Johnson Controls	INDOOR PACKAGED EQUIPMENT	
INSTALLATION, OPERATION, AND MAINTENANCE	NEW RELEASE	FORM 145.18-IOM2 (1215)

PREMIUM EFFICIENCY VPCS SERIES
VERTICAL STACKED WATER SOURCE HEAT PUMP

LD18014

LD18013

CABINET MODEL VPB/VPM/VPS/VPT09-36
AND
CHASSIS MODEL VPCS09-36

R-410A

INTERTEK ETL LISTED C US

ISSUE DATE:
December 4, 2015

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

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

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

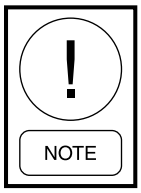
SAFETY SYMBOLS

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

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

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

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



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

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

CHANGEABILITY OF THIS DOCUMENT

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

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

CHANGE BARS

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

CABINET NOMENCLATURE

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

Product Category
- VPB = Vert. Stacked Heat Pump - Standard Cabinet Assembly
- VPM = Vert. Stacked Heat Pump - Master Cabinet Assembly
- VPS = Vert. Stacked Heat Pump - Slave Cabinet Assembly
- VPT = Vert. Stacked Heat Pump - Std Cab Single Riser 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

Control Options
- M = Microprocessor (MP) Control w/ 2-Speed Unit Mounted Switch
- 2 = MP Control w/ 2-Speed Thermostat Control
- 3 = MP Control w/ 3-Speed Thermostat Control
- P = MP Control w/ Surface-Mount Thermostat Connection w/ Unit Mounted Switch
- 4 = MP Control w/ Surface-Mount Thermostat Conn w/ 2-Speed Thermostat Control
- 5 = MP Control w/ Surface-Mount Thermostat Conn w/ 3-Speed Thermostat Control

Voltage
- 1 = 208/230-60-1

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

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

Cabinet Options

Cabinet Height	No OA Options	LEFT Top OA Entry - 4" Round	LEFT Top OA Entry - 4" Round w/ Motorized Damper	RIGHT Top OA Entry - 4" Round	RIGHT 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

Riser Arrangement
- 1 = Right Hand Risers
- 2 = Left Hand Risers
- 3 = Back Risers
- 4 = R/Hand Risers with Cover
- 5 = L/Hand Risers with Cover
- 6 = Back Risers with Cover

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)

Horizontal Discharge Opening Orientation

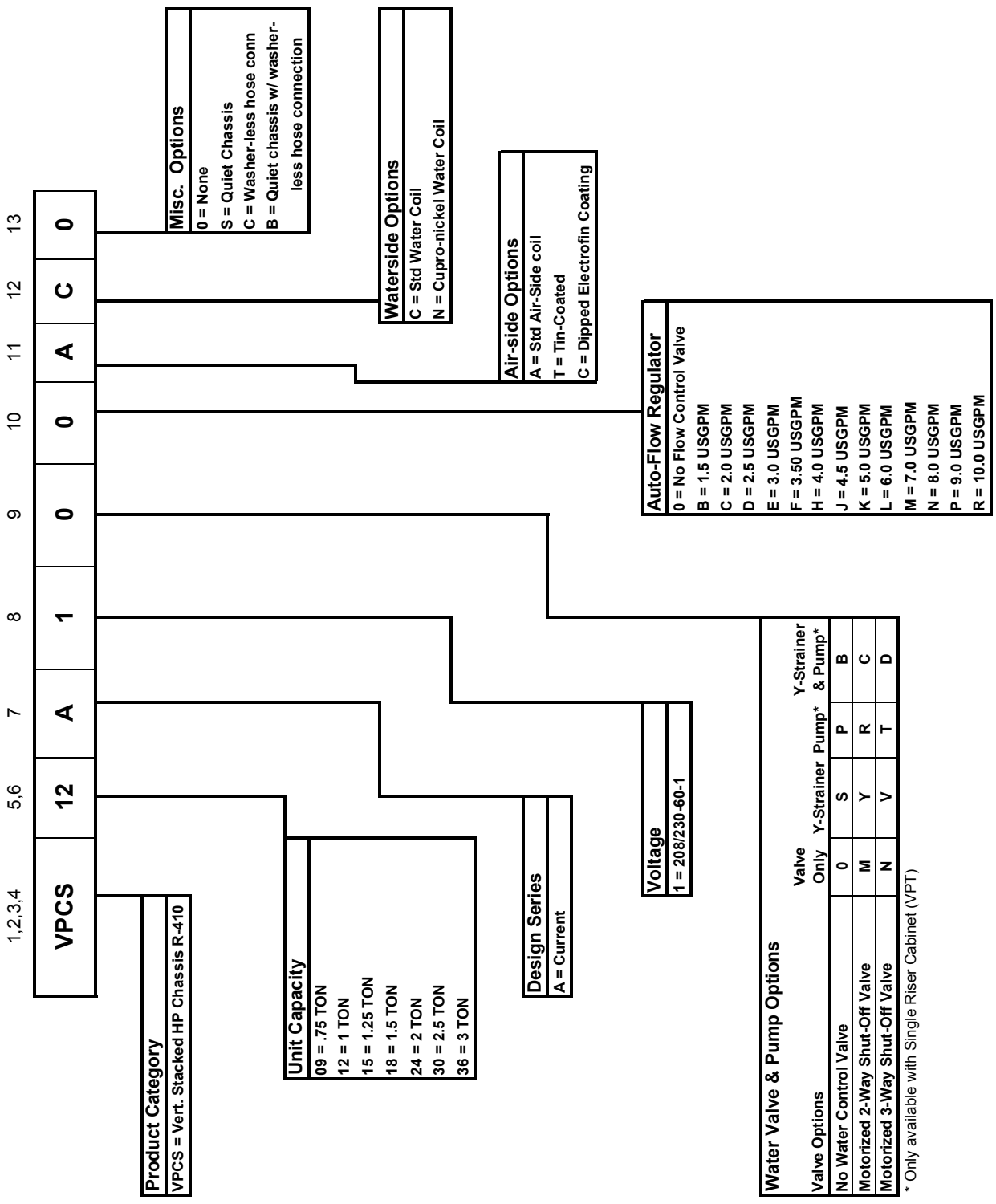
00, 0T	1H, 1T	2H, 2T	3H, 3T
X = None	B = Back	1 = Left + Front	7 = Front + Left + Right
	F = Front	2 = Left + Back	8 = Front + Right + Back
	L = Left	3 = Left + Right	9 = Front + Left + Back
	R = Right	4 = Right + Back	
		5 = Right + Front	
		6 = Back + Front	

Misc. Options

Option	Filters: MERV (Depth) 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

Design Series
- A = Current

CHASSIS NOMENCLATURE



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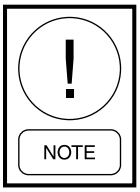

After installing the unit, show the user how to turn off the electricity to unit. Point out control and switch locations for turning off the electricity. Make sure user understands the importance of following all safety precautions.

NOTICE & DISCLAIMER

As originally manufactured, this unit contains refrigerant installed by Johnson Controls. Johnson Controls uses only refrigerants that have been approved for use in the unit's intended country or market. Johnson Controls' distributors similarly 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/or in the associated manuals. Any additions of refrigerant into this unit must comply with the country's requirements with regard to refrigerant use and should be obtained from JCI distributors. Use of unapproved refrigerant substitutes will void the warranties and can cause injury or death.

Disclaimer

Customer modifications to Johnson Controls certified products are prohibited.

Johnson Controls Inc. 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 will be needed to assess the impact to the product certification. In some instances, the changes may be such that the NRTL or testing facility will need to review and potentially re-approve of the product by means of a field or site inspection and certification. Any person or entity making changes to the product is responsible for obtaining any necessary engineering review and re-approval. Unauthorized customer modifications to Johnson Controls products are prohibited for the following reasons:

A. Modifications may create hazards that could result in death, serious injury or equipment damage.

B. Modifications will void product warranties.

C. Modifications may invalidate product certifications. Modifications 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.

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SECTION 2 - INSTALLATION

PREPARING TO INSTALL UNIT

Literature

Review this Manual and the User's Manual Information.

After installing the unit, give this Installer's Information Manual to the end user. If you need help on any of the installation instructions or other matters relating to the unit, contact the office where you bought the unit. You may also refer to the unit rating plate for a contact name.

Shipping

Cabinets and risers are shipped in one of the following configurations:

A. Risers are attached to cabinet, and cabinets are stacked on their side. Chassis ships on separate skids.

B. Risers ship loose, packaged in boxes, and sorted by floor. Cabinets ship upright up to four per skid. Chassis ships on separate skids.

C. Risers ship loose in packaged boxes, sorted by floor. Cabinets ship upright on skids with chassis inside cabinet (chassis electrical and water connections are not installed). Cabinet must remain standing upright. Do not place cabinets on their side with chassis inside. Chassis is secured to service panel. Remove screws before removing service panel and chassis.

Inspection & Storage

Cabinets, chassis, and risers should be stored in the same way they were shipped. Store in a dry area and ensure chassis units are always in their upright position. If risers are being stored at the job site, ensure the ends are capped to prevent contamination.

In areas where construction is not complete—including dry walling, plastering, painting, and where emission of dust particulates or fumes from outgassing are present—all precautions must be taken to protect the cabinet, cabinet openings, and chassis from physical damage and contamination by foreign material.

A. Check the unit for indications of damage in shipment. Notify the Transportation Company of any damage, and note the damage on the shipping receipt.

Rough handling may dislocate and damage internal components.

B. Check riser projections at each end of the cabinet for misalignment or end damage that would prevent making an acceptable connection.

C. Thermostats and other accessories that have been shipped separately should be inspected for quantity and transit damage.

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

Pre-Installation

A. Verify the model number on the unit nameplate with the ordering and shipping information, to ensure the correct unit has been shipped.

B. All cabinets may not be equipped with the same size riser or the same air supply grille arrangement. Carefully inspect each unit before delivery to the installation site. In most cases, each cabinet will be individually tagged for a specific location in the building.

C. Keep the cabinet sealed with the shipping materials until all plastering, painting, and construction work is complete.

D. Remove the inner service panel, and manually check the blower wheel for free rotation.

E. Match the refrigeration chassis to the proper cabinets by referring to the cabinet and chassis nameplate and label information.

F. 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.**

G. Ensure the compressor, which is mounted on neoprene isolators with metal spacing sleeves inside and secured with nuts, is snug against the metal spacer sleeves.

H. Inspect all electrical connections. Connections must be clean and tight at the terminals.

Do NOT use the risers to lift the cabinet assembly.

Do NOT install this unit outdoors.

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

Before servicing, open and tag all disconnect switches.

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

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

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.

Use gloves, protective goggles, and where appropriate, make sure to have a gas mask close at hand. Also use electrical protection equipment and tools suited for electrical operation purposes.

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

The system should be installed by Johnson Controls qualified personnel. If not, it may cause water leakage, electric shock, or fire.

Rigging

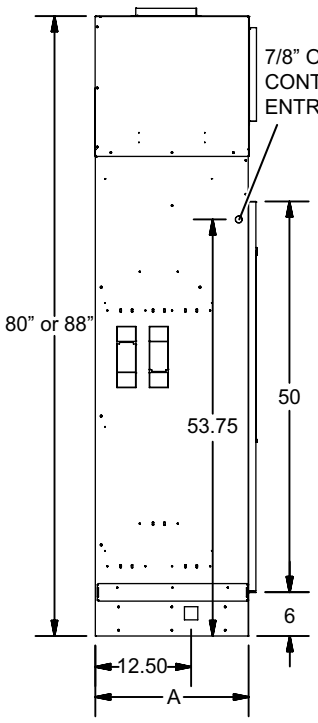
Follow all applicable regulations and safety practices during rigging and lifting. Prepare and follow written rigging and lifting plan. Lifting must be directed by trained professional rigger.

Spreader bars must be used and be long enough to prevent rigging from contacting unit. Use all and only designated lift points according to unit's Manual(s). Locate center of gravity through trial lifts to account for possible variations in unit configuration. Use rigging and lifting techniques that keep unit stable and level. Keep clear of unit when lifted.

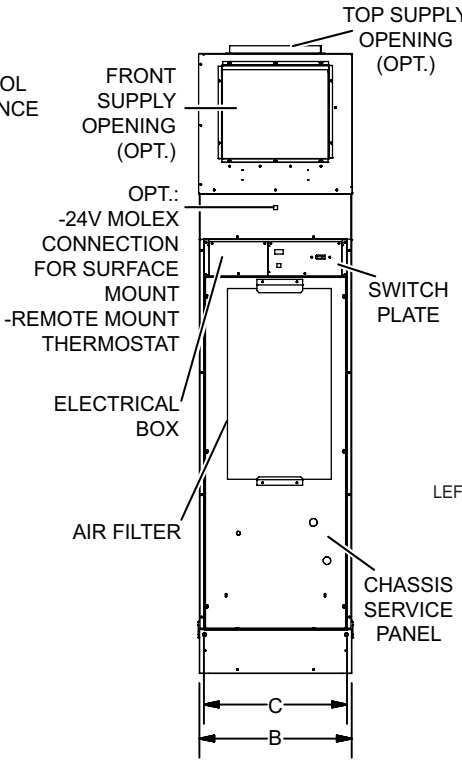
TABLE 1 - PREMIUM SERIES PHYSICAL DATA

PREMIUM SERIES MODEL	09	12	15	18	24	30	36
Nominal Cooling (Ton)(1)	0.75	1.0	1.25	1.5	2.0	2.5	3.0
Compressor Type	Rotary			Scroll			
Refrigerant Charge (oz)	37	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						
ECM Blower/Motor	DWDI Forward-Curved Centrifugal/ECM Direct-Drive						
Diameter x Width (in)	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 (in)	1-14x25x1	1-14x25x1	1-16x30x1	1-16x30x1	1-20x30x1	1-20x30x1	1-20x30x1
Flexible Hose	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
Condensate Connection Size	7/8" ID	7/8" ID	7/8" ID	7/8" ID	7/8" ID	7/8" ID	7/8" ID
Cabinet Weight (lb) (2)	145	145	145	145	175	175	175
Chassis Weight (lb)	104	110	117	137	156	165	172

NOTE:
1. Nominal Capacity calculated in accordance with ARI/ISO Standard 13256-1 for Water Loop Application.
2. Cabinet weight is approximate and does not include weight of risers.

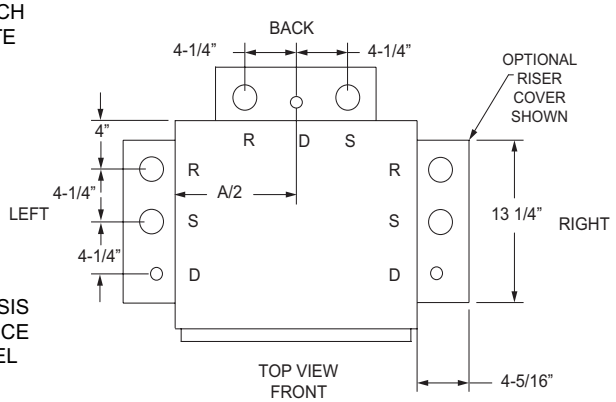


LEFT VIEW

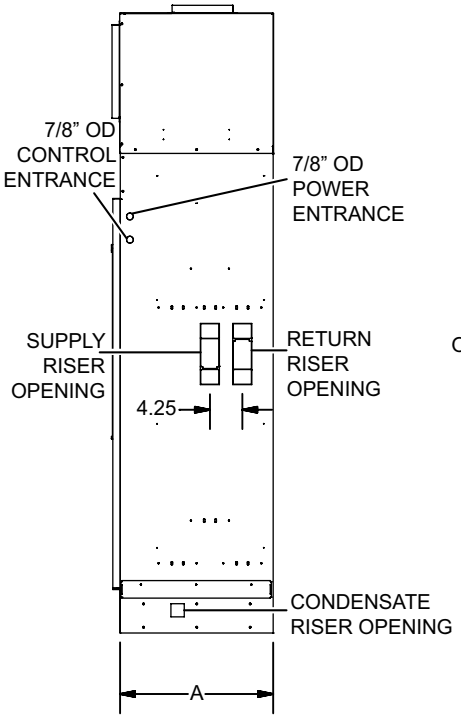


FRONT VIEW

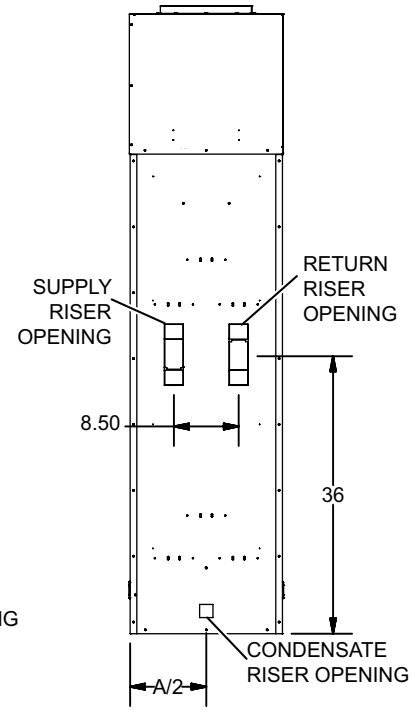
CABINET DIMENSIONS			
MODEL	A	B	R/A FLANGE (C)
SIZE 1: 09-12-15-18	20	20	18.75
SIZE 2: 24-30-36	24	24	22.75



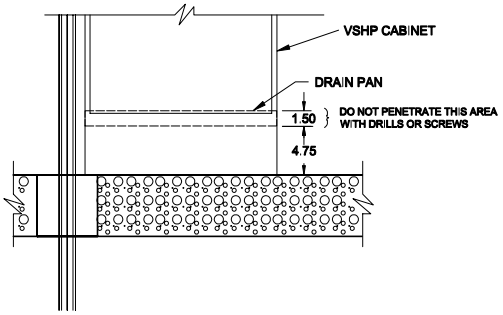
R - RETURN RISER
S - SUPPLY RISER
D - DRAIN RISER



RIGHT VIEW



BACK VIEW



Note:
1) Supply, Return, and Condensate riser openings are pre-punched on all sides and field convertible. Cut tabs to remove knock-out.
2) Supply and Return openings are 4" x 2.5". During riser installation, ensure stub-out is centered in supply and return openings.
3) Condensate P-trap is accessible from front by removing bottom cover plate or from top by removing drain pan.
4) Riser and shut-off location is measured from base of cabinet and does not include stand height.

LD19318b

NOTES:
1. Riser shut-off valve is measured from base of cabinet and does not include stand height.

FIGURE 1 - CABINET UNIT DIMENSIONS & FLOOR SLEEVE DIMENSIONS

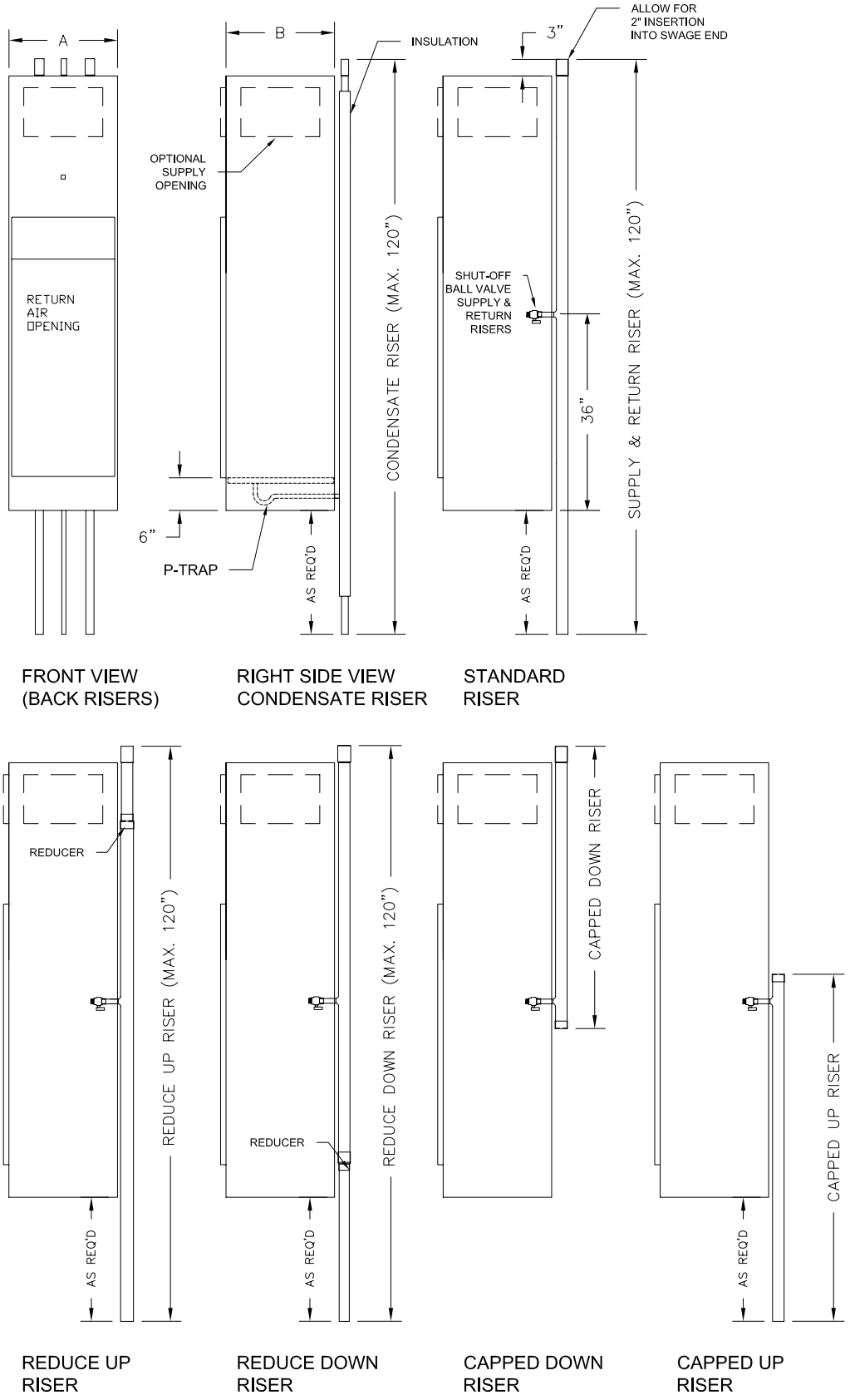


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FIGURE 2 - CABINET RISER DIMENSIONS

RISER/CABINET INSTALLATION

Cabinent Placement

Refer to *Figure 1 on page 14*, which shows the correct location of the cabinet in relation to the floor sleeve and risers.

Do NOT use risers to lift or move cabinets.

Risers must not be used to lift cabinets. Risers are not designed to support or lift any part of the cabinet. Risers are attached using nylon ties to allow for slight adjustments during installation and expansion of riser column during operation. Care must be taken during installation to avoid damage to risers and riser stub-outs.

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

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

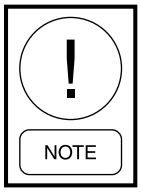
Do not drag risers on floor while moving the cabinet.

For orders where risers are shipped loose, riser installation can be done first before installation of cabinets. During riser installation, ensure riser stub-outs will be centered in the cabinet openings. Do not allow risers to bottom out in swage.

Where risers are shipped attached to cabinet, installation of risers and cabinet is done at the same time without the need to detach risers from cabinet.

1. Place the cabinet in a horizontal position on the floor adjacent to its installation location (when risers are attached to cabinet).
2. 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, field installed expansion compensation must be provided.

   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 standard riser models only: VBR/VMR/VBS)
3. If the installation requires the use of field or factory provided riser extensions, install the extensions to the unit-mounted risers prior to moving the cabinet into final position.
4. Raise the cabinet upright and lower the risers through the floor cut-out, aligning the risers into the swaged section of the unit on the floor below.



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.

To ensure correct riser positioning and to compensate for variations in floor-to-floor dimensions, DO NOT allow the riser tailpiece to bottom out into the swaged section.

5. Center the risers in the pipe chase, and level the cabinet using shims as necessary.
6. Plumb risers in two planes to assure proper unit operation and condensate drainage.
7. Placing cabinets on vibration isolation pads is recommended to reduce noise transmission into floor. Anchor cabinets into place using sheet metal angles.

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

8. 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.

9. 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. Riser stub-out should be centered 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.

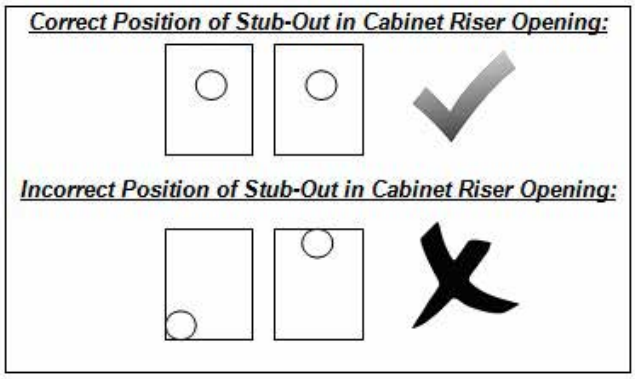


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FIGURE 3 - STUB-OUT POSITION IN CABINET RISER OPENING

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

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

11. **The riser system must be secured, at a minimum of one point, to the building structure. Cabinets are not intended to support riser system.** If the temperature range of the system will exceed the allowed expansion and contraction limits (1-1/2 inches maximum), riser compensation provisions must be made by the installing contractor.

12. Ensure that individual unit shut-off valves remain closed until the circulating loop system has been cleaned and flushed.

Supply and Return Piping

1. Install a drain valve, shut-off/balancing valves, flow indicators, and drain tees at the base of each supply and return riser to enable system flushing, balancing, and servicing.

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 loop water temperature is maintained between nominal operating limits of 60-90°F, piping will 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. Refer to the following diagrams for determining what riser shut-off valves and hose kits are required for job specific site conditions.

   a. **Factory-supplied risers** will come with the appropriate hose kits with NPSH of JIC type fittings (see *Figure 4 on page 18* and *Figure 6 on page 19*). Before attaching NPSH type hoses, check that the female end gasket is not missing and is free of damage or debris. See *Table 3 on page 18* for information on replacement gaskets.

   b. **For field-supplied risers**, we recommend ordering the appropriate NPSH of 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 5 on page 19* and *Figure 7 on page 20*).

Hoses

Ensure the correct hose set is matched with the compatible unit size; see *Table 2 on page 18* When installing NPSH or JIC factory-provided hoses, installer must follow these procedures when installing hoses:

1. Inspect for missing or damaged hose gasket. See *Table 3 on page 18* for replacement gasket part numbers.

2. Tighten by hand screw connections to male NPSH or JIC fitting on shut-off valve. Hold ferrule stationary when tightening.

3. Tighten by hand, then using a back up wrench tighten a further quarter turn only. Do not overtighten.

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

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

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.

TABLE 2 - CHASSIS HOSES

CHASSIS MODEL	HOSE TYPE
9/12/15/18	1/2" NPSH or JIC Female-Female
24/30/36	3/4" JIC Female-Female

TABLE 3 - REPLACEMENT HOSE GASKETS

REPLACEMENT GASKETS FOR NPSH HOSE KITS	
PART NO.	**DESCRIPTION**
VSGK-UFHW-050	1/2" Rubber Gasket

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

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

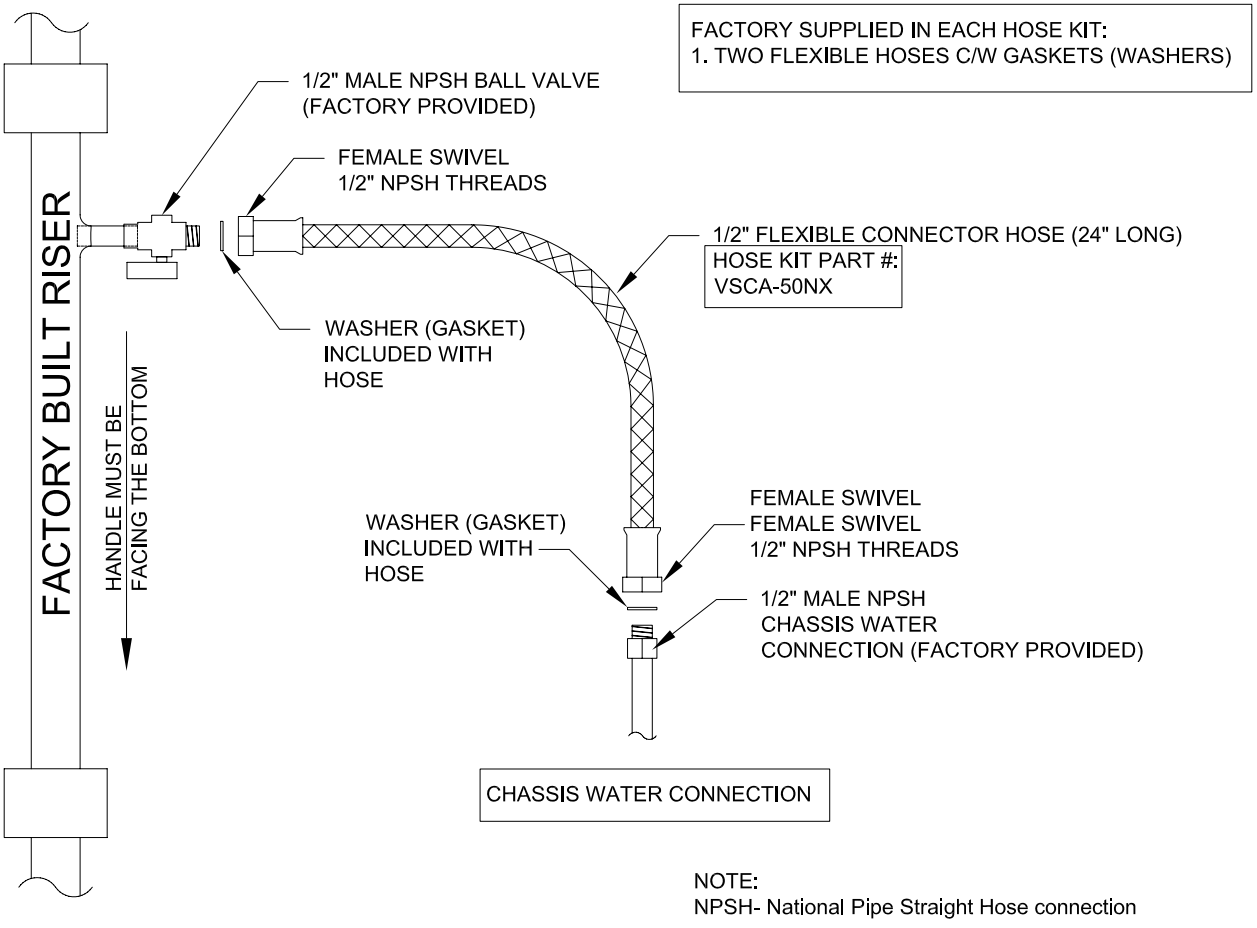


FIGURE 4 - STANDARD FACTORY SUPPLIED NPSH HOSE KITS AND RISERS

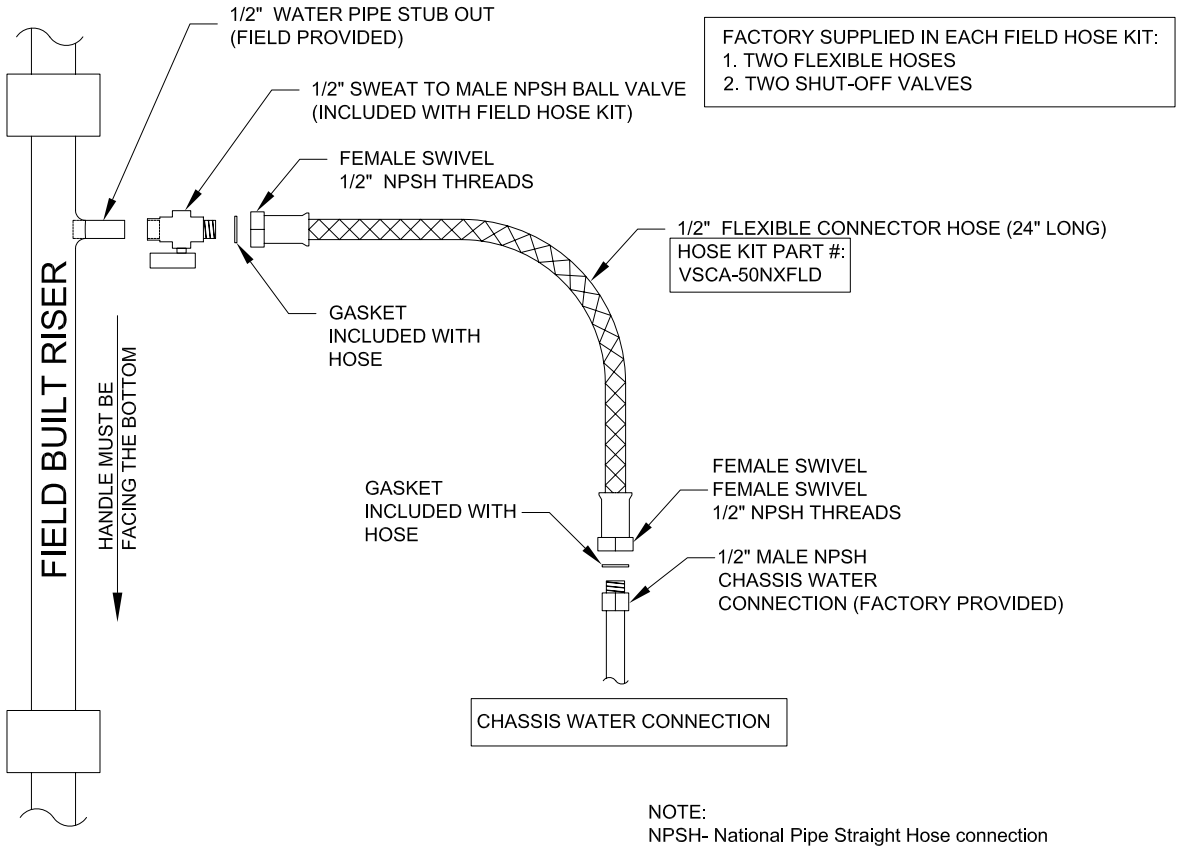


FIGURE 5 - OPTIONAL FIELD-SUPPLIED RISERS WITH FACTORY-SUPPLIED NPSH HOSE KITS AND SHUT-OFF VALVES

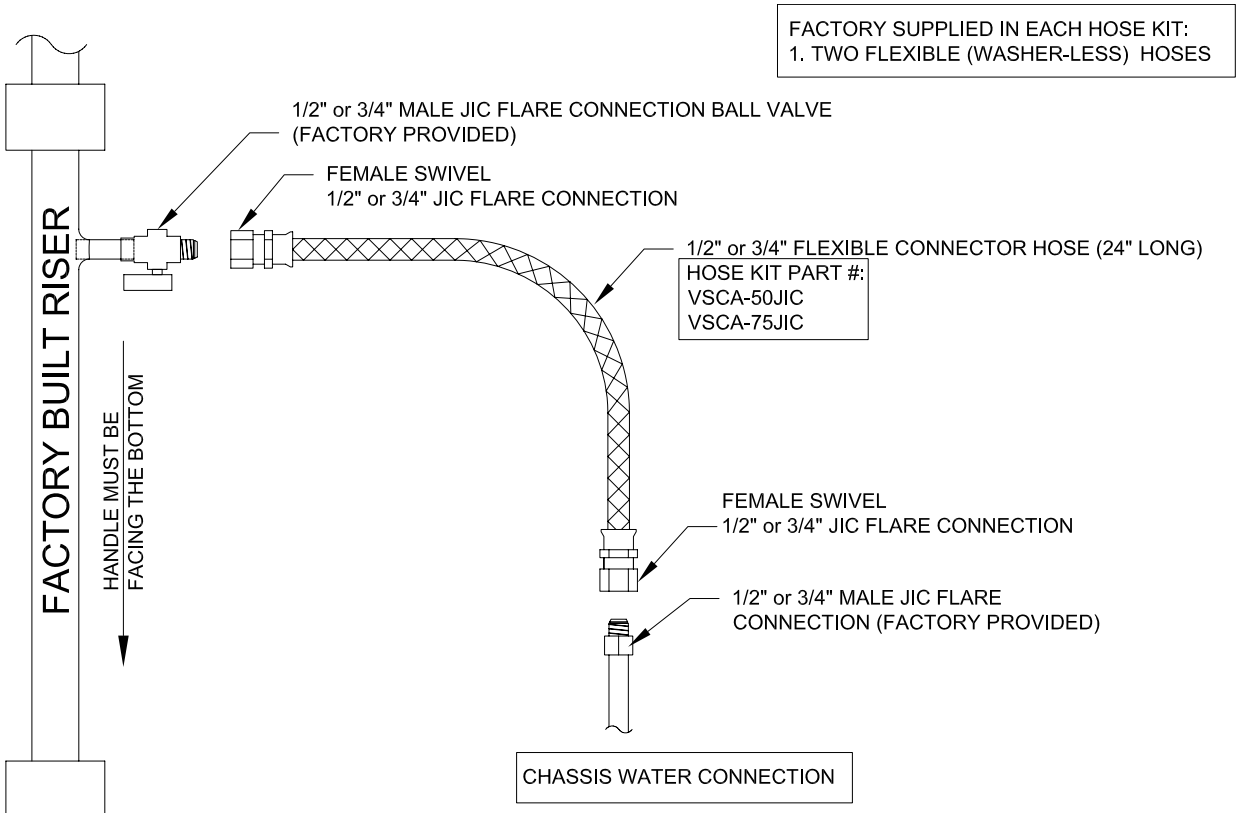


FIGURE 6 - STANDARD FACTORY SUPPLIED JIC HOSE KITS AND RISERS

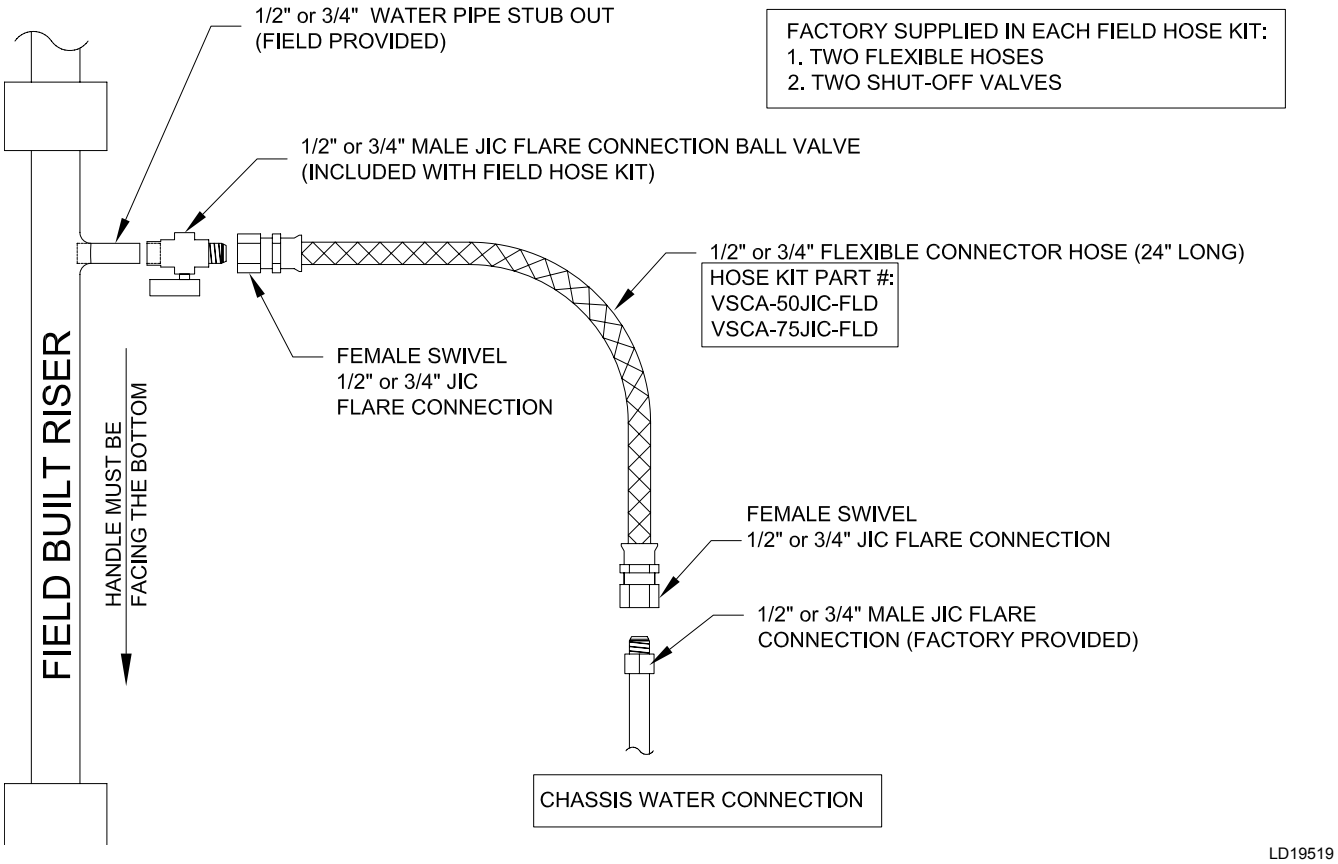


FIGURE 7 - OPTIONAL FIELD-SUPPLIED RISERS WITH FACTORY-SUPPLIED JIC HOSE KITS AND SHUT-OFF VALVES

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 Codes (NEC) and Local Codes by a professional 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 may result in equipment damage.

Verify that the available unit power supply is compatible with the unit's nameplate rating. Ensure breaker is properly sized as per nameplate. 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 that is away from supply air registers, on draft-free interior wall, and not near lights, television, direct sunlight, or other heat sources.

Thermostat connection within the unit is accomplished by connecting the remote thermostat wiring to microprocessor low voltage terminal strip. See *Figure 8 on page 21* for typical wiring connections.

CAUTION

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

TABLE 4 - WIRE SIZE AND LENGTH RECOMMENDATIONS

RECOMMENDED WIRE SIZE	MAX LOW VOLTAGE WIRE LENGTH
20 gauge	50 feet
18 guage	75 feet
16 gauge	125 feet

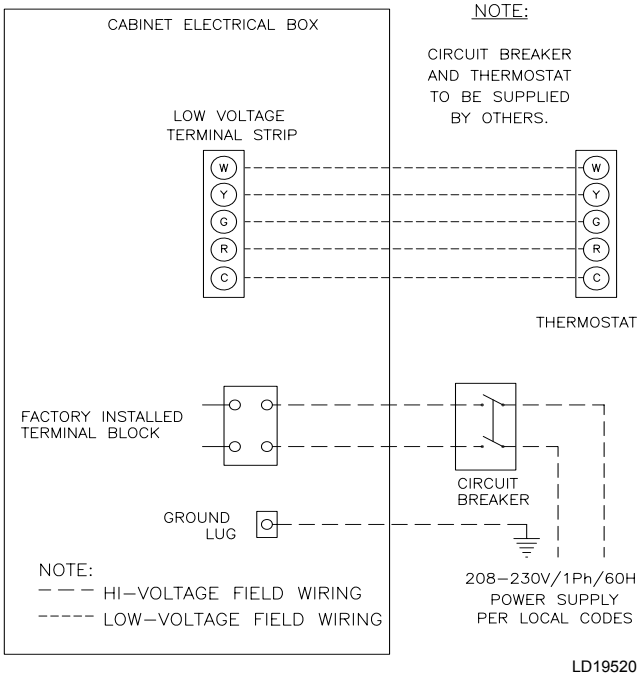


FIGURE 8 - FIELD WIRING DIAGRAM

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

NOTE

Resistance in excess of 1 ohm may cause component damage due to insufficient AC voltage supply.

NOTE

Check all loads and conductors for grounds, shorts, or mis-wiring. Do not run the low voltage wiring in the same conduit with the high voltage power wiring.

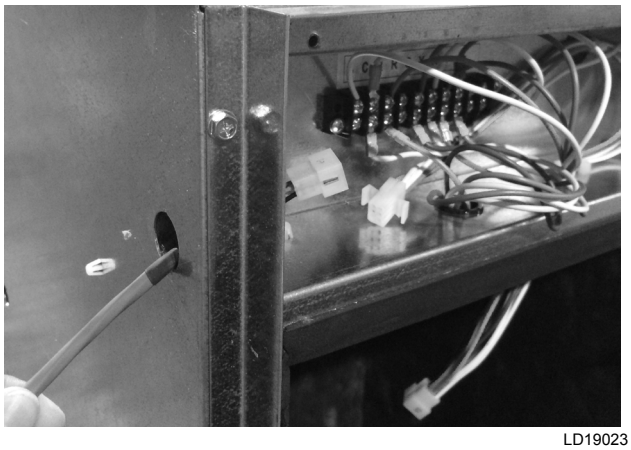
2

Optional Surface Mount Thermostat Connection Wiring

For applications where thermostat is mounted directly above the return air panel, cabinet Control Option 'P' must be selected (e.g. VPB12P). Thermostat plenum rated Molex pigtail harness (shipped loose to field) is field wired to thermostat terminals and Molex connector clips to mating panel mounted Molex connector on unit cabinet, located 7 inches above the electrical box. See optional 24V surface mount connection in *Figure 1 on page 14*.

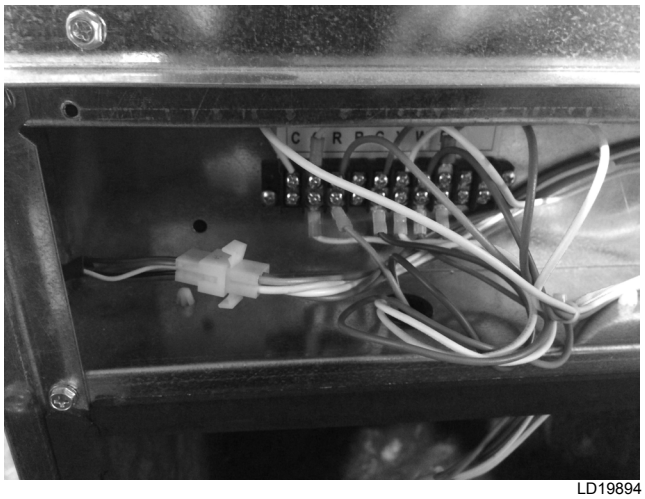
Optional Remote Mounted Thermostat Wiring

For units ordered with extended thermostat harness option, the thermostat is remote mounted and specific extended harness length can be ordered. Extended harness is plenum rated. Use low voltage 7/8-inch knockout on the side of the unit at the electrical box to field wire the low voltage thermostat wiring. Using a plastic bushing pass harness inside electrical box to factory wired mating Molex harness. See *Figure 9 on page 21 and Figure 10 on page 22*. Thermostat pigtail Molex harness is shipped loose for field wiring to thermostat terminals.



LD19023

FIGURE 9 - REMOTE THERMOSTAT WIRING



LD19894

FIGURE 10 - REMOTE THERMOSTAT WIRING

Optional ADA Door Mounted Thermostat

For units ordered with ADA thermostat option to meet the Americans with Disabilities Act's (ADA) requirements, thermostat is located on the return air panel door at a height of 48 inches from the base of the cabinet. Unit is supplied with a custom return air door panel with thermostat mounting holes, unit switch plate with Molex connector, and ADA 5-foot Molex pigtail harness. See *Figure 14 on page 24*.

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

Mount thermostat using the factory-provided 1/4-inch #8 screws. ADA thermostat harness is plenum rated and will hang in behind the return air door. For chassis servicing, unclip harness from unit switch plate.

LD19895

FIGURE 11 - UNIT SWITCH PLATE WITH ADA THERMOSTAT CONNECTION

ECM Continuous Fan

This option features a factory wired continuous low speed fan circuit. The EC motor (ECM), due to available 5 motor speed taps, offers ideal range for supporting continuous low speed fan.

Fan will run continuously on 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 ERV or room occupancy control. See *Figure 30 on page 45* for electrical schematics.

CLOSET & DRYWALL INSTALLATION

NOTE

To avoid potential vibration and noise issues, the Return Air Panel should not contact any part of the unit cabinet or sleeve. Maintain a sufficient gap between R.A. Panel frame and cabinet.

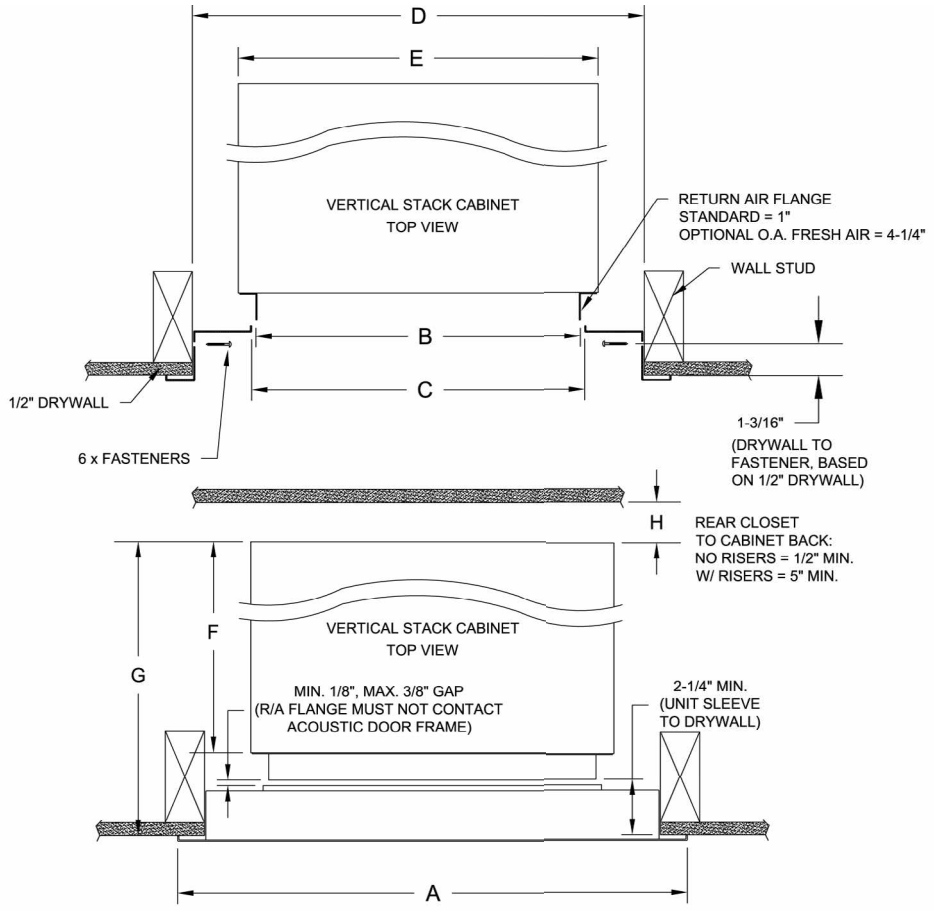
1. Build a closet enclosure for the cabinet that will incorporate the Return Air panel size while maintaining a sufficient gap between the closet and cabinet to prevent the cabinet from contacting the R.A. panel and closet enclosure. Refer to *Acoustic Return Air Panel on page 23* and *Figure 12 on page 23* and *Figure 13 on page 24*.
2. Before installing drywall around cabinet, cover the supply and return openings with plastic or cardboard to prevent dust or debris from entering the unit components.
3. Install drywall using conventional construction methods. Studs or drywall should not be fastened directly to the cabinet surface. The spacing of the framing members will be dependent on the return air access and the type/quantity of supply air outlets. See *Figure 12 on page 23* and *Figure 13 on page 24*.
4. Install sheetrock around unit cabinet by securing the drywall to building construction studs. Cut holes around the supply air and return air openings to allow access to the unit chassis, unit controls, and the supply air 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 PANEL

1. Return Air (R.A.) Panel is painted standard "Appliance White." Carefully unpack R.A. Panels from shipping box. R.A. panels with optional key locks require key locks to be field installed to the slot in panel door. ADA R.A. Door Panels come with an opening and pilot holes mounting a Johnson Controls thermostat. ADA harness for wiring to thermostat and connecting to unit is shipped loose with the thermostats.
2. Locate drywall opening at a distance from the unit that prevents the R.A. Panel from contacting the unit sleeve. See *Figure 12 on page 23 and Figure 13 on page 24*. R.A. Panel throat opening should be centered to the unit cabinet return air flange opening.
3. Fasten R.A. Panel to frame opening using screws provided. See *Figure 12 on page 23*.
4. Refer to *Figure 15 on page 25* showing opening for mounting ADA compliant thermostat at 48 inches above floor. Note that location of opening on door changes if cabinet is ordered with stand. A left-hand opening door is shown. R.A Panel with ADA is not reversible and must be ordered in either Left- or Right-hand opening configuration, determined by location of door hinge.



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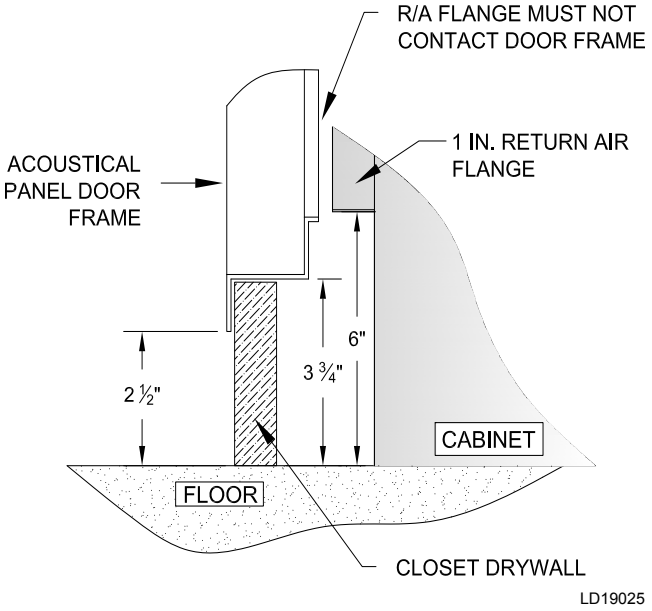
UNIT SIZE	A (PANEL WIDTH)	B (SLEEVE WIDTH)	C (R/A PANEL OPENING)	D (ROUGH IN WIDTH)	E (UNIT WIDTH)	F (UNIT DEPTH)	G (NO OA OPTION)	G (OA OPTION)
09/12/15/18	25 3/4	19	19 1/4	23 3/4 ± 1/8	20	20	23 1/4 MIN 23 1/2 MAX	27 1/4 MIN 27 1/2 MAX
24/30/36	29 3/4	23	23 1/4	27 3/4 ± 1/8	24	24	27 1/4 MIN 27 1/2 MAX	31 1/4 MIN 31 1/2 MAX

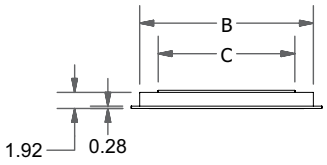
All dimensions are in inches.

FIGURE 12 - CRITICAL RETURN AIR PANEL WITH UNIT CABINET INSTALLATION DIMENSIONS

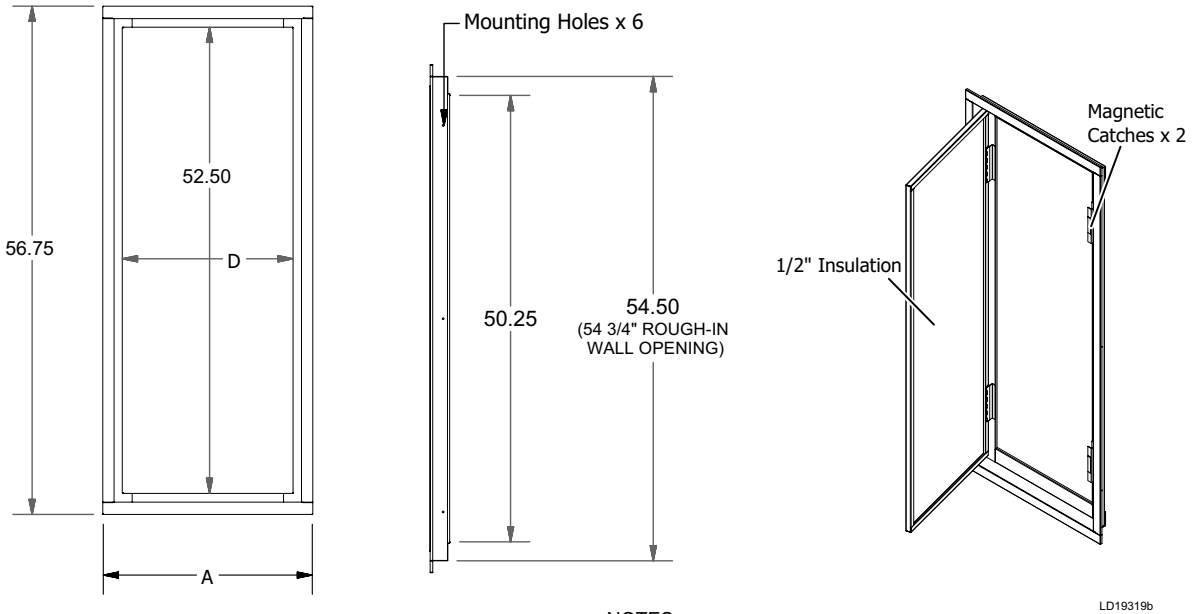


* Cut away view for standard cabinet with no stand. Add stand height to cabinet to obtain correct dimension of R/A panel from floor.

FIGURE 13 - R.A. PANEL CROSS SECTION INSTALLATION AT FLOOR LEVEL



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



NOTES:
-Powder coated in 'Appliance White'
-Inside panel lined with 1/2-inch acoustical insulation
-Hinged panel complete with magnetic latches

FIGURE 14 - R.A. PANEL DIMENSIONS

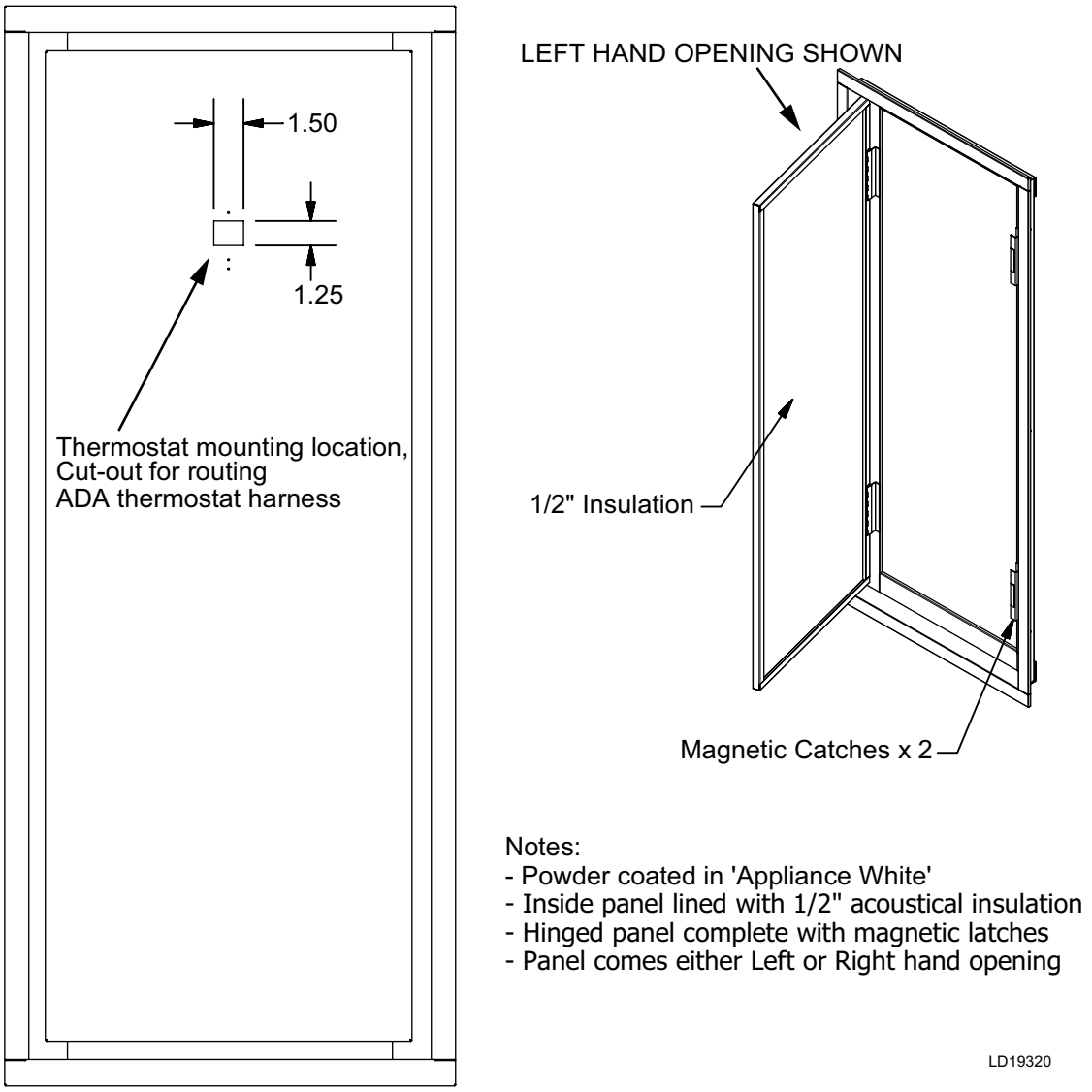


FIGURE 15 - OPTIONAL R.A. PANEL WITH ADA MOUNTED THERMOSTAT

SUPPLY AIR DUCTWORK

NOTE

Installer must ensure there is no direct contact between cabinet sheet metal parts and drywall enclosure. This includes return air and supply air 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 return air opening from the space inside the drywall enclosure.

Johnson Controls-supplied grilles shall have a clearance of a ¼ inch around the perimeter in order to fit inside the unit supply flange. Other grille manufacturers could have different clearances and should be verified.

Field-supplied gasket must be applied accordingly 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 will fit inside the cabinet supply flange. It is recommended to apply 1/8-inch neoprene tape (field supplied) around the perimeter the volume damper prior to inserting into the supply opening. See *Figure 17 on page 27* for an example. This will assist in reducing noise transmission and air recirculation into unit closet.

For ducted openings, connect the unit supply opening to the supply ductwork using a watertight flexible duct connector. This will minimize 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 will minimize 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 5 on page 28*. Recommended face velocity at the outlet supply grille is 300-500 FPM. *Table 6 on page 28* gives face velocity at the unit supply openings in relation to *Table 5 on page 28*. To calculate the face velocity at the supply grille, take the FPM from *Table 6 on page 28* and divide by the supply grille area factor.

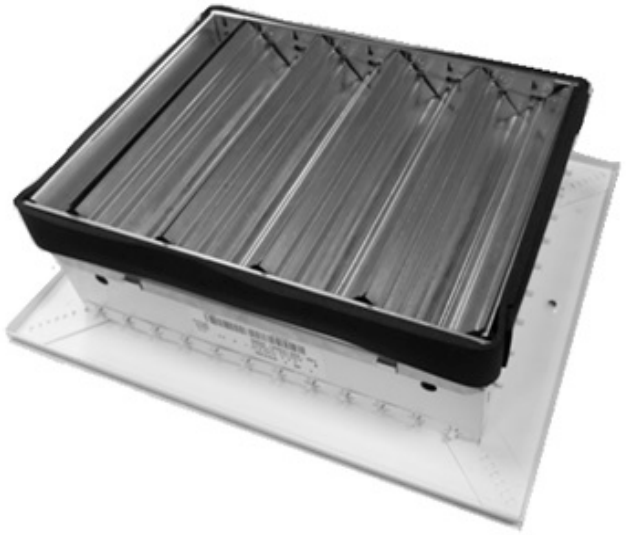
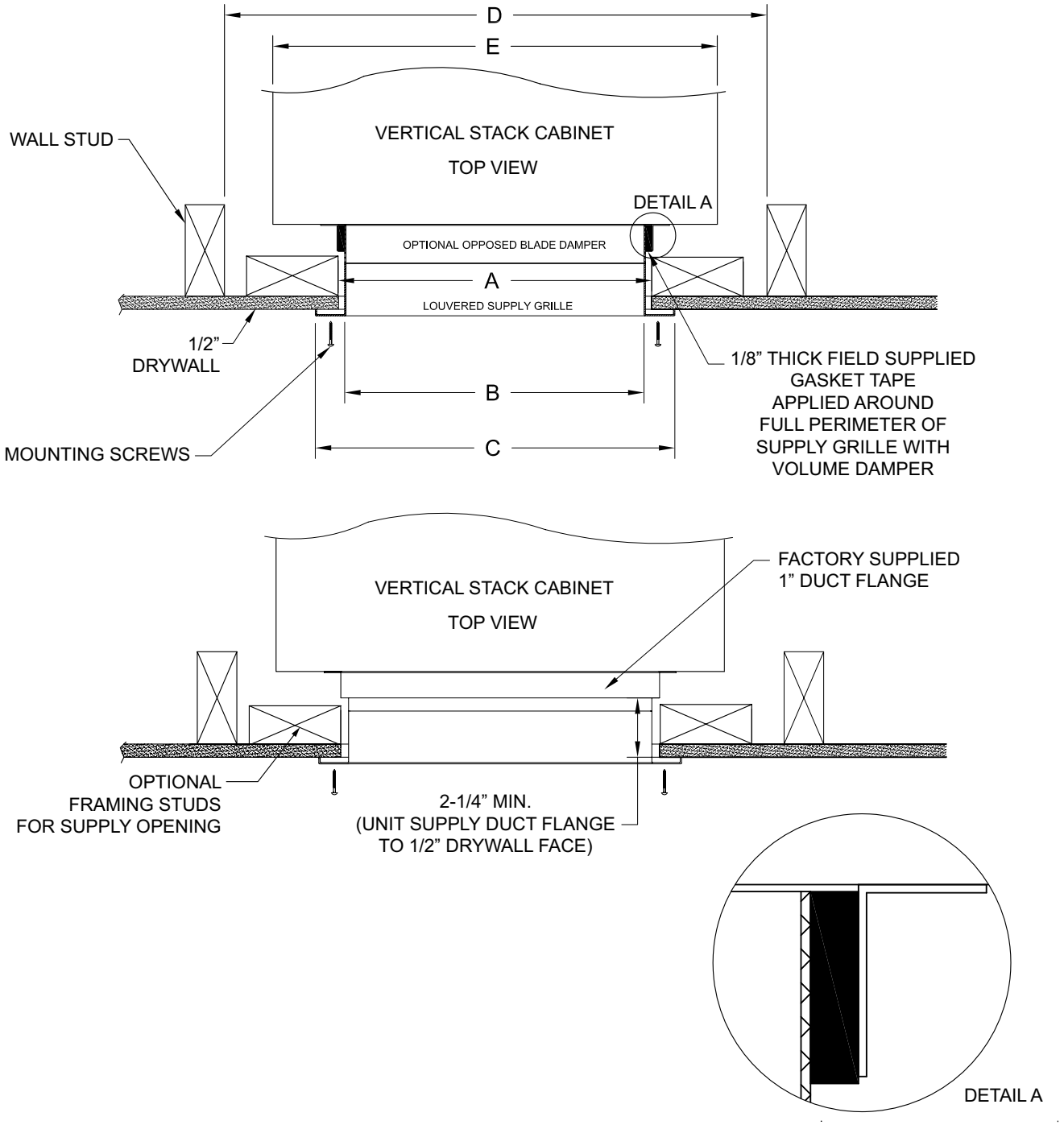


FIGURE 16 - SUPPLY GRILLE WITH VOLUME DAMPER AND 1/8-INCH NEOPRENE TAPE APPLIED TO PERIMETER



UNIT SIZE	A (SUPPLY GRILLE NOMINAL WIDTH)	B (GRILLE WIDTH)	C (GRILLE FLANGE WIDTH)	D (ROUGH IN WIDTH)	E (UNIT WIDTH)
09/12/15/18	X	B=X-0.5"	C=X+1.75"	23 3/4 ± 1/8	20
24/30/36	X	B=X-0.5"	C=X+1.75"	27 3/4 ± 1/8	24

All dimensions are in inches and typical for JCI-supplied grilles only. Check dimensions for field-supplied grilles, as dimensions can be different.

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FIGURE 17 - UNIT MOUNTED SUPPLY GRILLE INSTALLATION

TABLE 5 - UNIT SUPPLY OPENING SIZES

	HORIZONTAL OPENINGS					TOP OPENING
	SINGLE HORIZONTAL		DOUBLE HORIZONTAL		TRIPLE HORIZONTAL	
MODEL	NO TOP OPENING	W/ TOP OPENING	NO TOP OPENING	W/ TOP OPENING	NO TOP OPENING	
9	16W x 12H	14W x 6H	14W x 8H	Not Available	Not Available	12 x 12
12	16W x 14H	14W x 6H	14W x 10H	Not Available	Not Available	14 x 12
15	16W x 14H	14W x 8H	16W x 12H	Not Available	14W x 8H	14 x 12
18	Not Available	14W x 8H	16W x 12H	14W x 6H	14W x 10H	14 x 12
24	Not Available	14W x 10H	20W x 14H	14W x 6H	16W x 12H	18 x 16
30	Not Available	16W x 12H	20W x 14H	14W x 6H	16W x 14H	18 x 16
36	Not Available	16W x 12H	Not Available	14W x 6H	16W x 14H	18 x 16

1. Unit mounted supply grilles will be supplied as double-deflection type.
2. Grilles for unequal airflow applications (e.g., unit-mounted plus ducted supply) shall be provided with integral opposed-blade dampers.
3. All grilles will be 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, shall be 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 is not recommended or single horizontal discharge openings with unit mounted supply grille. 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	W/ TOP OPENING	NO TOP OPENING	W/ TOP OPENING	NO TOP OPENING	
9	446	280	426	Not Available	Not Available	375
12	459	299	369	Not Available	Not Available	386
15	531	324	310	Not Available	394	446
18	Not Available	436	417	379	383	600
24	Not Available	326	337	317	337	425
30	Not Available	379	427	401	366	538
36	Not Available	423	Not Available	448	408	600

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

TOP-MOUNTED FRESH AIR SUPPLY OPENING

Top-Mounted Fresh Air

The optional fresh air intake provides a 4-inch round duct connection on top of the unit (see *Figure 22 on page 31* for right and left hand version). The fresh air is discharged upstream of the DX coil through the discharge collector box.

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

Unit can be selected with the fresh air opening located on 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 return air opening is not designed to draw 10% or more in passive fresh air systems.

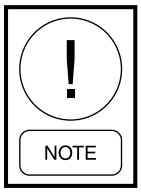
It is recommended that fresh air with a high humidity ratio is pre-treated before entering unit assembly using energy recovery ventilators (ERV) or make-up air units. Fresh air duct inside unit is insulated to protect unit from condensation in the event of high humidity air. However excessively moist fresh air over prolonged periods can potentially result in condensate inside unit or closet.

Recommend fresh air is pre-treated before entering unit assembly by ERV or make-up air units to avoid condensate developing inside ducts and equipment.

Unit comes with 4-1/4-inch return air sleeve. Front supply openings will come with 4-1/4-inch supply plaster flange.

Top-Mounted Fresh Air with Motorized Damper

Same features as in the top-mounted fresh air intake option and including a motorized damper assembly inside the discharge collector box similar to depiction in *Figure 22 on page 31*. Damper assembly can be easily removed; see the following servicing steps. Motorized damper assembly opens during FAN ON operation. See *Figure 30 on page 45* for electrical schematic. For other control options, please contact the factory.



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 startup, check that the damper is opening when unit fan is running. It can take 20 seconds to fully open. If damper opens, unit is operating as intended.

If it fails to open, the cause is likely a loose cover preventing actuator from rotating. To remove actuator and service the damper, refer to instructions below:

STEP 1. Looking up underneath the top of the return air flange, notice the damper assembly. See *Figure 18 on page 29*. Remove the seven fasteners holding the damper plate. Drop the plate down, and disconnect the quick-connect terminals from the harness.

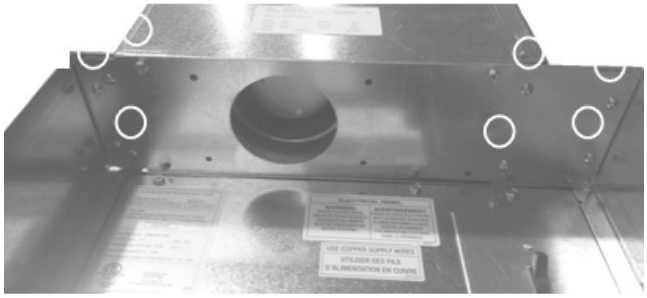


FIGURE 18 - STEP 1 - REMOVE DAMPER PLATE

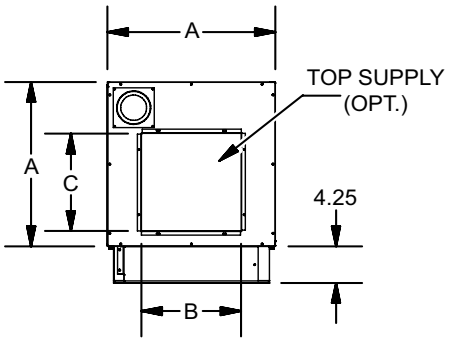
STEP 2. Remove red cover from actuator body, as shown in *Figure 19 on page 29*. If black cover has become loose, position it in place, as shown in *Figure 20 on page 30*, and slide back onto actuator, as shown in *Figure 21 on page 30*.

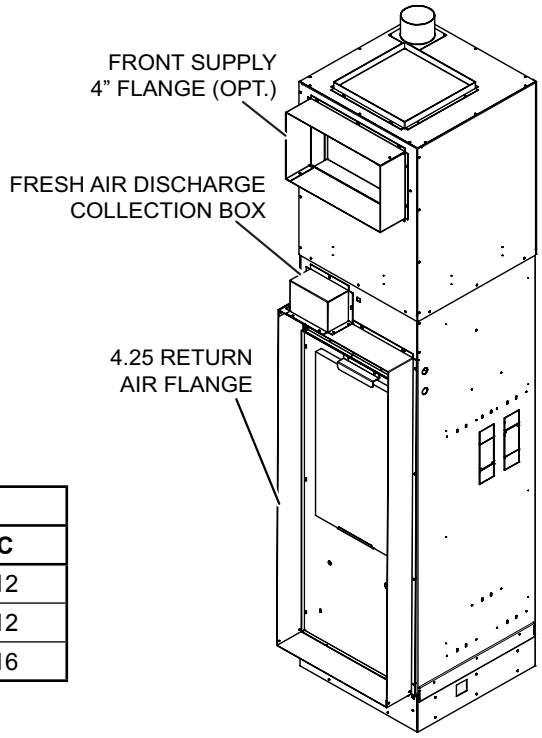
FIGURE 19 - STEP 2 - REMOVE RED COVER

FIGURE 20 - STEP 2 - POSITION LOOSE BLACK COVER

FIGURE 21 - STEP 2 - SLIDE BLACK COVER ONTO ACTUATOR

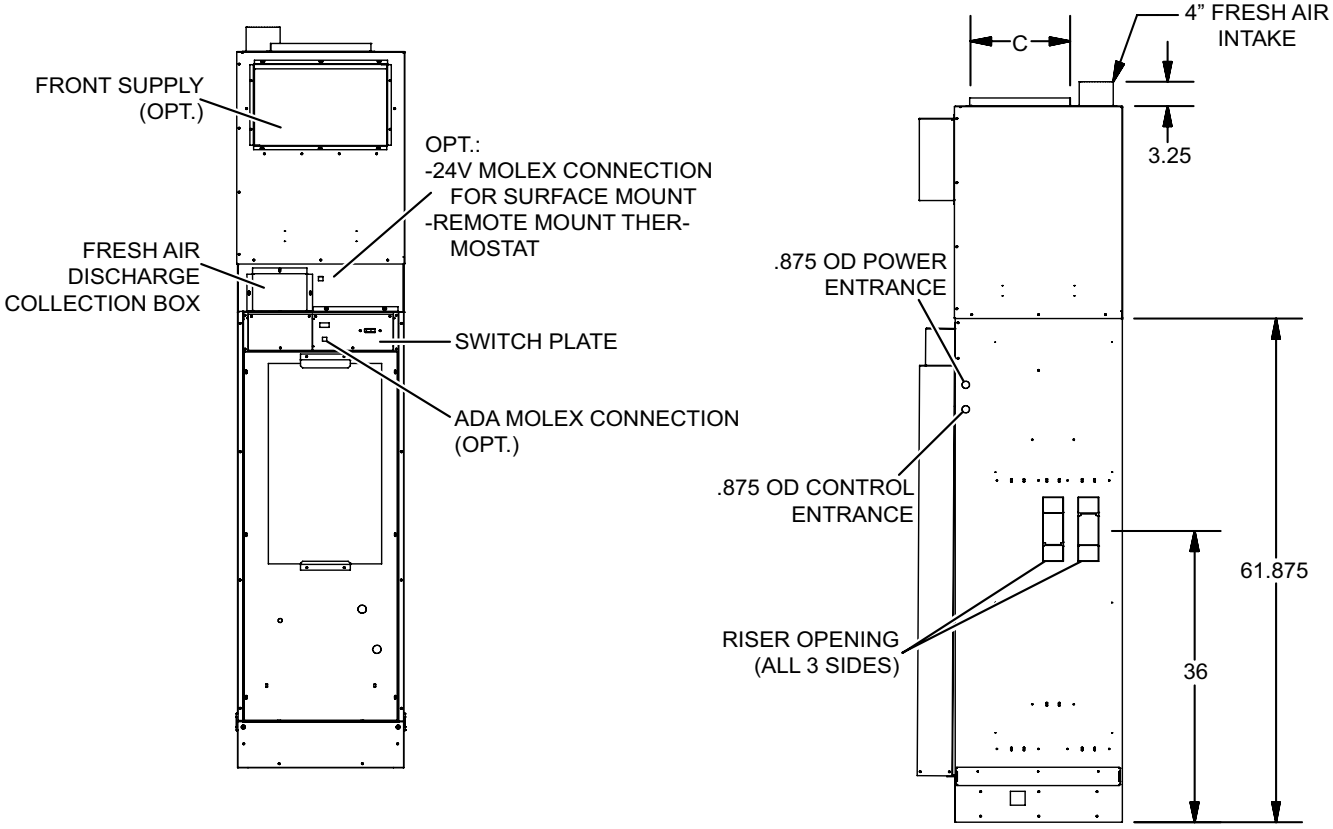
STEP 3. Secure red cover back over actuator assembly. Ensure the plastic tabs are secured to the metal body bracket. Connect quick-connect terminals, and insert damper assembly into discharge collector box. Fasten using screws.





CABINET DIMENSIONS			
MODEL	**A**	**B**	**C**
SIZE 1: 09	20	12	12
SIZE 2: 12 - 15 - 18	20	14	12
SIZE 3: 24 - 30 - 36	24	18	16

1. Optional Fresh Air option comes with 4-1/4” R.A. flange.
2. Optional front supply opening comes with 4-1/4” duct flange.
3. All other openings come with standard 1” duct flange.
4. Left and Right hand versions shown.



LD19511

FIGURE 22 - FRESH AIR OPENING – LEFT HAND AND RIGHT HAND UNIT SHOWN

SYSTEM FLUSHING AND CLEANING

After the piping system is complete, and prior to connection of the refrigeration chassis, the risers should be flushed and cleaned to ensure proper start-up and continued efficient operation of the system.

2. Ensure that the supply and return riser shut-off valves are closed at each unit.
3. Using flexible hoses or piping, connect the supply and return stub-outs in the unit located at the end of the riser run(s). If the building has more than ten floors, connect the supply and return stub-outs in the last two units to divide the water flow and reduce pressure drop at the pump (see *Figure 23 on page 33*).
4. Open the shut-off valves in the units that have had the supply and return risers inter-connected.
5. The water circulation system should be filled with clean water using the make-up water supply. The air vents should be open during initial filling (do not allow the system to overflow).
6. With the air vents closed, start the circulating pump and then crack each air vent to ensure that all air is bled from the system. (Make-up water must be available in sufficient volume to replace the volume occupied by the air that is bled off.)
7. When all air is vented, and the water is circulating under pressure, the entire system should be checked for leaks. Make any repairs as required.
8. Set the loop temperature controls to raise the temperature to approximately 85°F. Perform a visual check for any leaks that may have occurred due to the increased heat. Repair as required.
9. Open the drain at the lowest point in the system (make-up water flow rate must be equal to rate of drain bleed). Continue to bleed system until water leaving the drain is clear, but not less than 2 hours.
10. Completely drain the piping system.

After the initial Flushing, the system should be chemically cleaned. The procedure for re-filling the system, and circulating the cleaning solution, is the repeat of the above flushing method.

The services of a professional water treatment company are recommended with regards to the type of solution to be used, and the duration of the cleaning application.

Once the cleaning process is complete, shut off the circulating pump and completely drain the system. Refill the system with clean water in preparation for connection of the refrigeration chassis, and system start-up.

It is strongly recommended a professional water treatment company is used to perform ongoing maintenance of water loop including chemical analysis, and if necessary flushing. The water loop testing should be performed at intervals recommended by the professional water treatment consultant. It is up to the customer to carry out adequate water loop maintenance over the lifespan of the units otherwise damage to the units may occur.

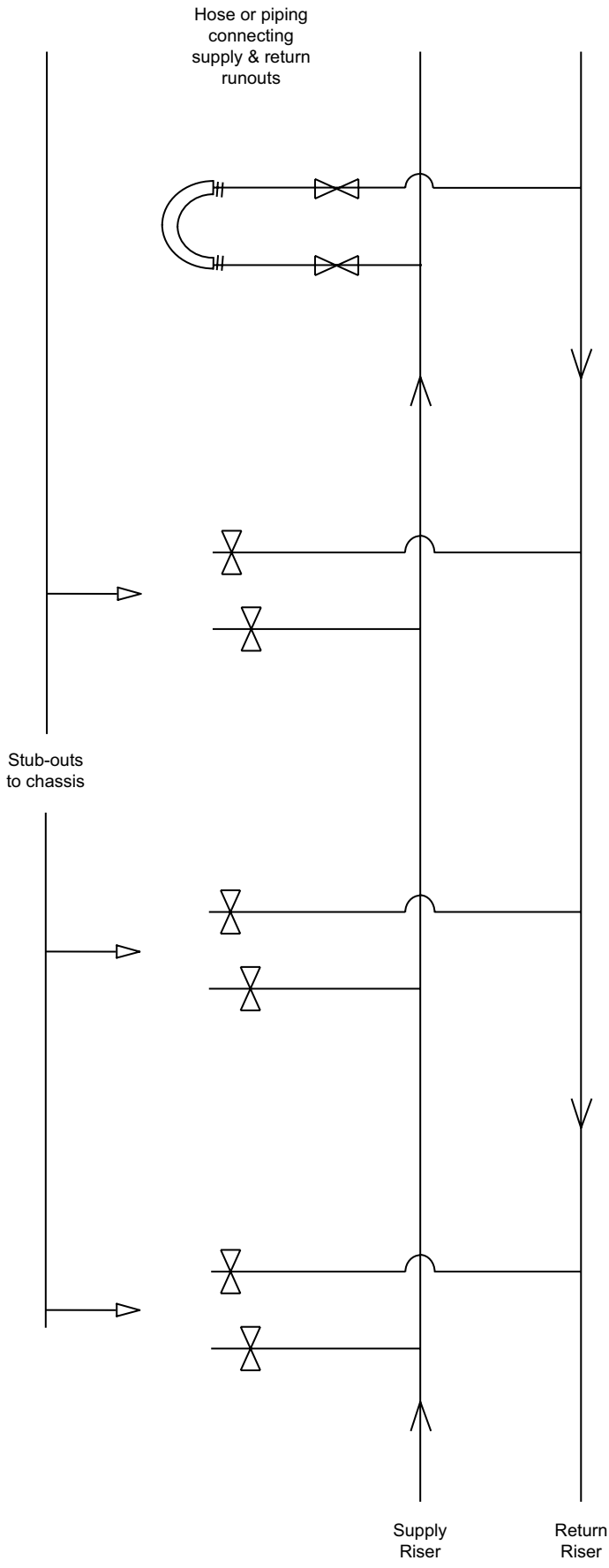


FIGURE 23 - SUPPLY AND RETURN HOSE OR PIPE CONNECTION

CHASSIS INSTALLATION

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 on page 32.

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

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

Always use a backup wrench when installting hoses.

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

Remove the inner service panel from the cabinet, and inspect the interior compartment for debris.

Locate the supply and return shut-off valves, and verify that the valves are closed. Check to see what type of hose kit fittings were 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 *Supply and Return Piping on page 17* for more information.

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

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

For Units with NPSH and JIC Valve Connection and Hose Sets

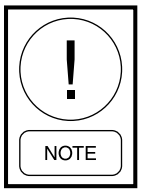
NPSH/JIC Flexible connection hoses do not require any pipe dope or sealant tape. DO NOT ADD THREAD SEALANT OR PIPE DOPE TO NPSH/JIC FITTINGS. Connect the hoses to the NPSH fitting on the shut-off valves. Always use a backup wrench when tightening the hose to the valve fitting. Allow the hoses to hang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

Once chassis is slid into place, attach the NPSH/JIC hoses to the NPSH/JIC fittings on the chassis stub outs, projecting through the top of the compressor compartment access cover. Always use a backup wrench to prevent twisting of the copper water piping within the chassis assembly. Refer to the following page for proper chassis installation.

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 FPT fitting on the shut-off valves. Always use a back-up wrench when tightening the hose to the valve fitting. Allow the hoses to hang free inside the cabinet.

Slide chassis into place, see following page. J-swivel adapter (supplied with the hose kit), comes with thread sealing compound pre-applied. NO ADDITIONAL THREAD SEALANT SHOULD BE REQUIRED. Thread the swivel adapters into the FPT fittings projecting through the top of the compressor compartment access cover. Always use a back-up wrench to prevent twisting of the copper water piping within the chassis assembly.



To minimize the possibility of damage to the chassis or cabinet, for maximum ease of installation, the use of a two-wheeled dolly is strongly recommended.

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

1. Lift chassis from the front of chassis as shown below.

LD19035

FIGURE 24 - LIFTING CHASSIS

2. Align chassis with the opening of the cabinet. Tilt back sufficiently for the base of the chassis to clear the mounting rails on the cabinet drain pan.

LD19036

FIGURE 25 - ALIGNING CHASSIS

3. Insert chassis midway into the opening of the cabinet. Lower the rear of the chassis until the base of the chassis contacts the formed mounting rails in the cabinet drain pan.

LD19037

FIGURE 26 - INSERTING CHASSIS

4. Pivot the chassis base on the front edge of the drain pan rails. Before fully inserting chassis, ensure wiring harness and/or water hoses will not be pinched between chassis and cabinet.

LD19038

FIGURE 27 - PIVOTING CHASSIS

5. Slide the chassis into the cabinet until at least ¾ 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.

LD19039

FIGURE 28 - SLIDING CHASSIS

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

Do not apply excessive force when sliding chassis into cabinet.

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

6. Connect hoses to the chassis. Ensure that the hoses will not be pinched once the chassis is slid into place.
7. Check alignment of the chassis in the cabinet. The chassis should be centered in the cabinet opening – without touching the flanges on the sides of the cabinet opening.

LD19040

FIGURE 29 - CHECKING CHASSIS

8. Complete the electrical connections to the chassis by means of the two quick connect mating plugs. The unit-mounted plug ends are located on the bottom of the control box.
9. Remove the shipping cover from the face of the air-to-refrigerant coil. Install the inner service panel. Check that the foam gasket seal between the panel and the chassis is slightly compressed. If necessary, pull the chassis forward slightly to ensure an adequate seal between the chassis and the service panel.
10. 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.
11. Install service panel. If not done already, install the Return Air panel into the drywall opening. Refer to *Acoustic Return Air Panel on page 23*. Secure the panel into the drywall with six screws.

SECTION 3 - START-UP

PRE-START-UP CHECKLIST

When the installation is complete and the system is cleaned and flushed, open the supply and return shut-off valves at each unit, refill the system, and bleed off all air.

Before energizing the unit, the following system devices must be checked:

- ☐ Is the high voltage power supply correct and in accordance with the nameplate ratings?
- ☐ Is the field wiring and circuit protection the correct size?
- ☐ Is the unit electrically grounded?
- ☐ Is the low voltage control wiring correct per the unit wiring diagram?
- ☐ Is vibration isolation provided? (unit isolation pad, flexible hoses, etc.)
- ☐ Are the low/high-side pressure temperature caps secure and in place?
- ☐ Are all the unit access panels secure and in place?
- ☐ Is the thermostat in the OFF position?
- ☐ Is the water flow established and circulating through all the units?
- ☐ Is the ductwork (if required) correctly sized, run, taped, and insulated?
- ☐ Does the indoor blower turn freely without rubbing?
- ☐ If applicable, has glycol fluid been added in the proper mix to prevent freezing in closed system application?
- ☐ Are clean, properly sized air filters in place?
- ☐ Is the condensate drain pipe firmly secured to both drain riser and drain pan stub?

INITIAL UNIT START-UP

1. Close disconnect switches on all units to provide line power.

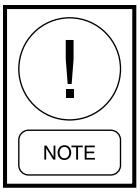
During installation, testing, servicing, and troubleshooting of this product, it may be necessary to work with live electrical components. Failure to follow all electrical safety precautions when exposed to live electrical components could result in serious injury or death.

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 are energized. Water temperature leaving the heat exchanger should be cooler than the entering water temperature (approx. 9–12 °F). Blower operation should be smooth. Compressor and blower amps should be within the nameplate data values. The suction line should be cool with no frost observed in the refrigerant circuit.
5. Turn the thermostat switch to the OFF position. The compressor and fan should stop running, and the reversing valve should de-energize.
6. Leave the unit off for approximately 5 minutes to allow for pressure equalization.
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 are energized. After several minutes, warm air should be detected at the supply register. A water temperature decrease of approximately 5–9 °F across the heat exchanger should be noted. The blower and compressor operation should be 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 entering water temperatures (EWT) in cooling mode above rated conditions of 86 °F EWT will increase power consumption and increase compressor noise levels. Sustained operation above 100°F EWT may increase maintenance costs, and increased compressor noise may affect occupancy comfort. Unit is designed to operate up to 110 °F EWT ONLY for intermittent periods when system loop temperatures become elevated under high load conditions. It is not recommended to set system loop temperatures at 110 °F in case of high load conditions cause supply loop temperatures to exceed 110 °F EWT. Unit sound performance may be negatively impacted at high EWT.

When in heating season, maximum operating loop temperature is 90 °F EWT. It is recommended to maintain system loop temperatures at or above rated conditions of 68 °F EWT for optimal unit performance. If system loop temperatures are low where freezing the coaxial is possible, system loop must contain a glycol fluid mixture that is adequate to prevent freezing. Minimum loop temperature with glycol mixture is 20 °F EWT. Lower loop temperatures will result in lower efficiency and heating capacity.



High system loop temperatures may negatively affect unit performance, efficiency, maintenance and reliability, and noise levels.

TABLE 7 - OPERATING LIMITS

	COOLING	HEATING
MIN. ENTERING WATER	30°F	20°F
MAX. ENTERING WATER	110°F	90°F

FAN SPEED ADJUSTMENT

Multi-speed ECMs are used in all units as standard. Although the EC motors have five speeds, only two speeds are set up and available for selection when unit compressor is running. Optional low speed, continuous fan only option is also available.

Optional ECM increases 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. Refer to *Table 8 on page 39* for factory blower speed settings and minimum operating airflow.

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

Located on the electrical box cover, a unit mounted 2-speed fan switch allows fan speed switching from LOW and HIGH fan speeds to meet site conditions such as increased ductwork static pressure or the use of higher efficient filters.

Installed system must be test run to ensure operation with sufficient heating and cooling airflow. Excessive ductwork static pressure will result in an improper volume of airflow. High airflow volumes will result in elevated noise levels and may affect occupancy comfort.

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.

TABLE 8 - ECM BLOWER PERFORMANCE (CFM)

UNIT SIZE	MOTOR SPEED	EXTERNAL STATIC OPTION	ECM TAP#	RATED COOLING CFM	RATED HEATING CFM	EXTERNAL STATIC PRESSURE (IN W.G.)												
						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
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	HIGH	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	HIGH	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	HIGH	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	HIGH	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	HIGH	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

NOTES: All airflow ratings are at lowest voltage rating of dual rating (ie. 208 volt)
Airflow ratings include resistance of wet coil and clean air filters.

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SECTION 4 - MAINTENANCE

Maintenance on the unit is simplified with the following preventive suggestions:

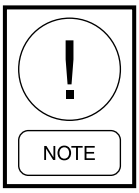
1. Visually inspect unit at least once a month. Special attention should be paid to hose assemblies. Note any signs of hose deterioration or cracking; attend to any indication of minor leakage immediately.
2. Filter maintenance must be performed to ensure proper operation of the equipment. Inspect filters at least every three months, and replace when visible dirt build-up is evident.

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. Inspect condensate drain pan for algae growth and mineral build-up every three months. Excessive algae or mineral deposits in the drain pan or drain line can result in condensate overflow and unpleasant mildew odors.
4. Check fan motor and blower assembly annually. All units employ permanently lubricated fan motors. DO NOT OIL FAN MOTORS. Vacuum any accumulation of dirt from motor ventilation slots and the blower wheel.
5. Check the contactors and relays within the control panel annually. Inspect for any signs of overheating damage to the contacts or temperature change to the wiring. Check terminals for tightness.
6. Conduct an amperage check annually on the compressor and fan motor. Higher amperage draw than nameplate values (more than 10%) may indicate heat exchanger fouling, low water flow, or premature physical motor failure.
7. Inspect air-to-refrigerant heat exchanger surface at least once a year. 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 as required.

SAFETY CONTROL RESET

1. All VPCS heat pumps are furnished with a high-pressure protection switch, a low-pressure control switch, low water temperature protection switch, and condensate overflow switch to prevent compressor operation during abnormal conditions.
2. If any of these safety devices is activated, a lockout relay circuit is engaged, which interrupts heating and cooling operation even though the control contacts may have automatically re-closed.
3. This microprocessor driven lockout circuit must be manually reset. Reset is accomplished by moving the thermostat control (system) switch to the OFF position momentarily, then back to the HEAT or COOL (or AUTO) position.
4. The lockout circuit may also be reset by opening and closing the unit mounted disconnect switch.



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

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.

A. Unit is complete with self-contained low-voltage control circuit.
B. Unit incorporates a lockout circuit which provides reset capability from a hard lockout at the space thermostat or base unit, should any of the following standard safety devices trip and shut off compressor.
   - Loss-of-charge/Low-pressure switch
   - High-pressure switch
   - Freeze-protection thermostat, unit shutdown on low water temperature
   - Condensate Overflow protection switch
C. Unit operates with conventional thermostat designs and has a low voltage terminal strip for easy hook-up.

D. Unit control board has on-board diagnostics and fault code display.

E. Standard controls include anti-short cycle and low voltage protection.

F. Control board monitors each refrigerant safety switch independently.

G. Control board has random start feature.

H. Control board retains last five fault codes in non-volatile memory, which will not be lost in the event of a power loss.

Sequence of Operation

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

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

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

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

Continuous Blower

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

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds between operations.

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

Once the room thermostat has been satisfied, it will de-energize"Y". If the compressor has satisfied its minimum run time, the compressor and fan de-energize. Otherwise, the unit operates the cooling system until the minimum run time for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling.

To be available, a compressor must not be locked-out due to a high pressure switch; low pressure switch; condensate overflow switch; freeze-stat trip and the anti-short cycle delay (ASCD) must have elapsed.

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 run times 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 will re-energize the compressor and unit fan.

Should a high pressure switch open three times within two hours of operation, the microprocessor control will permanently lock out the system compressor, requiring a manual reset of the system (enter a hard lockout), by de-energizing the 24-volt power to unit, or turning the room thermostat to the "OFF" position then back to either heating or cooling as required. The microprocessor control will flash a fault code indicating the high pressure lockout (see *Table 9 on page 44*).

Low Pressure Limit Switch

The low pressure limit switch is not monitored during the initial 30 seconds of compressor operation. For the following 30 seconds, the microprocessor control will monitor the low pressure switch to ensure it closes. If the low pressure switch fails to close after the 30 second monitoring phase, the microprocessor control will de-energize the compressor, initiate the ASCD, and stop the fan (soft lockout).

Once the low–pressure switch has been proven (closed during the 30 second monitor period described above), the microprocessor control will monitor the low pressure switch for any openings. If the low–pressure switch opens for greater than 5 seconds, the microprocessor control will de-energize the compressor, initiate the ASCD, and stop the compressor (soft lockout).

If the call for cooling is still present at the conclusion of the ASCD, the microprocessor control will re-energize the compressor.

Should a low pressure switch open three times within one hour of operation, the microprocessor control board will lock out the compressor (enter into a hard lockout) and flash a fault code (see *Table 9 on page 44*).

Freeze-stat

If a freeze-stat opens, the microprocessor control will de-energize the compressor and initiate the ASCD. If a call for cooling or heating is still present at the conclusion of the ASCD, the microprocessor control will re-energize the halted compressor.

Condensate Overflow Switch

A Condensate Overflow fault occurs if the Condensate Overflow switch opens continuously for 30 seconds. The compressor is shutdown regardless of Minimum Run Time, and alarm 15 is set. Fan continues operating in its current state.

The 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 is reset to zero. When lockouts are removed, the alarm is reset.

Safety Controls

The microprocessor control monitors the following inputs:

1. A suction line freeze-stat to protect against low leaving water temperatures (opens at 37 °F and resets at 49 °F).
2. A high pressure switch to protect against excessive discharge pressures (opens at 625 psig +/– 25 psig).
3. A low pressure switch to protect against loss of refrigerant charge (opens at 38psig +/– 5 psig).
4. A Condensate Overflow Switch to protect against condensate overflow.

Coaxial Freeze Protection Set Point

The unit allows for field selection of the coaxial freeze protection set point. Unit utilizes a suction line freeze-stat factory set for compressor lockout when leaving water temperature drops below 37 °F (resets at 49 °F). To lower the set point for low temp heating applications with an adequate water-antifreeze solution, unplug freeze-stat sensor located at “P6” on the microprocessor control board, and plug in the (pink) jumper attached to existing harness. By installing the jumper, the freeze-stat is bypassed, allowing for heating operation with leaving glycol fluid mixture below 35 °F. Use jumper only in glycol mixture applications with adequate antifreeze protection, otherwise damage can occur. Minimum loop temperature for cooling is 30 °F and 20 °F for heating.

Random Start

Random start function, upon power up, will impose time delay of 4 minutes plus a random delay of 1 to 64 seconds. The random number generator seed is determined by a fixed seed programmed at the factory combined with the serial number, model number, and the hours of compressor run time of the unit.

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 will open to shut down the compressor. The microprocessor control incorporates features to minimize compressor wear and damage. An ASCD is utilized to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized. The ASCD is initiated on unit start-up and on any compressor reset or lockout.

Microprocessor Control Unit Flash Codes

Various flash codes are utilized by the microprocessor control to aid in troubleshooting. Flash codes are distinguished by the short on and off cycle used (approximately 200ms on and 200ms off). To show normal operation, the control boards flash a one second on, one second off “heart beat” during normal operation. This is to verify that the microprocessor is functioning correctly. Do not confuse this with an error flash code. To prevent confusion, a 1-flash fault code is not used. See *Table 9 on page 44* for list of all flash codes.

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

1. Last Error – When this button is pressed and released one time within five 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.
2. Test Reset – When this button is pressed and released one time within five seconds, any ASCD is bypassed for one cycle.

3. Comm Set UP – 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 five seconds, it scans the bus, and then assigns itself the first available address (starts at 2). It then flashes that address one time.

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

Communication

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

TABLE 9 - FLASH CODES

FLASH CODES	DESCRIPTION
On Steady	Control Failure - Replace Control
Heart Beat	Normal Operation
2 Flashes	Control Waiting on ASCD 1 (Anti-Short Cycle Delay)
3 Flashes	HPS1 - Compressor Lock out
5 Flashes	LPS1 - Compressor Lock out
11 Flashes	Compressor Held OFF due to Economizer Active 1,2
13 Flashes	Compressor Held OFF due to Low Voltage1
14 Flashes	EEPROM Storage Filure (Control Failure)
15 Flashes	Condensate Overflow Switch - Compressor Lock out
16 Flashes	Coaxial Freeze Thermostat - Compressor Lock out

1. These flash codes do not represent alarms.
2. Check for Y1 and ECON jumper on P4.

APPENDIX

VPB SERIES WIRING DIAGRAM

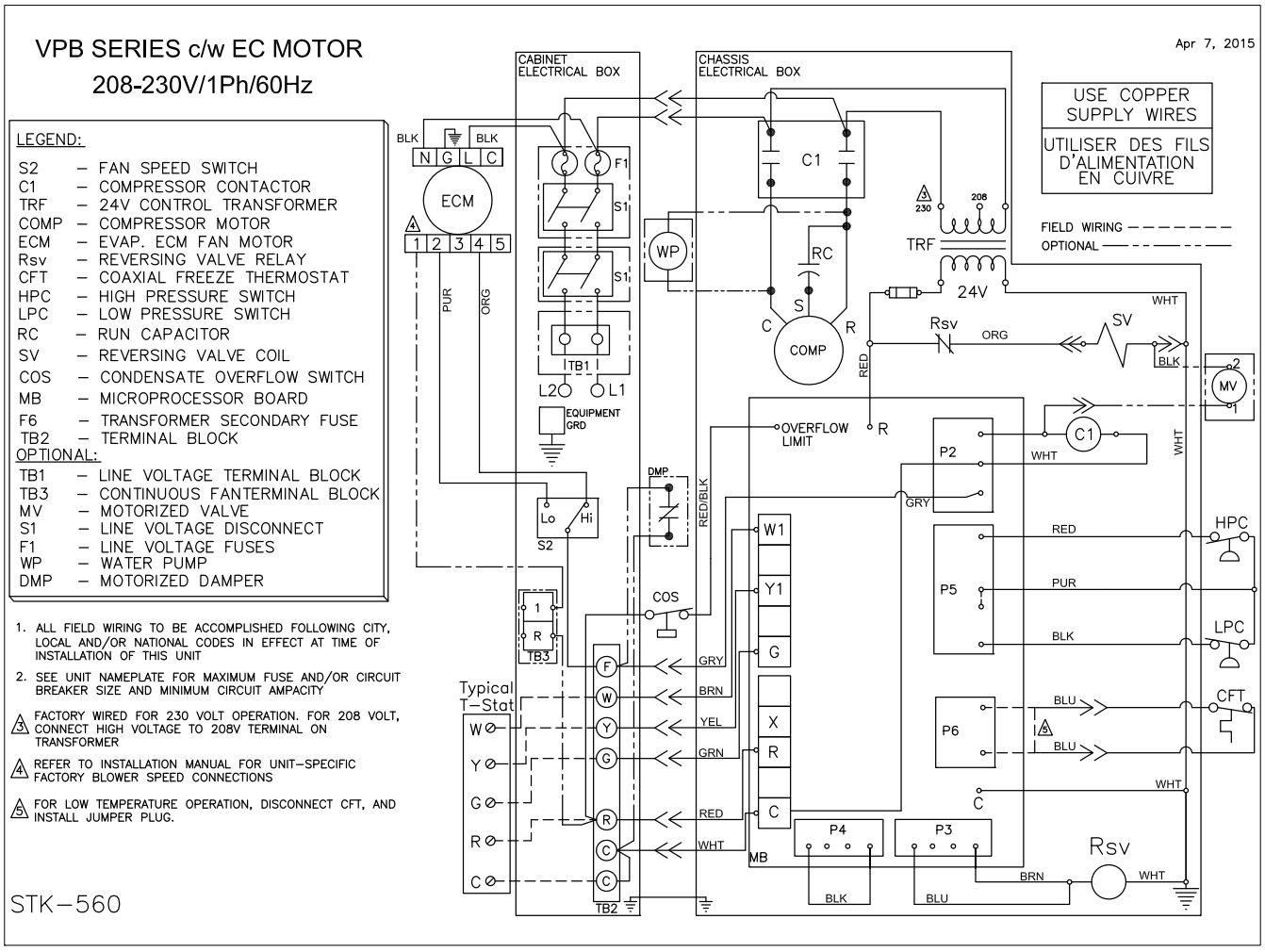


FIGURE 30 - ECM WIRING DIAGRAM

TABLE 10 - PREMIUM SERIES PRESSURE DROP

PREMIUM SERIES MODEL	GPM	PRESSURE DROP (PSI)				
		30°F	50°F	70°F	90°F	110°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
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

R-410A QUICK REFERENCE GUIDE

Refer to Installation Instructions for specific installation requirements.

- R-410A Refrigerant operates at 50 - 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- 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.
- Do not use R-410A service equipment on R-22 systems. All hoses, gages, 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 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 can only be used with POE type oils.
- POE type oils rapidly absorb moisture from the atmosphere.
- Vacuum pumps will not remove moisture from POE type oils.
- Do not use liquid line driers with a rated 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 to be used, it must be an R-410A TXV.
- Never open system to atmosphere when under vacuum.
- If system must be opened for service, evacuate system then break the vacuum with dry nitrogen and replace filter driers.

The following factors can be used to convert from English to the most common SI Metric values.

TABLE 11 - SI METRIC CONVERSION

MEASUREMENT	MULTIPLY ENGLISH UNIT	BY FACTOR	TO OBTAIN METRIC UNIT
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

TEMPERATURE

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

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

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

Example: 10.0°F range x 0.5556 = 5.6 °C range

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