 6H	14W x 8H	Consult application engineer	Consult application engineer	12 x 12
12	16W x 14H	14W x 6H	14W x 10H	Consult application engineer	Consult application engineer	14 x 12
15	16W x 14H	14W x 8H	16W x 12H	Consult application engineer	14W x 8H	14 x 12
18	Consult application engineer	14W x 8H	16W x 12H	14W x 6H	14W x 10H	14 x 12
24	Consult application engineer	14W x 10H	20W x 14H	14W x 6H	16W x 12H	18 x 16
30	Consult application engineer	16W x 12H	20W x 14H	14W x 6H	16W x 14H	18 x 16
36	Consult application engineer	16W x 12H	Consult application engineer	14W x 6H	16W x 14H	18 x 16

① Note:

1. Unit mounted supply grilles are supplied as double-deflection type.
2. Grilles for unequal airflow applications (for example, unit mounted plus ducted supply) are provided with integral opposed blade dampers.
3. All grilles are supplied in standard appliance white painted finish.
4. Grilles are shipped loose for field installation upon completion of cabinet/ductwork/drywall installation.
5. Top opening size does not change. When combined with any other discharge arrangement, it is included in determining horizontal opening grille size.
6. Openings marked Not Available result in face velocities outside the recommended 300–500 FPM range.
7. Hi-static blower option or single horizontal discharge openings with unit mounted supply grille are not recommended. Hi-static blower option is only recommended for units with top supply/opening and appropriate higher external static requirements.

Table 6: Unit supply face velocity (FPM)

Model	Horizontal openings					Top opening
	Single horizontal		Double horizontal		Triple horizontal	
	No top opening	Top opening	No top opening	Top opening	No top opening	
9	446	280	426	Consult application engineer	Consult application engineer	375
12	459	299	369	Consult application engineer	Consult application engineer	386
15	531	324	310	Consult application engineer	394	446
18	Consult application engineer	436	417	379	383	600
24	Consult application engineer	326	337	317	337	425
30	Consult application engineer	379	427	401	366	538
36	Consult application engineer	423	Consult application engineer	448	408	600

Note:

1. Tabulated face velocities do not account for supply grille free area factor. Face velocities at supply grille are higher depending on grille type.
2. Face velocities are based on the nominal rated CFM and feet per minute (FPM).
3. Face velocities are calculated by taking the average across all openings. Tabulated top opening face velocity is only for units with single top opening and no horizontal openings.

Top mounted fresh air intake

The optional fresh air intake provides a 4-inch round duct connection on top of the unit (see Figure 23 for right and left hand version). The fresh air is discharged upstream of the direct expansion (DX) coil through the discharge collector box.



Do not allow incoming air to bypass the DX coil, otherwise, damage to the unit may occur.

Units can be selected with the fresh air opening located on the top left or right hand side for ease of installation.

It is recommended that applications requiring 10% or more outdoor air utilize a pressurized fresh air system. Unit cabinet static pressure at the RA opening is not designed to draw 10% or more in passive fresh air systems.

The fresh air duct inside the unit is insulated to protect the unit from condensation in the event of high humidity air. However excessively moist fresh air over prolonged periods can result in condensate inside unit or closet.

CAUTION

To avoid condensate developing inside ducts and equipment, it is recommended to pretreat fresh air with a high humidity ratio before it enters the unit assembly through ERVs or make-up air units.

The unit comes with a 4-1/4 inch RA sleeve. Front supply openings come with a 4-1/4 inch supply plaster flange.

Top mounted fresh air intake with motorized damper

This include the same features as the top mounted fresh air intake option with the addition of a motorized damper assembly inside the discharge collector box similar (see Figure 23).

The damper assembly can be easily removed for servicing (see Removing the Actuator on page). The motorized damper assembly opens during FAN ON operation. See Figure 31 and Figure 32 for the electrical schematic. For other control options, please contact the factory.

ⓘ Note: During transportation, handling or installation of the cabinet, excessive handling can cause an inner black plastic cover to come loose and jam the actuator, preventing the damper from opening.

During start-up, check that the damper is opening when the unit fan is running. It can take 20 seconds to fully open. If the damper opens, the unit is operating as intended. If the damper fails to open, the cause is likely a loose cover preventing actuator from rotating. Remove the actuator to service the damper.

Removing the actuator

1. Remove the damper plate:
 - a. a. Look underneath the top of the RA flange to notice the damper assembly.
 - b. b. Remove the seven fasteners holding the damper plate (see Figure).
 - c. c. Drop the plate and disconnect the quick-connect terminals from the harness.
2. Remove the red cover from the actuator body (see Figure).

Figure 19: Damper plate fasteners



LD23557

Figure 20: Remove the red cover



LD23558

Figure 21: Position black cover



LD23559



LD23560

4. If the black cover is loose, position it in place and slide it back onto the actuator (see).
5. Secure the red cover back over the actuator assembly.
6. Ensure the plastic tabs are secured to the metal body bracket.
7. Connect the quick-connect terminals, and insert the damper assembly into the discharge collector box.
8. Fasten the assembly using the seven fasteners.

System flushing and cleaning

After the piping system is complete, and before connecting the refrigeration chassis, flush and clean the risers. This ensures a proper start-up and continued efficient operation of the system (see Figure 22).

Flushing the system

1. Ensure the supply and return riser shut-off valves are closed at each unit.
2. Fill the water circulation system with clean water from the make-up water supply. Ensure the air vents are open during initial filling. Do not allow the system to overflow.
3. Ensure that all air is bled from the system by cracking each air vent.
 - ⓘ **Note:** Make-up water must be available in sufficient volume to replace the volume occupied by the air that is bled off.
4. When all the air is vented and the water is circulating under pressure, check the entire system for leaks. Repair the leaks as required.
5. Raise the temperature to approximately 85.0°F by setting the loop temperature controls. Visually check for any leaks that may have occurred due to the increased heat. Repair any leaks as required.
6. Open the drain at the lowest point in the system.
 - ⓘ **Note:** The make-up water flow rate must be equal to the rate of the drain bleed.
7. Continue to bleed the system until the water leaving the drain is clear, no less than 2 hours.
8. Completely drain the piping system.

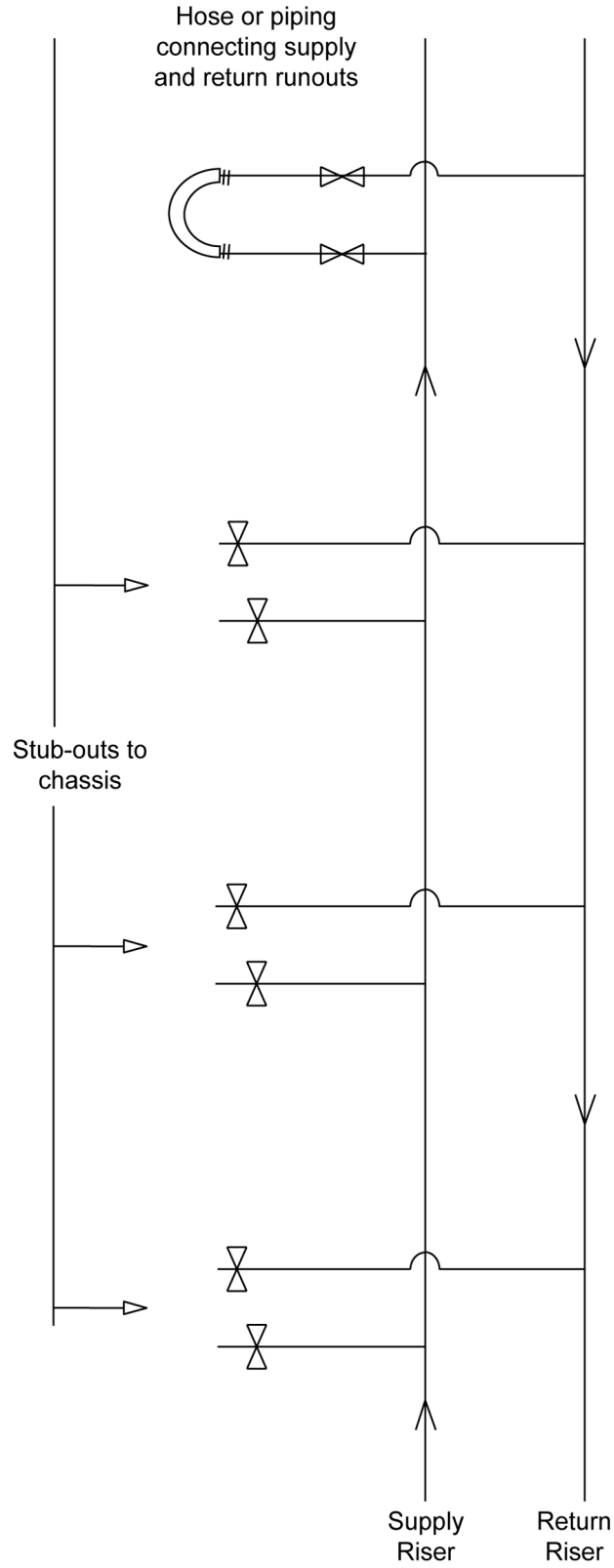
Cleaning the system

1. After the initial flushing, chemically clean the system. Repeat the method in [Flushing the system](#) to refill the system and circulate the cleaning solution. It is recommended to use the services of a professional water treatment company for the type of solution to be used and the duration of the cleaning application.
2. Once the cleaning process is complete, shut off the circulating pump and completely drain the system.
3. Refill the system with clean water to prepare for refrigeration chassis connection and system start-up.

CAUTION

It is recommended that a professional water treatment company perform ongoing maintenance of the water loop including chemical analysis and flushing, if necessary. The water loop testing should be performed at intervals recommended by the professional water treatment consultant. It is recommended that the water loop testing be performed at least once a year. Standard practice is once a month or quarterly. The customer is responsible for completing adequate water loop maintenance over the lifespan of the units. Otherwise, damage to the units may occur.

Figure 22: System flushing and cleaning

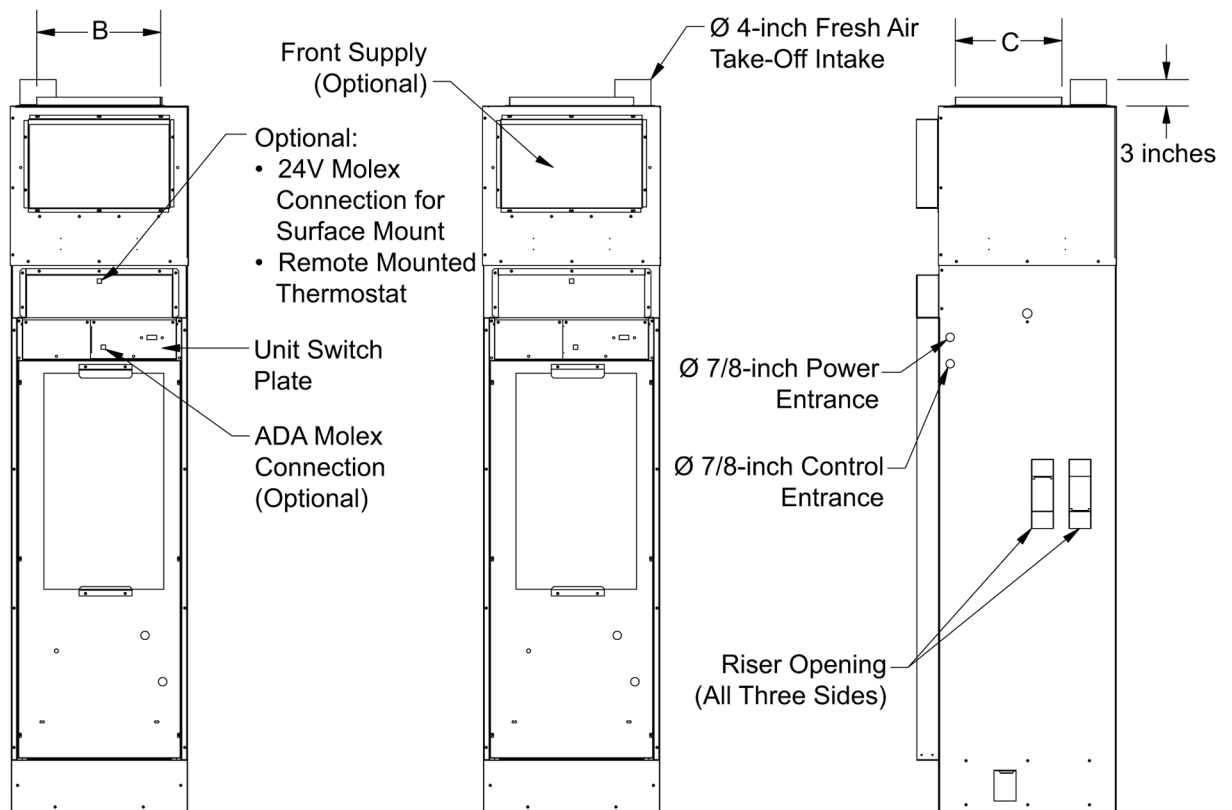
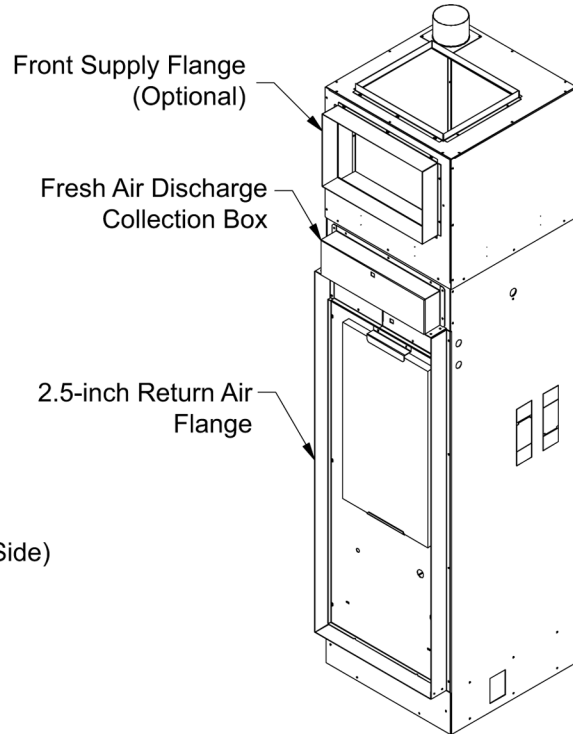
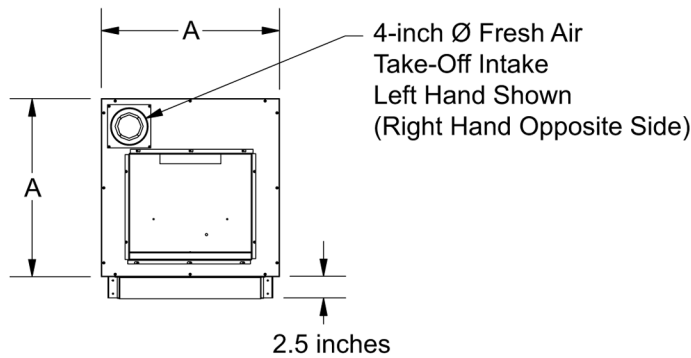


LD19685

Figure 23: Fresh air opening without motorized damper – left and right hand unit shown

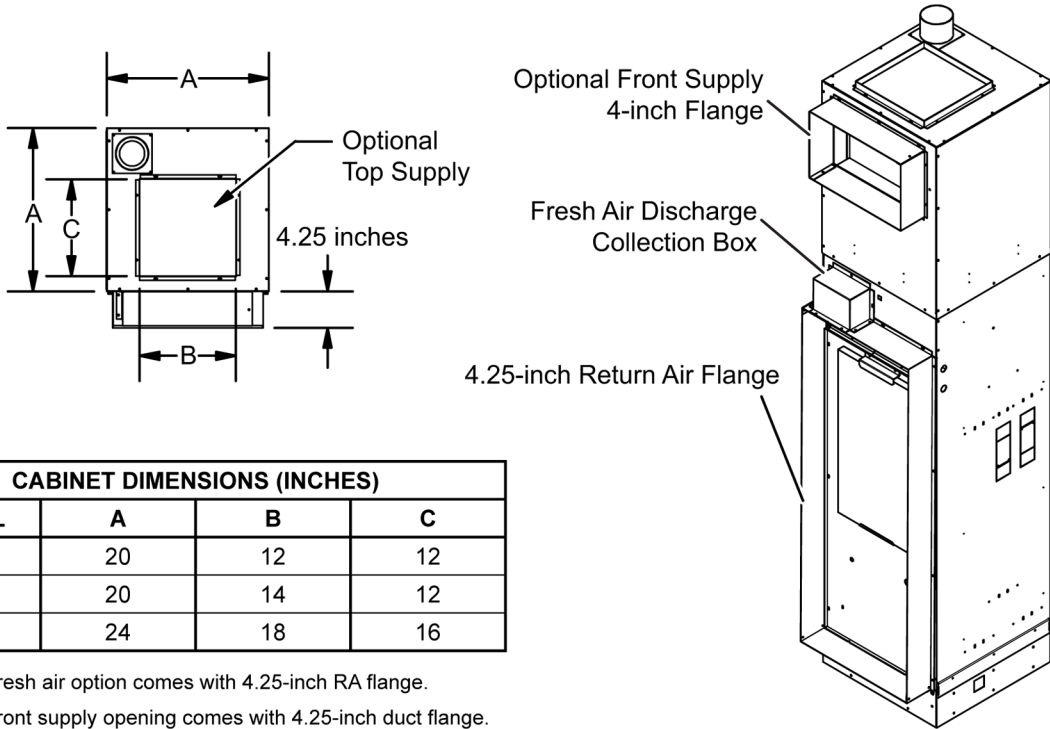
CABINET DIMENSIONS (INCHES)			
MODEL	A	B	C
09	20	12	12
12-18	20	14	12
24-36	24	18	16

1. Optional fresh air option comes with 2.25-inch RA flange.
2. Optional front supply opening comes with 2.5-inch duct flange.
3. All other openings come with standard 1-inch duct flange.
4. Left and right hand versions shown.



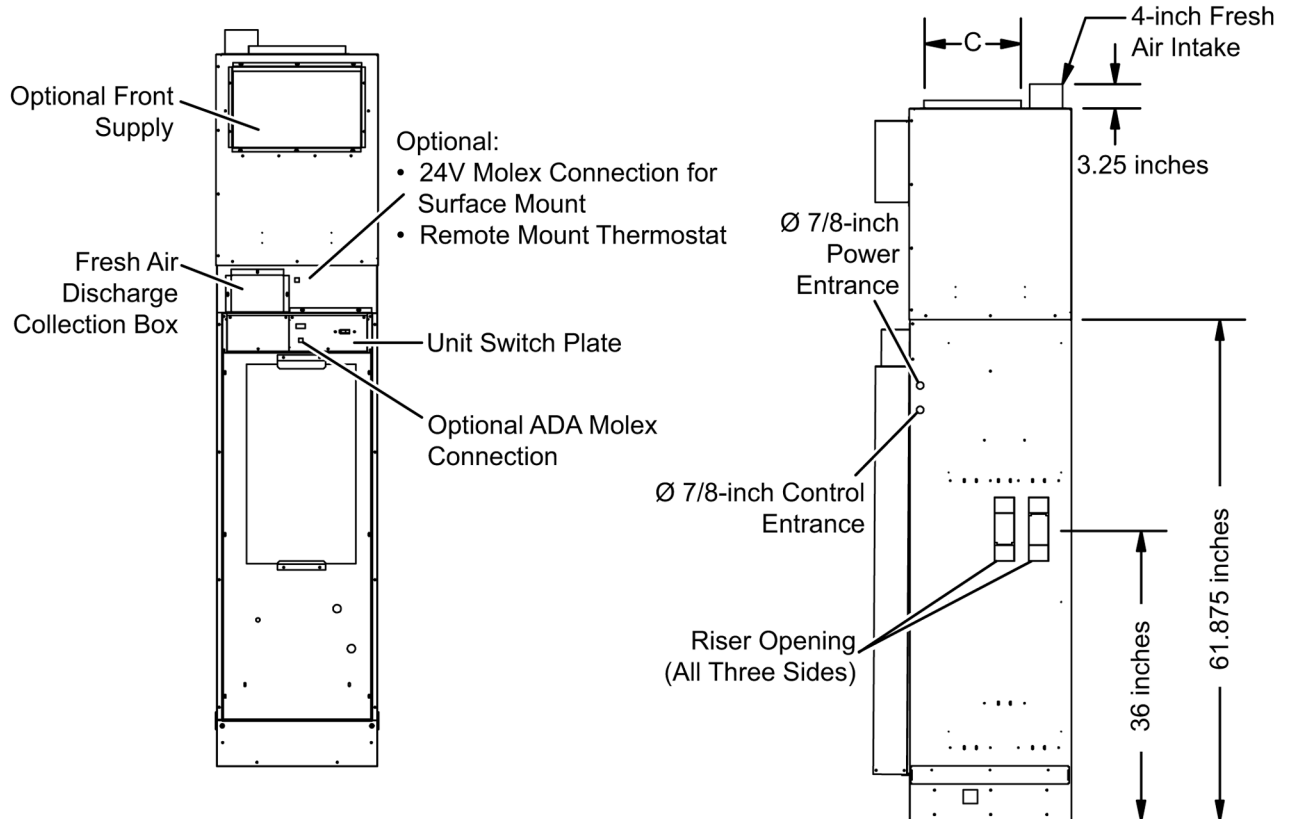
LD27635

Figure 24: Fresh air opening with motorized damper – left and right hand unit shown



CABINET DIMENSIONS (INCHES)			
MODEL	A	B	C
09	20	12	12
12-18	20	14	12
24-36	24	18	16

1. Optional fresh air option comes with 4.25-inch RA flange.
2. Optional front supply opening comes with 4.25-inch duct flange.
3. All other openings come with standard 1-inch duct flange.
4. Left and right hand versions shown.



LD19511

Chassis installation

CAUTION

Prior to installation of the refrigeration chassis and connection to the supply and return risers, the entire water loop system must be flushed and cleaned. See [System flushing and cleaning](#).

CAUTION

Do not apply sealing tape or pipe dope on NPSH or JIC style fittings.

CAUTION

Check that the female end gasket from the NPSH hose is not missing, has no visible damage, and is free of debris.

CAUTION

Always use a backup wrench when installing hoses.

CAUTION

Protect the chassis from physical damage, drywall dust, paint fumes, and any other construction contamination during installation.

WARNING

Hoses must be hand tightened then further tightened no more than 1/4 turn. Do not apply excessive force.

WARNING

Always use a backup wrench when tightening hoses to valves. Otherwise, damage to the valve solder joint can lead to property damage or serious injury.

Remove the inner service panel from the cabinet, and inspect the interior compartment for debris. Clear all debris and vacuum construction dust from the cabinet.

Locate the supply and return shut-off valves. Verify the following:

- The valves are closed.
- The type of hose kit fittings provided with the unit. All 3/4-inch hoses feature JIC fittings only, while 1/2-inch hose kits are available with either NPSH or JIC fittings. Refer to [Riser loop](#) for more information.

For units with NPSH and JIC valve connection and hose sets

About this task:

NPSH/JIC flexible connection hoses do not require any pipe dope or sealant tape. DO NOT ADD THREAD SEALANT OR PIPE DOPE TO NPSH/JIC FITTINGS. Connect the hoses to the NPSH fitting on the shut-off valves. Always use a backup wrench when tightening the hose to the valve fitting. Allow the hoses to hang free inside the cabinet.

Slide the chassis into place using the following steps:

1. Attach the NPSH/JIC hoses to the NPSH/JIC fittings on the chassis stub-outs by projecting through the top of the compressor compartment access cover.
2. Use a backup wrench to prevent twisting of the copper water piping within the chassis assembly.
3. For chassis installation, see [For units with NPT style \(tapered pipe thread\) valve connection and hoses](#).

For units with NPT style (tapered pipe thread) valve connection and hoses

Factory supplied NPT flexible connection hoses come with thread sealing compound pre-applied. NO ADDITIONAL THREAD SEALING TAPE SHOULD BE REQUIRED. Connect the hoses to the female pipe thread fitting on the shut-off valves. Always use a backup wrench when tightening the hose to the valve fitting. Allow the hoses to hang free inside the cabinet.

Slide chassis into place using the following steps. A J-swivel adapter (supplied with the hose kit) comes with thread sealing compound pre-applied. NO ADDITIONAL THREAD SEALANT SHOULD BE REQUIRED.

1. Thread the swivel adapters into the female pipe thread fittings projecting through the top of the compressor compartment access cover. To prevent twisting of the copper water piping in the chassis assembly, always use a backup wrench.
 - ⓘ **Note:** To minimize the possibility of damage to the chassis or cabinet and for maximum ease of installation, the use of a two-wheeled dolly is strongly recommended.

CAUTION

Do not contact the finned coil face. Damage to the fins will result.

2. Lift chassis from the front of chassis (see Figure).
3. Align chassis with the opening of the cabinet. Tilt the chassis sufficiently for the base of the chassis to clear the mounting rails on the cabinet drain pan (see Figure).
4. Insert the chassis midway into the opening of the cabinet. Lower the rear of the chassis until the base of the chassis touches the formed mounting rails in the cabinet drain pan (see Figure).

Figure 25: Lift the chassis front



LD23564

Figure 26: Tilt the chassis



LD23565

Figure 27: Insert the chassis



LD23566

CAUTION

Before fully inserting chassis, ensure wiring harness and or water hoses will not be pinched.

5. Pivot the chassis base on the front edge of the drain pan rails. Before fully inserting the chassis, ensure the wiring harness and water hoses cannot be pinched between the chassis and cabinet (see Figure).

Figure 28: Pivot the chassis



LD23567

Figure 29: Slide the chassis



LD23568

Figure 30: Check the chassis



LD23569

⚠ CAUTION

Do not apply excessive force when sliding chassis into cabinet.

6. Slide the chassis into the cabinet until at least 3/4 of the depth of the chassis is supported. The chassis should slide easily on the drain pan rails. **DO NOT APPLY EXCESSIVE FORCE.** Ensure that the chassis will not tip forward before removing dolly (see Figure).

 **WARNING**

To avoid damage from clogged coil surfaces, plugged motor ventilation openings, and potential unit failure, DO NOT operate unit without complete enclosure, supply grille, RA panel, and filter in place.

7. Connect the hoses to the chassis. Ensure that the hoses cannot be pinched once the chassis is slid into place.
8. Without touching the flanges on either side, ensure the chassis' alignment in the cabinet is centered in the cabinet opening (see Figure).
9. Complete the electrical connections to the chassis using the two quick-connect mating plugs. The unit-mounted plug ends are located on the bottom of the control box.
10. Remove the shipping cover from the face of the air-to-refrigerant coil.
11. Install the inner service panel and check that the foam gasket seal between the panel and the chassis is slightly compressed.
 12. If necessary, pull the chassis forward slightly to ensure an adequate seal between the chassis and the service panel.
13. Install the air filter onto the face of the service panel. Slide the filter upward into the top-retaining clip until the bottom of the filter can be dropped onto the lower clip.
14. Install service panel.
15. Install the RA panel into the drywall opening if not already installed. Refer to [Acoustic return air \(RA\) panel](#). Secure the panel into the drywall with six screws.

Operation

Once the installation is complete and the system is cleaned and flushed, begin unit start-up. Open the supply and return shut-off valves at each unit, refill the system, and bleed off all air.

Pre-start-up checklist

Before energizing the unit, perform the following checks and complete the Vertical Stacked Heat Pump Start-Up and Performance Checklist (*Form 145.18-CL1*) in compliance with warranty requirements.

- The high voltage power supply is correct and in accordance with the nameplate ratings.
- The field wiring and circuit protection are the correct size.
- The unit is electrically grounded.
- The low voltage control wiring is correct per the unit wiring diagram.
- There is vibration isolation (for example, unit isolation pad, flexible hoses).
- The low-side or high-side pressure temperature caps are secure and in place.
- All the unit access panels are secure and in place.
- The thermostat is in the OFF position.
- The water flow is established and circulating through all the units.
- The ductwork (if required) is correctly sized, run, taped, and insulated.
- The indoor blower turns freely without rubbing.
- If applicable, glycol fluid was added in the proper mix to prevent freezing in closed system application.
- Clean, properly sized air filters are in place.
- The condensate drain pipe is firmly secured to both the drain riser and the drain pan stub.

Initial unit start-up

About this task:



During installation, testing, servicing, and troubleshooting of this product, it may be necessary to work with live electrical components. Failure to follow all electrical safety precautions when exposed to live electrical components could result in serious injury or death.

1. Close the disconnect switches on all units to provide line power.
2. Set the thermostat to the highest temperature setting.
3. Set the thermostat system switch to COOL and the fan control switch to AUTO. The compressor should NOT run.
4. Reduce the temperature control setting until the compressor and supply fan energize, with the following results:
 - a. Water temperature leaving the heat exchanger is warmer than the entering water temperature (EWT) (approximately 9.0–12.0°F).
 - b. The blower operation is smooth.

- c. The compressor and blower amps are within the nameplate data values.
 - d. The suction line is cool with no frost observed in the refrigerant circuit.
5. Turn the thermostat switch to the OFF position. The compressor and fan stop running and the reversing valve de-energizes.
 6. To allow for pressure equalization, leave the unit off for approximately 5 minutes.
 7. Turn the thermostat to the lowest setting.
 8. Set the thermostat system switch to the HEAT position. The compressor should NOT run.
 9. Adjust the temperature setting upward until the compressor and supply fan energize, with the following results after several minutes:
 - a. Warm air is detected at the supply register.
 - b. The water temperature decreases approximately 5.0–9.0°F across the heat exchanger.
 - c. The blower and compressor operation are smooth with no frost observed in the refrigerant circuit.
 10. Set the thermostat to maintain the desired space temperature.
 11. Check all water connections for any leaks, including condensate drain hose connections.

System loop temperature

Loop temperatures affect unit performance, power consumption (efficiency), maintenance and reliability, and noise levels. High EWT in cooling mode above rated conditions of 86.0°F EWT increases power consumption and compressor noise levels. Sustained operation above 100°F EWT can increase maintenance costs, and increased compressor noise can affect occupancy comfort. The unit is designed to operate up to 110.0°F EWT for intermittent periods when high load conditions elevate system loop temperatures.

It is not recommended to set system loop temperatures at 110.0°F in case high load conditions cause supply loop temperatures to exceed 110.0°F EWT. Unit sound performance can be negatively impacted at high EWT.

During heating season, the maximum operating loop temperature is 90.0°F EWT. For optimal unit performance, it is recommended to maintain system loop temperatures at or above the rated conditions of 68.0°F EWT. If system loop temperatures are low and freezing the coaxial is possible, the system loop must contain a glycol fluid mixture that is adequate to prevent freezing. The minimum loop temperature with glycol mixture is 20.0°F EWT. Lower loop temperatures result in lower efficiency and heating capacity.

- ⓘ **Note:** High system loop temperatures may negatively affect unit performance, efficiency, maintenance and reliability, and noise levels.

Table 7: Operating limits

	Cooling	Heating
Minimum EWT	50.0°F / 30.0°F*	50.0°F / 20.0°F*
Maximum EWT	110.0°F	90.0°F

- ⓘ **Note:** * Geothermal operation (antifreeze mixture).

Fan speed adjustment

Multi-speed EC motors (ECMs) are used in all units as standard. ECMs have five speeds, however only two speeds are available for selection when the unit compressor is running. A low speed, continuous fan only option is also available.

Optional ECMs increase operating efficiency. Motors are factory programmed and cannot be re-programmed in the field. Each motor contains five low voltage speed taps. Two speed taps are used as standard.

Blower speed taps are factory set for optimum heating and cooling airflow ranges. See Table 8 for factory blower speed settings and minimum operating airflow.

 **CAUTION**

Operating the unit below the minimum airflow may result poor heating/cooling performance and periodic unit lockout.

A unit mounted two-speed fan switch located on the electrical box cover allows the fan speed to switch from LOW and HIGH. This enables the fan speed to meet site conditions such as increased ductwork static pressure or the use of higher efficient filters.

Perform a test run on the installed system to ensure operation with sufficient heating and cooling airflow. Excessive ductwork static pressure results in an improper volume of airflow. High airflow volumes result in elevated noise levels and can affect occupancy comfort.

 **WARNING**

Lock all electrical power supply switches in the OFF position before servicing the unit. Failure to disconnect power supply may result in electrical shock or even death.

Refrigerant charge adjustment

About this task:

All units are factory charged with R-410A at the nameplate charge listed in Table 1. Unit subcooling should be 6.0–20.0°F at design conditions. The subcooling temperature can be calculated as follows:

1. Record the temperature of the liquid line at the outlet of the condenser.
2. Subtract it from the saturation temperature for the corresponding discharge pressure.

Table 8: EC motor (ECM) blower performance

Unit size	Motor speed	External static option	ECM tap#	Rated cooling (CFM)	Rated heating (CFM)	External static pressure (IWG)													
						0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	
09	Optional fan only	N/A	1	375	400	300	280	260	235	210	190	170	-	-	-	-	-	-	
	Low	Low	2			320	305	290	270	250	225	200	-	-	-	-	-	-	-
	High		3			400	370	350	335	315	290	265	230	-	-	-	-	-	-
	Low	High	4			410	395	385	370	350	335	315	290	260	-	-	-	-	-
	High		5			535	520	510	500	485	470	460	440	420	400	375	350	330	
12	Optional fan only	N/A	1	450	500	300	280	260	235	210	190	170	-	-	-	-	-	-	
	Low	Low	2			410	395	385	370	350	335	315	290	260	-	-	-	-	-
	High		3			475	460	445	430	415	395	380	355	335	315	-	-	-	-
	Low	High	4			500	485	475	460	450	435	425	410	395	380	360	-	-	-
	High		5			590	570	550	535	525	510	490	470	450	430	405	380	350	

Table 8: EC motor (ECM) blower performance

Unit size	Motor speed	External static option	ECM tap#	Rated cooling (CFM)	Rated heating (CFM)	External static pressure (IWG)													
						0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	
15	Optional fan only	N/A	1	520	580	415	405	395	350	320	275	245	-	-	-	-	-	-	
	Low	Low	2			480	460	440	415	390	370	350	-	-	-	-	-	-	-
	High		3			570	545	520	505	490	470	450	430	410	-	-	-	-	
	Low		4			600	585	570	550	530	510	490	475	460	435	410	-	-	
	High	5	630			615	600	580	560	545	530	510	490	470	450	425	400		
18	Optional fan only	N/A	1	700	750	415	405	395	350	320	275	245	-	-	-	-	-	-	
	Low	Low	2			610	595	580	565	550	530	510	495	480	-	-	-	-	
	High		3			730	720	710	695	680	670	660	640	625	600	580	555	530	
	Low		4			680	665	650	635	620	610	595	570	565	545	530	510	490	
	High	5	790			775	760	745	730	715	700	675	650	625	600	570	540		
24	Optional fan only	N/A	1	850	950	660	620	590	565	540	510	480	460	440	420	-	-	-	
	Low	Low	2			800	785	770	750	730	710	690	670	650	625	600	-	-	
	High		3			880	865	850	835	820	810	795	780	770	750	730	-	-	
	Low		4			920	900	880	870	860	845	830	810	790	775	760	740	720	
	High	5	1070			1055	1040	1020	1000	980	960	940	920	905	890	870	850		
30	Optional fan only	N/A	1	1075	1075	870	850	830	810	790	770	750	725	700	680	660	-	-	
	Low	Low	2			940	920	900	885	870	855	840	820	800	775	750	-	-	
	High		3			1160	1125	1090	1075	1060	1050	1040	1035	1010	995	980	960	930	
	Low		4			1070	1055	1040	1020	1000	980	960	940	920	900	880	860	840	
	High	5	1330			1315	1300	1285	1270	1250	1230	1205	1160	1130	1080	1070	1060		
36	Optional fan only	N/A	1	1100	1250	870	850	830	810	790	770	750	725	700	680	660	-	-	
	Low	Low	2			1070	1055	1040	1020	1000	980	960	940	920	900	880	-	-	
	High		3			1200	1185	1170	1155	1140	1120	1100	1085	1070	1055	1040	995	950	
	Low		4			1160	1125	1090	1075	1060	1050	1040	1035	1010	995	980	960	930	
	High	5	1460			1430	1400	1370	1340	1295	1250	1210	1175	1145	1090	1080	1070		

Note:

All airflow ratings are at the lowest voltage rating of dual rating (for example, 208 volt).
 Airflow ratings include the resistance of wet coil and clean air filters.

Unit controls

The control system microprocessor board is specifically designed for water source heat pump operation. The control system interfaces with a conventional type thermostat.

- The unit is complete with a self-contained low-voltage control circuit.
- The unit incorporates a lockout circuit that provides reset capability from a hard lockout at the space thermostat or base unit if any of the following standard safety devices trip and shut off the compressor:
 - Low pressure limit switch (loss of charge).
 - High pressure limit switch.
 - Freeze protection switch (unit shutdown on low water temperature).
 - Condensate overflow switch.
- The unit operates with conventional thermostat designs and has a low voltage terminal strip for easy hook-up.
- Unit control board has on-board diagnostics and fault code display.
- Standard controls include anti-short cycle and low voltage protection.

- The control board monitors each refrigerant safety switch independently.
- The control board has a random start feature.
- The control board retains the last five fault codes in nonvolatile memory that cannot be lost in the event of a power loss.

Sequence of operation

The room thermostat makes a circuit between R and Y for cooling.

The call passes to the unit microprocessor control that determines whether the requested operation is available and if so, which components to energize.

For heating, the room thermostat makes a circuit between R and W. The microprocessor control energizes the compressor and fan, enabling the unit to run in heating mode.

If at any time there is a call for both heating and cooling, the heating operation is performed. Heating always takes priority. If cooling mode is operating, it halts and ends the call for cooling.

Continuous blower

With the room thermostat fan switch set to AUTO and the system switch set to either AUTO or HEAT, the blower energizes whenever a cooling or heating operation is requested. The blower energizes after any specified delay associated with the operation.

The indoor blower energizes for a minimum runtime of 30 seconds. Additionally, the indoor blower delays for 10 seconds between operations.

When the room thermostat calls for cooling, the low-voltage control circuit completes from R to Y and G. The compressor and fan motor energize. After completing the specified fan on delay for cooling, the microprocessor control energizes the blower motor.

Once the room thermostat has been satisfied, it de-energizes Y. If the compressor satisfies its minimum runtime, the compressor and fan de-energize. Otherwise, the unit operates the cooling system until the minimum runtime for the compressor completes. After the compressor de-energizes and the fan off delay for cooling elapses, the blower stops.

To be available, a compressor must not be locked-out because of a high pressure limit switch, low pressure limit switch, condensate overflow switch, or a freeze-stat trip. The anti-short cycle delay (ASCD) must elapse.

Safety control reset

All VPCS heat pumps are furnished with a high pressure limit switch, a low pressure limit switch, low water temperature freeze protection switch, and condensate overflow switch to prevent compressor operation during abnormal conditions.

If any of these safety devices activate, a lockout relay circuit engages. The circuit interrupts heating and cooling operation even if the control contacts automatically re-close.

This microprocessor driven lockout circuit must be manually reset. Reset by momentarily moving the thermostat control (system) switch to OFF, then back to HEAT or COOL (or AUTO).

The lockout circuit can also be reset by opening and closing the unit mounted disconnect switch.

- ① **Note:** If the unit must be reset more than twice on consecutive operating cycles, check the unit for a dirty filter, abnormal EWT, inadequate or excessive water flow, or refrigerant circuit malfunction. If the unit continues to cutout, contact a trained service technician.

Operation errors

Each refrigerant system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum runtimes for compressors.

High pressure limit switch

If a high pressure limit switch opens, the microprocessor control de-energizes the compressor, initiates the ASCD, and stops the unit fans (soft lockout). If a call for cooling or heating is still present at the conclusion of the ASCD, the microprocessor control re-energizes the compressor and unit fan.

If a high pressure limit switch opens three times within 2 hours of operation, the microprocessor control permanently locks out the system compressor, requiring a manual reset of the system (a hard lockout). To manually reset, either de-energize the 24-volt power to the unit or turn the room thermostat to OFF, then back to either HEAT or COOL as required. The microprocessor control flashes a fault code indicating the high pressure lockout (see Table 9).

Low pressure limit switch

The microprocessor does not monitor the low pressure limit switch during the initial 30 seconds of compressor operation. For the following 30 seconds, the microprocessor control monitors the low pressure limit switch to ensure it closes. If the low pressure limit switch fails to close after the 30 second monitoring phase, the microprocessor control de-energizes the compressor, initiates the ASCD, and stops the fan (a soft lockout).

Once the low pressure limit switch is proven (closes during the 30 second monitor period), the microprocessor control monitors the low pressure limit switch for any openings. If the low pressure limit switch opens for more than 5 seconds, the microprocessor control de-energizes the compressor, initiates the ASCD, and stops the compressor (a soft lockout).

If the call for cooling is still present after the ASCD, the microprocessor control re-energizes the compressor.

If a low pressure limit switch opens three times within 1 hour of operation, the microprocessor control board locks out the compressor (a hard lockout) and flashes a fault code (see Table 9).

Freeze-stat

If a freeze-stat opens, the microprocessor control de-energizes the compressor and initiates the ASCD. If a call for cooling or heating is still present after the ASCD, the microprocessor control re-energizes the halted compressor.

Condensate overflow switch

A condensate overflow fault occurs if the condensate overflow switch opens continuously for 30 seconds. The compressor shuts down regardless of the minimum runtime, and alarm 15 sets. The fan continues operating in its current state.

The microprocessor control logs the first incident per compressor request. Lockout occurs on the second fault occurrence within a request cycle, requiring reset or power cycling. If the compressor request is removed, the fault occurrence counter resets to zero. When lockouts are removed, the alarm resets.

Safety controls

The microprocessor control monitors the following inputs:

1. A suction line freeze-stat to protect against low leaving water temperatures (LWTs) (opens at 37.0°F and resets at 49.0°F).
2. A high pressure limit switch to protect against excessive discharge pressures (opens at 625 psig \pm 25 psig).
3. A low pressure limit switch to protect against loss of refrigerant charge (opens at 38 psig \pm 5 psig).
4. A condensate overflow switch to protect against condensate overflow.

Coaxial freeze protection setpoint

The field can select the coaxial freeze protection setpoint. The unit uses a suction line freeze-stat factory setpoint for compressor lockout when the LWT drops below 37.0°F (resets at 49.0°F). To lower the setpoint for low temperature heating applications with an adequate water-antifreeze solution, unplug the freeze-stat sensor located at P6 on the microprocessor control board, and plug in the (pink) jumper attached to the existing harness.

Installing the jumper bypasses the freeze-stat, enabling heating operation with a leaving glycol fluid mixture temperature below 35.0°F. Use the jumper only in glycol mixture applications with adequate antifreeze protection. Otherwise, damage can occur. The minimum loop temperature for cooling is 30.0°F and 20.0°F for heating.

Random start

The random start function upon power up imposes time delay of 4 minutes plus a random delay of 1–64 seconds. A combination of the following determine the random number generator seed:

- A fixed seed programmed at the factory
- The serial number
- The model number
- The hours of the unit's compressor runtime

Compressor protection

In addition to the external pressure switches, the compressor also has inherent internal protection. If there is an abnormal temperature rise in a compressor, the protector opens to shut down the compressor. The microprocessor control incorporates features to minimize compressor wear and damage. The control uses an ASCD to prevent compressor operation too soon after its previous run. Additionally, a minimum runtime is imposed any time a compressor is energized. The ASCD initiates on unit start-up and on any compressor reset or lockout.

Microprocessor control unit flash codes

The microprocessor control uses various flash codes to aid in troubleshooting. The flash codes are distinguished by a short on and off cycle (approximately 200ms on and 200ms off).

During normal operation, to show that the microprocessor correctly functions, the control boards flash for 1 second on, 1 second off, also known as a heart beat. Do not confuse this with an error flash code. To prevent confusion, a 1-flash fault code is not used. For a list of all flash codes, see Table 9.

Current alarms or active restrictions are flashed on the microprocessor control LED.

Last error

When this button is pressed and released one time within 5 seconds, it flashes the last five fault codes on the board's LED. The most recent alarm is shown first and the oldest alarm is shown last.

Test reset

When this button is pressed and released one time within 5 seconds, any ASCD is bypassed for one cycle.

Comm setup

If the board is to be networked with other units, this button is used to set the network address.

The first time the button is pressed within 5 seconds, it scans the bus, assigns itself the first available address (starts at 2), and then flashes that address once.

Pressing the button two times within 5 seconds causes the control to flash the address.

Table 9: Flash codes

Flash codes	Description
On steady	Control failure – replace control
Heart beat	Normal operation
2 flashes	Control waiting on ASCD*
3 flashes	HPS1 - Compressor lockout
5 flashes	LPS1 - Compressor lockout
11 flashes	Compressor held off due to economizer active*+
13 flashes	Compressor held off due to low voltage*
14 flashes	EEPROM storage failure (control failure)
15 flashes	Condensate overflow switch - compressor lockout
16 flashes	Coaxial freeze thermostat - compressor lockout

① Note:

* These flash codes do not represent alarms.

+Check for Y1 and ECON jumper on P4.

Communication

The communication protocol is Modbus™ using the RTU method of packet framing at 19200-baud rate.

Maintenance

Unit maintenance is simplified by the following preventive suggestions:

1. At least once a month, visually inspect the unit. Pay special attention to hose assemblies. Note any signs of hose deterioration or cracking. Immediately attend to any sign of minor leakage.
2. At least once every three months, perform filter maintenance to ensure proper operation of the equipment. Inspect the filters and replace when visible dirt buildup is evident.

CAUTION

To avoid fouled machinery and extensive unit clean up, DO NOT operate units without filters in place or use the unit as a temporary cooling/heating source during construction.

3. Every three months, inspect the condensate drain pan for algae growth and mineral buildup. Excessive algae or mineral deposits in the drain pan or drain line can result in condensate overflow and unpleasant mildew odors.
4. Annually check the fan motor and blower assembly. All units employ permanently lubricated fan motors. DO NOT OIL FAN MOTORS. Vacuum any accumulation of dirt from the motor ventilation slots and the blower wheel.
5. Annually check the contactors and relays within the control panel. Inspect the panel for any signs of damage caused by overheated contacts or temperature change to the wiring. Check the terminals for tightness.
6. Annually conduct an amperage check on the compressor and fan motor. An amperage draw more than 10% higher than the nameplate values can indicate heat exchanger fouling, low water flow, or premature physical motor failure.
7. At least once a year, inspect the air-to-refrigerant heat exchanger surface. A dirty or partially clogged coil can significantly reduce operating capacity and can result in serious equipment problems. If the coils appear dirty, clean them using mild detergent or a commercial coil-cleaning agent.
8. Inspect hoses, valves, and connections for water leaks. For hose connection leaks, inspect rubber hose gaskets and replace them as required.

Appendix

VPB series wiring diagrams

Figure 31: EC motor (ECM), 2 speed fan wiring diagram

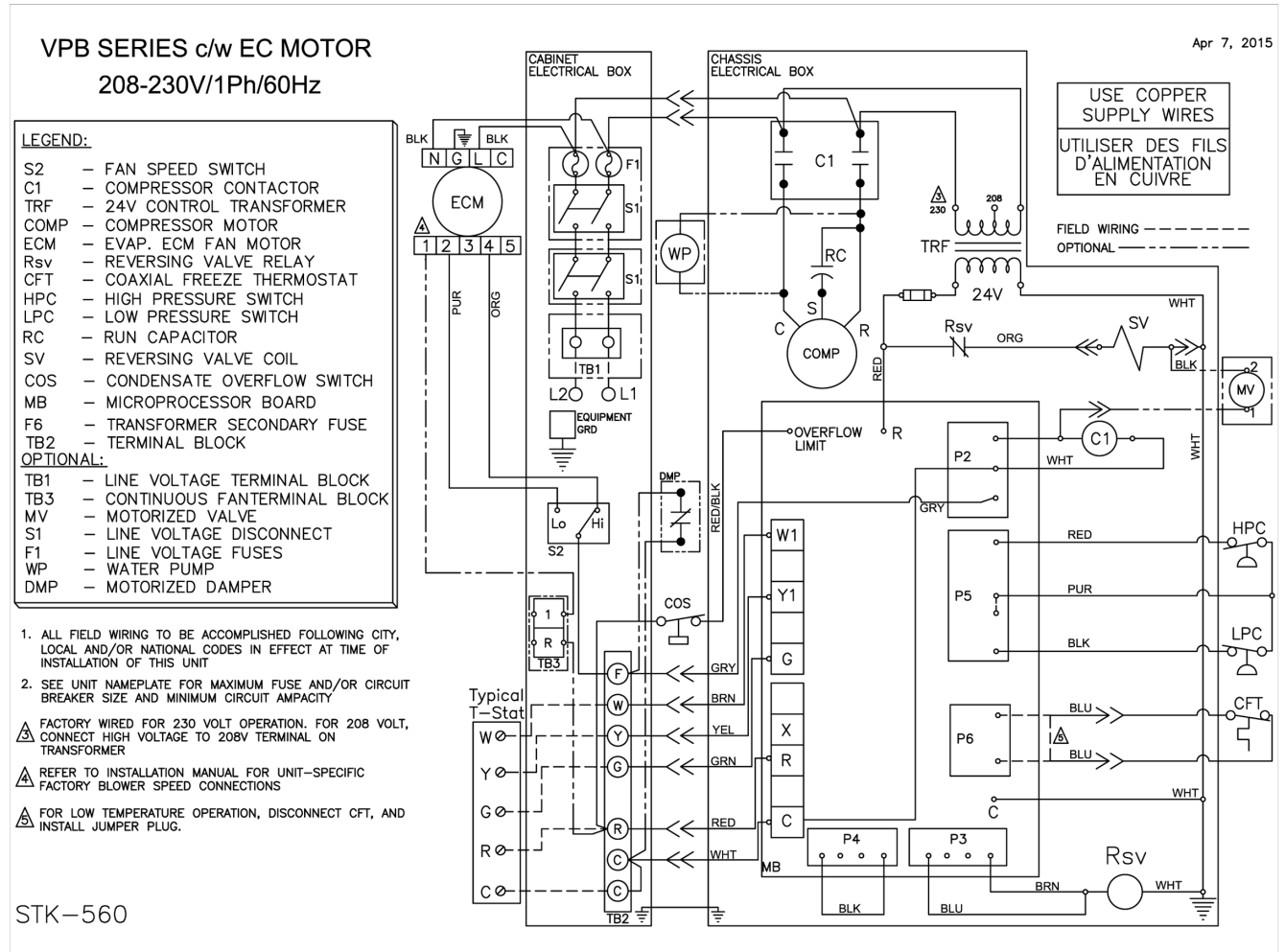
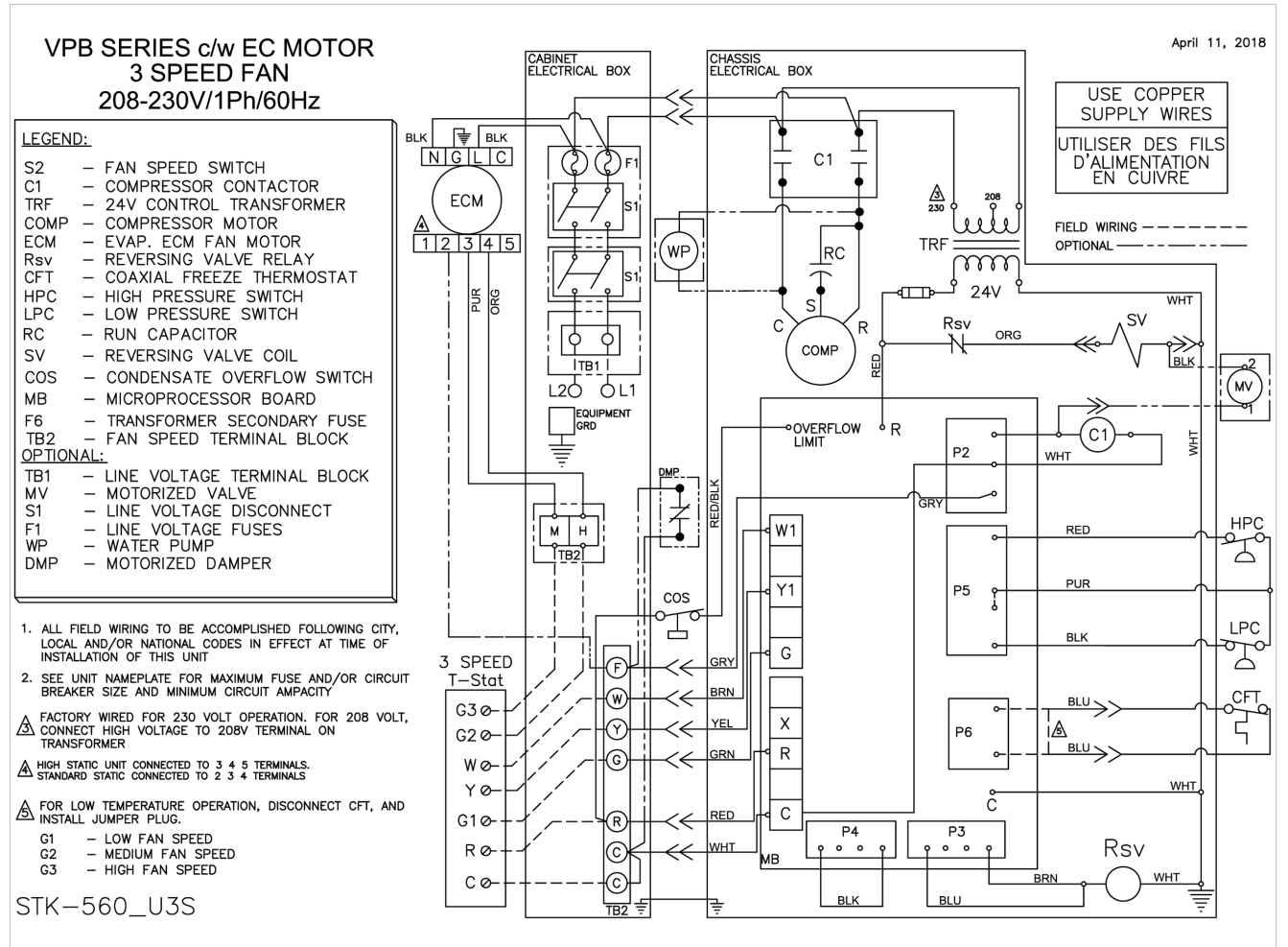


Figure 32: EC motor (ECM), 3 speed fan wiring diagram



LD28382

Table 10: Premium series pressure drop

Premium series model	GPM	Pressure drop (PSI)				
		30.0°F	50.0°F	70.0°F	90.0°F	110.0°F
VPCS09	1.6	1.9	1.8	1.6	1.5	1.3
	2.4	3.4	3.1	2.9	2.6	2.3
	3.2	5.5	5.1	4.6	4.2	3.2
VPCS12	1.9	1.9	2.0	1.6	1.2	0.7
	2.8	4.4	4.0	3.6	3.1	2.7
	3.8	6.8	6.4	6.0	5.6	5.1
VPCS15	2.5	3.4	3.1	2.8	2.4	2.1
	3.8	6.9	6.3	5.6	5.0	4.3
	5	11.1	10.1	9.0	8.0	6.9

Table 10: Premium series pressure drop

Premium series model	GPM	Pressure drop (PSI)				
		30.0°F	50.0°F	70.0°F	90.0°F	110.0°F
VPCS18	3.4	4.6	4.2	3.9	3.5	3.1
	5	13.2	12.1	11.0	9.9	8.8
	6.8	22.0	20.2	18.3	16.5	14.7
VPCS24	4.1	4.5	3.8	3.0	2.3	1.6
	6.2	7.2	6.5	5.8	5.1	4.4
	8.2	11.5	10.4	9.3	8.1	7.0
VPCS30	3.8	4.4	4.1	3.7	3.3	2.9
	5.7	6.5	5.9	5.4	4.9	4.3
	7.5	8.4	7.7	7.0	6.3	5.6
VPCS36	4.5	3.1	2.7	2.3	1.9	1.5
	6.8	7.1	6.2	5.3	4.4	3.4
	9	10.9	9.5	8.1	6.7	5.3

Heating and cooling data record sheet

JOB NAME: _____
 JOB ADDRESS: _____

 INSTALLER: _____
 SPECIAL QUOTES/OPTIONS (YES/NO): _____

JOB #: _____
 DATE: _____
 INSTALLER'S ADDRESS: _____

 SERVICE TECHNICIAN: _____

UNIT INFORMATION

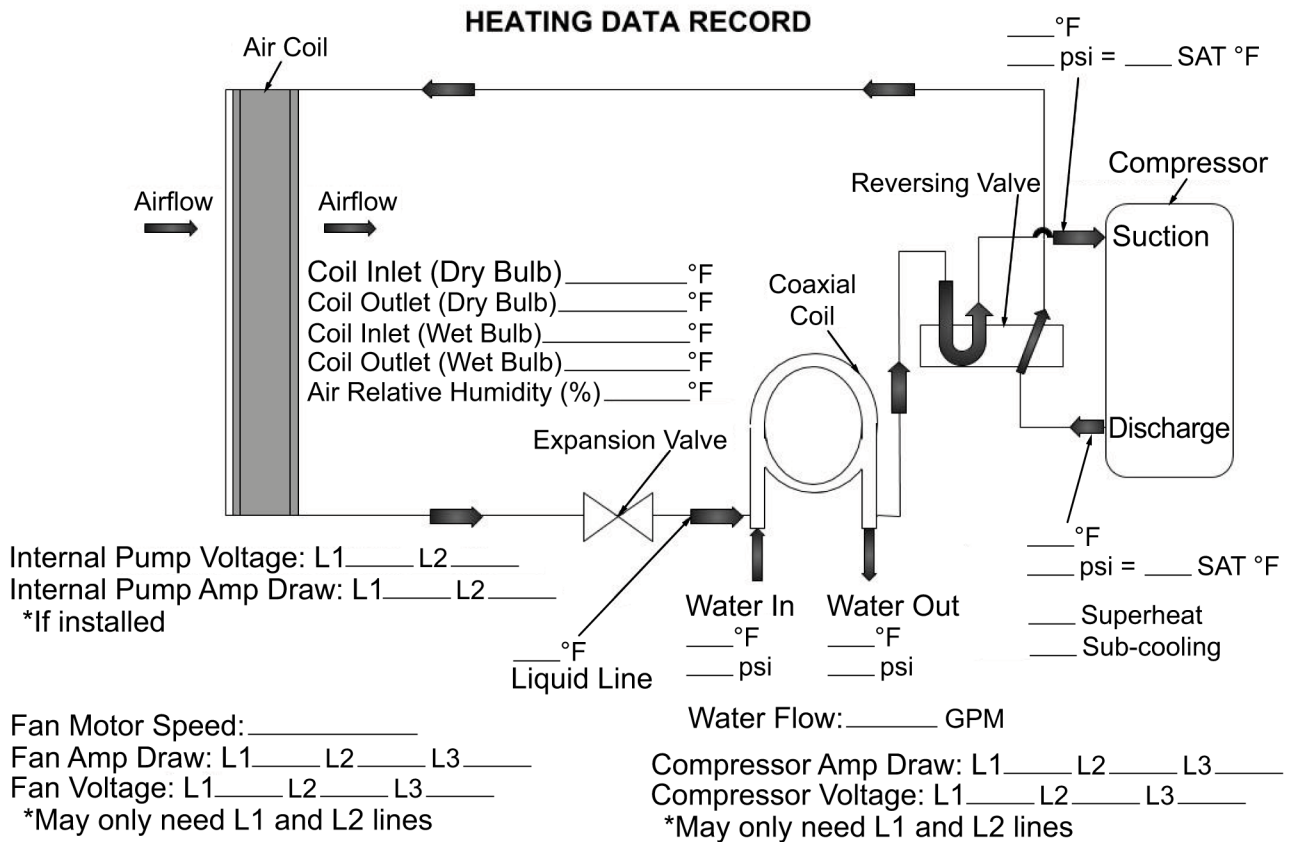
CABINET MODEL #: _____
 CHASSIS MODEL #: _____
 OPERATING MODE (HEATING/COOLING): _____
 DUCTED/FREE DISCHARGE: _____
 LENGTH, WIDTH, HEIGHT OF DUCT(S): _____

 SUPPLY DUCT EXTERNAL STATIC PRESSURE (iwg): _____

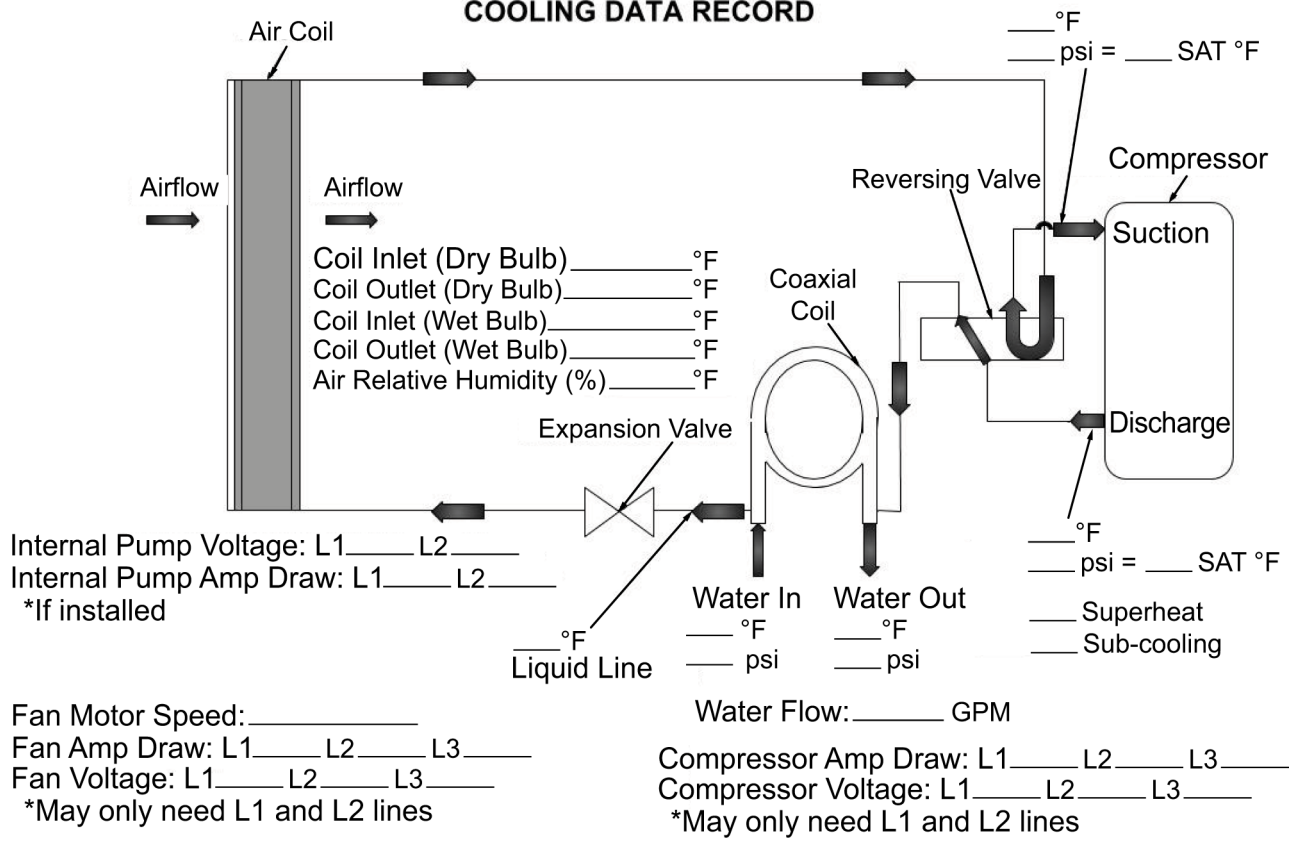
CABINET SERIAL #: _____
 CHASSIS SERIAL #: _____
 LOCATION / ROOM # OF HEAT PUMP: _____
 FLASH CODES OR FAULTS FROM CONTROL BOARD: _____

 DOES UNIT HAVE AN INTERNAL PUMP: (YES/NO): _____
 SUPPLY AIRFLOW MEASUREMENT (CFM): _____

Please attach a sketch of the duct(s) run with this form when returned to the Applied Ducted Systems PTS team.



COOLING DATA RECORD



Notes

Limited warranty

Johnson Controls warrants this product to be free from defects in workmanship or material for a period of 1 year from date of original installation or 18 months from date of shipment, whichever comes first.

Johnson Controls' obligation under this warranty is LIMITED to repairing or replacing at our sole option, at our factory, any part thereof which shall be returned to our factory, transportation charges prepaid and which on examination proves to have been thus defective under normal domestic use not exceeding the fuel rating. The defective part should be returned through a qualified servicing dealer. Upon warranty determination, the replacement part will be shipped freight collect and assumes the unexpired portion of this Limited Warranty.

When a defective part can be repaired or replaced, Johnson Controls shall not be obligated to repair the entire unit or any part thereof other than the defective part.

This warranty applies only to the original homeowner and is subject to the terms and conditions hereof.

Compressor - five year limited warranty

In addition to the 1 year Limited Warranty, Johnson Controls warrants the compressor to be free from defects in workmanship or material for a period of 5 years from the date of original installation. If a compressor fails during this five year period, a new compressor will be supplied. The customer will be responsible for freight costs from our factory for delivery of the replacement compressor and also for the return of the defective compressor which may be required under the terms of the Warranty. Labor and any other expense involved in replacing the compressor is not covered by this warranty.

Labor and cost not covered

This Limited Warranty provides only replacement parts or credits and does not provide for or cover any labor, shipping, handling, or other costs for service travel, servicing, removing, or installing any parts.

Exclusions

This Limited Warranty shall be void if:

1. The unit is not installed by a licensed or otherwise qualified contractor and in compliance with the installation manual, applicable installation, and good trade practices.
2. The defect or damage is caused by accident, abuse, negligence of any person or company, misuse, riot, flood, fire, or Acts of God.
3. The unit is not operated and regularly serviced and maintained as called for in the Installation, Operation, and Maintenance (IOM) Manual.
4. Damages are caused by operating the unit in a commercial or corrosive atmosphere containing any damaging or dangerous chemicals.
5. The unit is modified or serviced in a manner not in accordance with the IOM Manual.
6. Components, replacement parts, or other accessories not compatible with the unit or not approved by Johnson Controls have been used with or attached to the unit.
7. The defect or damage is not caused by Johnson Controls, or it arises from circumstances beyond the control of Johnson Controls.
8. The unit is installed outside the United States or Canada or has been removed from the place where it was originally installed.

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R-410A quick reference guide

See [Installation](#) for specific installation requirements.

- R-410A refrigerant operates at 50–70% higher pressures than R-22 refrigerant. Ensure that servicing equipment and replacement components are designed to operate with R-410A refrigerant.
- R-410A refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig (DOT 4BA400 or DOT BW400).
- Recovery equipment must be rated for R-410A refrigerant.
- Do not use R-410A service equipment on R-22 systems. All hoses, gauges, recovery cylinders, charging cylinders, and recovery equipment must be dedicated for use on R-410A systems only.
- Manifold sets must be at least 700 psig high side and 180 psig low side with a 550 psig retard.
- All hoses must have a service pressure rating of 800 psig.
- Leak detectors, must be designed to detect HFC refrigerants.
- Systems must be charged with refrigerant. Use a commercial type metering device in the manifold hose.
- R-410A refrigerant can only be used with polyester (POE) type oils.
- POE type oils rapidly absorb moisture from the atmosphere.
- Vacuum pumps cannot remove moisture from POE type oils.
- Do not use liquid line driers with a working pressure rating less than 600 psig.
- Do not install suction line driers in the liquid line.
- A liquid line drier is required on every unit.
- Do not use an R-22 TXV. If a TXV is necessary, it must be an R-410A TXV.
- Never open the system to atmosphere when under vacuum.
- If the system must be opened for service, evacuate the system, then break the vacuum with dry nitrogen and replace the filter driers.

