HIGH EFFICIENCY VSCS SERIES
VERTICAL STACKED WATER SOURCE HEAT PUMP

CABINET MODEL VB/VM/VS09–36
AND
CHASSIS MODEL VSCS09–36

R-410A

ISSUE DATE:
January 24, 2019
IMPORTANT!
READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

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

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

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

- **NOTE**
  
  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 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 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.

CHANGE BARS

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

ASSOCIATED LITERATURE

<table>
<thead>
<tr>
<th>MANUAL DESCRIPTION</th>
<th>FORM NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Stacked Heat Pump Start-Up and Performance Checklist</td>
<td>145.18-CL1</td>
</tr>
<tr>
<td>Vertical Stacked Water Source Heat Pump Heating and Cooling Data Record Sheet</td>
<td>145.18-CL2</td>
</tr>
</tbody>
</table>
CABINET NOMENCLATURE

1, 2 3, 4 5 6 7 8 9 10 11, 12 13 14 15

| VB | 12 | M | 1 | D | E | A | 2T | 4 | 0 | C |

PRODUCT CATEGORY
- VB = Vertical Stacked Heat Pump - Standard Cabinet Assembly
- VM = Vertical Stacked Heat Pump - Master Cabinet Assembly
- VS = Vertical Stacked Heat Pump - Satellite Cabinet Assembly

UNIT CAPACITY
- 09 = 0.75 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 with 2-Speed Unit Mounted Switch
- 2 = MP Control with 2-Speed Thermostat Control
- 3 = MP Control with 3-Speed Thermostat Control
- P = MP Control with Surface-Mount Thermostat Connection with Unit Mounted Switch
- 4 = MP Control with Surface-Mount Thermostat Connection with 2-Speed Thermostat Control
- 5 = MP Control with Surface-Mount Thermostat Connection with 3-Speed Thermostat Control (ECM Only)

BLOWER OPTIONS
- A = PSC Blower
- B = Hi-Static PSC Blower
- E = ECM Blower
- F = Hi-Static ECM Blower
- G = ECM with Continuous Low Speed
- H = Hi-Static ECM with Continuous Low Speed

ELECTRICAL CONNECTION
- 0 = None (Terminal Block)
- D = Non-Fused Disconnect
- F = Disconnect with Fuses

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)

RISER ARRANGEMENT
- 1 = Right Hand Risers
- 2 = Left Hand Risers
- 3 = Back Risers
- 4 = Right Hand Risers with Cover
- 5 = Left Hand Risers with Cover
- 6 = Back Risers with Cover

MISCELLANEOUS OPTIONS
- 0 = None
- S = Stainless Steel (SST) Drain Pan
- F = MERV 8 Filters
- C = SST Drain Pan with MERV 8 Filters

HORIZONTAL DISCHARGE OPENING ORIENTATION

<table>
<thead>
<tr>
<th>00, 0T</th>
<th>1H, 1T</th>
<th>2H, 2T</th>
<th>3H, 3T</th>
</tr>
</thead>
<tbody>
<tr>
<td>X = None</td>
<td>B = Back</td>
<td>1 = Left + Front</td>
<td>7 = Front + Left + Right</td>
</tr>
<tr>
<td>F = Front</td>
<td>L = Left</td>
<td>2 = Left + Back</td>
<td>8 = Front + Right + Back</td>
</tr>
<tr>
<td>R = Right</td>
<td>4 = Right + Back</td>
<td>3 = Left + Right</td>
<td>9 = Front + Left + Back</td>
</tr>
<tr>
<td>5 = Right + Front</td>
<td>6 = Back + Front</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VOLTAGE
- 0 = 208/230-60-1
- 6 = 265-60-1

CABINET OPTIONS

<table>
<thead>
<tr>
<th>Cabinet Height</th>
<th>No OA Options</th>
<th>Left Top OA Entry (4-inch Round with Motorized Damper)</th>
<th>Right Top OA Entry (4-inch Round with Motorized Damper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>88 inches</td>
<td>A</td>
<td>G</td>
<td>L</td>
</tr>
<tr>
<td>80 inches</td>
<td>B</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>80 inches with 4-inch Stand</td>
<td>D</td>
<td>K</td>
<td>P</td>
</tr>
<tr>
<td>80 inches with 8-inch Stand</td>
<td>F</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>Z</td>
</tr>
<tr>
<td>88 inches</td>
<td></td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>80 inches</td>
<td></td>
<td></td>
<td>Z</td>
</tr>
</tbody>
</table>
CHASSIS NOMENCLATURE

PRODUCT CATEGORY
VSCS = Vertical Stacked Heat Pump Chassis
R-410A

UNIT CAPACITY
09 = 0.75 TON
12 = 1 TON
15 = 1.25 TON
18 = 1.5 TON
24 = 2 TON
30 = 2.5 TON
36 = 3 TON

DESIGN SERIES
C = Current Generation

VOLTAGE
1 = 208/230-60-1
6 = 265-60-1

WATER VALVE & PUMP OPTIONS
<table>
<thead>
<tr>
<th>VALVE OPTIONS</th>
<th>VALVE ONLY</th>
<th>Y-STRAINER</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Water Control Valve</td>
<td>O</td>
<td>S</td>
</tr>
<tr>
<td>Motorized 2-Way Shut-Off Valve</td>
<td>M</td>
<td>Y</td>
</tr>
<tr>
<td>Motorized 3-Way Shut-Off Valve</td>
<td>N</td>
<td>V</td>
</tr>
</tbody>
</table>

WATERSIDE OPTIONS
C = Standard Water Coil
B = Standard Water Coil with Low Temperature Option
N = Cupro-Nickel Water Coil
R = Cupro-Nickel Water Coil with Low Temperature Option

AIRSIDE OPTIONS
A = Standard Airside Coil
C = Corrosion Protective 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 = 3.5 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
R = 10.0 USGPM
# TABLE OF CONTENTS

**SECTION 1 - INSTALLATION**

Notice and Disclaimer .................................................................................................................. 9
Disclaimers ................................................................................................................................. 9
Pre-Installation ............................................................................................................................ 9
Literature ..................................................................................................................................... 9
Shipping ....................................................................................................................................... 9
Inspection and Storage ................................................................................................................ 10
Preparations for Installing the Unit ........................................................................................... 10
Rigging .......................................................................................................................................... 11
Cabinet Riser Installation .......................................................................................................... 11
Placing the Cabinet .................................................................................................................... 11
Riser Loop ................................................................................................................................... 16
Hoses ............................................................................................................................................ 16
Electrical Wiring ........................................................................................................................ 18
Field-Installed Power Wiring ..................................................................................................... 18
Field-Installed Low Voltage Wiring .......................................................................................... 18
Optional Surface Mount Thermostat Connection Wiring ....................................................... 19
Optional Remote Mounted Thermostat Wiring ........................................................................ 19
Optional ADA Door Mounted Thermostat ............................................................................... 20
EC Motor (ECM) Continuous Fan ............................................................................................ 20
Closet and Drywall Installation ................................................................................................. 20
Acoustic Return Air (RA) Panel ................................................................................................. 20
Supply Air (SA) Ductwork ......................................................................................................... 24
Horizontal Supply Air ............................................................................................................ 24
Top Discharge Supply Air ......................................................................................................... 24
Top Mounted Fresh Air Intake .................................................................................................. 27
Top Mounted Fresh Air Intake with Motorized Damper .......................................................... 27
System Flushing and Cleaning .................................................................................................. 28
Flushing the System .................................................................................................................. 28
Cleaning the System ................................................................................................................. 29
Chassis Installation .................................................................................................................... 32
For Units with NPSH Valve Connection and Hose Sets ......................................................... 32
For Units with NPT Style (Tapered Pipe Thread) Valve Connection and Hoses ..................... 32

**SECTION 2 - OPERATION**

Pre-Start-Up Checklist .............................................................................................................. 35
Initial Unit Start-Up .................................................................................................................... 35
System Loop Temperature ........................................................................................................ 36
Fan Speed Adjustment ............................................................................................................... 36
Unit Controls .............................................................................................................................. 40
Sequence of Operation ............................................................................................................. 40
Continuous Blower .................................................................................................................... 40
Safety Control Reset ................................................................................................................ 40
Operation Errors ....................................................................................................................... 41
Safety Controls .......................................................................................................................... 41
Random Start ............................................................................................................................. 42
Compressor Protection ............................................................................................................. 42
Microprocessor Control Unit Flash Codes ............................................................................... 42
Communication ........................................................................................................................ 42
TABLE OF CONTENTS (CONT'D)

SECTION 3 - MAINTENANCE ................................................................................................................................. 43

APPENDIX .................................................................................................................................................................. 45
  Heating and Cooling Data Record Sheet .................................................................................................................. 49
  R-410A Quick Reference Guide ............................................................................................................................. 51

LIST OF FIGURES

FIGURE 1 - Ideal Riser Insertion Depth ....................................................................................................................... 12
FIGURE 2 - Correct/Incorrect Stub-Out Positions in Cabinet Riser Opening............................................................. 12
FIGURE 3 - Cabinet Unit Dimensions & Floor Sleeve Dimensions ................................................................................ 14
FIGURE 4 - Cabinet Riser Dimensions ....................................................................................................................... 15
FIGURE 5 - Standard Factory Supplied NPSH Hose Kits and Risers ........................................................................... 17
FIGURE 6 - Optional Field Supplied Risers with Factory Supplied NPSH Hose Kits and Shut-Off Valves .............. 17
FIGURE 7 - Conversion of NPT to NPSH Type Fittings (VB Units with NPT Fittings Only) ........................................ 18
FIGURE 8 - Field Wiring Diagram .............................................................................................................................. 19
FIGURE 9 - Remote Thermostat Wiring ..................................................................................................................... 19
FIGURE 10 - Unit Switch Plate with ADA Thermostat Connection ........................................................................... 20
FIGURE 11 - Critical Return Air (RA) Panel with Unit Cabinet Installation Dimensions ....................................... 21
FIGURE 12 - RA Panel Cross Section Installation at Floor Level ................................................................................ 22
FIGURE 13 - RA Panel Dimensions ........................................................................................................................... 22
FIGURE 14 - Optional RA Panel with ADA Mounted Thermostat ........................................................................... 23
FIGURE 15 - Supply Grille with Volume Damper and 1/8-inch Neoprene Tape Applied to Perimeter ................. 24
FIGURE 16 - Unit Mounted Supply Grille Installation ................................................................................................. 25
FIGURE 17 - Damper Plate Fasteners ........................................................................................................................ 27
FIGURE 18 - Remove the Red Cover .......................................................................................................................... 27
FIGURE 19 - Position Black Cover ............................................................................................................................ 28
FIGURE 20 - System Flushing and Cleaning ................................................................................................................. 29
FIGURE 21 - Fresh Air Opening without Motorized Damper – Left and Right Hand Unit Shown .......................... 30
FIGURE 22 - Fresh Air Opening with Motorized Damper – Left and Right Hand Unit Shown .................................. 31
FIGURE 23 - Lift the Chassis Front ............................................................................................................................. 33
FIGURE 24 - Tilt the Chassis ........................................................................................................................................ 33
FIGURE 25 - Insert the Chassis ..................................................................................................................................... 33
FIGURE 26 - Pivot the Chassis ....................................................................................................................................... 34
FIGURE 27 - Slide the Chassis ...................................................................................................................................... 34
FIGURE 28 - Check the Chassis .................................................................................................................................... 34
FIGURE 29 - PSC Motor Wiring Diagram .................................................................................................................... 45
FIGURE 30 - ECM Wiring Diagram ........................................................................................................................... 46
FIGURE 31 - Continuous Fan with ECM Wiring Diagram .......................................................................................... 47
FIGURE 32 - Motorized Damper ECM Wiring Diagram ............................................................................................. 48
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>High Series Physical Data</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE 2</td>
<td>Replacement Hose Gaskets</td>
<td>16</td>
</tr>
<tr>
<td>TABLE 3</td>
<td>Chassis Hoses</td>
<td>16</td>
</tr>
<tr>
<td>TABLE 4</td>
<td>Typical Wire Connections</td>
<td>19</td>
</tr>
<tr>
<td>TABLE 5</td>
<td>Unit Supply Opening Sizes</td>
<td>26</td>
</tr>
<tr>
<td>TABLE 6</td>
<td>Unit Supply Face Velocity (FPM)</td>
<td>26</td>
</tr>
<tr>
<td>TABLE 7</td>
<td>Operating Limits</td>
<td>36</td>
</tr>
<tr>
<td>TABLE 8</td>
<td>PSC Standard Blower Performance (CFM)</td>
<td>37</td>
</tr>
<tr>
<td>TABLE 9</td>
<td>PSC High Static Blower Performance (CFM)</td>
<td>37</td>
</tr>
<tr>
<td>TABLE 10</td>
<td>ECM Standard Blower Performance (CFM)</td>
<td>38</td>
</tr>
<tr>
<td>TABLE 11</td>
<td>ECM High Static Blower Performance (CFM)</td>
<td>38</td>
</tr>
<tr>
<td>TABLE 12</td>
<td>ECM Blower Performance - All Speed Taps (CFM)</td>
<td>39</td>
</tr>
<tr>
<td>TABLE 13</td>
<td>Flash Codes</td>
<td>42</td>
</tr>
</tbody>
</table>
SECTION 1 - INSTALLATION

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:

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 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**

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.*

   **CAUTION**

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.

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

**Preparations for Installing the Unit**

Before installing the unit, perform the following preparations:

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

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

- 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.

- Ensure the compressor is mounted on neoprene isolators with metal spacing sleeves inside. Secure it with nuts that are snug against the metal spacer sleeves.

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

Do NOT use the risers to lift the cabinet assembly.

**CAUTION**

Do NOT install this unit outdoors.

**WARNING**

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.

**DANGER**

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

**DANGER**

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

- 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.

- Keep the cabinet sealed with the shipping materials until all plastering, painting, and construction work is complete.
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 and protective goggles where appropriate and have a gas mask close at hand. Use electrical protection equipment and tools suited for electrical operations.

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

Only manufacturer-qualified personnel should install this system. 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 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

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

Refer to Figure 3 on page 14, 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.

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 the stub-out opening of the cabinet riser. Do not allow riser stub-outs or risers to contact cabinet sheet metal.

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 on page 12).

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

The correct location of the cabinet in relation to the floor sleeve and risers is shown in Figure 3 on page 14. 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.

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.

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.

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.

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 have 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.

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

7. 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.

8. 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.

9. 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.
10. Braze or solder riser joints with industry accepted solder or brazing rod material.

*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 - HIGH SERIES PHYSICAL DATA

<table>
<thead>
<tr>
<th>HIGH SERIES MODEL</th>
<th>09</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Cooling (ton)</td>
<td>0.75</td>
<td>1.0</td>
<td>1.25</td>
<td>1.5</td>
<td>2.0</td>
<td>2.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Compressor Type</td>
<td>Rotary</td>
<td>Scroll</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant Charge (oz)</td>
<td>21</td>
<td>25</td>
<td>34</td>
<td>38</td>
<td>44</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>Air Coil-Type</td>
<td>Enhanced Copper Tubes, Enhanced Aluminum Fins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face Area (sq ft)</td>
<td>1.46</td>
<td>1.56</td>
<td>2.35</td>
<td>2.35</td>
<td>2.63</td>
<td>3.33</td>
<td>3.33</td>
</tr>
<tr>
<td>Water Coil-Type</td>
<td>Enhanced Surface Co-Axial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Blower/Motor</td>
<td>Double Width Double Inlet (DWDI) Forward-Curved Centrifugal/Permanent Split Capacitor (PSC) Direct Drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter x Width (inches)</td>
<td>9x4T</td>
<td>9x4T</td>
<td>9x7T</td>
<td>9x7T</td>
<td>9x7</td>
<td>9x8</td>
<td>9x8</td>
</tr>
<tr>
<td>Motor HP</td>
<td>0.10</td>
<td>0.10</td>
<td>0.17</td>
<td>0.17</td>
<td>0.25</td>
<td>0.33</td>
<td>0.50</td>
</tr>
<tr>
<td>Hi-Static Blower/Motor</td>
<td>DWDI Forward-Curved Centrifugal/PSC Direct Drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter x Width (inches)</td>
<td>9x4T</td>
<td>9x4T</td>
<td>9x7T</td>
<td>9x7T</td>
<td>10x7T</td>
<td>10x8T</td>
<td>10x8T</td>
</tr>
<tr>
<td>Motor HP</td>
<td>0.10</td>
<td>0.10</td>
<td>0.17</td>
<td>0.17</td>
<td>0.25</td>
<td>0.33</td>
<td>0.50</td>
</tr>
<tr>
<td>EC Motor (ECM) Blower/Motor</td>
<td>DWDI Forward-Curved Centrifugal/ECM Direct Drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter x Width (inches)</td>
<td>9x4T</td>
<td>9x4T</td>
<td>9x7T</td>
<td>9x7T</td>
<td>10x7T</td>
<td>9x8</td>
<td>9x8</td>
</tr>
<tr>
<td>Motor HP</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Hi-Static ECM Blower/Motor</td>
<td>DWDI Forward-Curved Centrifugal/ECM Direct Drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter x Width (inches)</td>
<td>9x4T</td>
<td>9x4T</td>
<td>9x7T</td>
<td>9x7T</td>
<td>10x7T</td>
<td>10x8T</td>
<td>10x8T</td>
</tr>
<tr>
<td>Motor HP</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Filter Quantity/Size (inches)</td>
<td>1/14x25x1</td>
<td>1/14x25x1</td>
<td>1/16x30x1</td>
<td>1/16x30x1</td>
<td>1/16x30x1</td>
<td>1/20x30x1</td>
<td>1/20x30x1</td>
</tr>
<tr>
<td>Cabinet Weight (lb)</td>
<td>130</td>
<td>130</td>
<td>145</td>
<td>145</td>
<td>150</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Chassis Weight (lb)</td>
<td>70</td>
<td>75</td>
<td>95</td>
<td>100</td>
<td>140</td>
<td>155</td>
<td>160</td>
</tr>
</tbody>
</table>

**NOTE:**

1. Nominal capacity is calculated in accordance with ARI/ISO Standard 13256-1 for water loop application.
2. Cabinet weight is approximate and does not include the weight of the risers.
NOTES
1. Supply, return, and condensate riser openings are pre-punched on all sides and field convertible. Cut tabs to remove the knock-out.
2. 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.
3. Condensate P-trap is accessible from the front by removing the bottom cover plate.
4. Riser and shut-off location is measured from base of cabinet and does not include the stand height.

FIGURE 3 - CABINET UNIT DIMENSIONS & FLOOR SLEEVE DIMENSIONS
NOTE
Riser shut-off valve is measured from base of cabinet and does not include the stand height.

FIGURE 4 - CABINET RISER DIMENSIONS
**RISER LOOP**

5. 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

6. Install strainers at the inlet of each circulating pump.

7. 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.

8. Install vents in piping loop as required to bleed residual air from the piping system during filling and servicing.

9. 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 type fittings (see Figure 5 on page 17). Before attaching NPSH type hoses, check that the female end gasket is not missing and is free of damage or debris. See Table 2 for information on replacement gaskets for NPSH hose kits.

   b. For field-supplied risers, it is recommended to order the appropriate NPSH 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 on page 17).

   c. Legacy chassis with NPT type connections and matching risers with NPT shut-off valve connections require a special hose kit. The kit comes complete with a NPT to NPSH swivel adapter on the shut-off valve and chassis connection to mate with factory hoses (see Figure 7 on page 18).

**TABLE 2 - REPLACEMENT HOSE GASKETS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSGK-UFHW-050</td>
<td>1/2-inch Rubber Gasket</td>
</tr>
<tr>
<td>VSGK-UFHW-075</td>
<td>3/4-inch Rubber Gasket</td>
</tr>
</tbody>
</table>

**HOSES**

Ensure the correct hose set is matched with the compatible unit size (see Table 3). Install the NPSH factory-provided hoses by completing the following steps:

1. Inspect for missing or damaged hose gasket. See Table 2 for replacement gasket part numbers.

2. Tighten by hand the screw connections to the male NPSH 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.

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

   **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.**

   **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.**

   **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.**

   **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 3 - CHASSIS HOSES**

<table>
<thead>
<tr>
<th>CHASSIS MODEL</th>
<th>HOSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>09–18</td>
<td>1/2-inch NPSH Female-Female</td>
</tr>
<tr>
<td>24–36</td>
<td>3/4-inch NPSH Female-Female</td>
</tr>
</tbody>
</table>
SECTION 1 - INSTALLATION

FIGURE 5 - STANDARD FACTORY SUPPLIED NPSH HOSE KITS AND RISERS

FIGURE 6 - OPTIONAL FIELD SUPPLIED RISERS WITH FACTORY SUPPLIED NPSH HOSE KITS AND SHUT-OFF VALVES
ELECTRICAL WIRING

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.

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

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.

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 8 for typical wiring connections.

Ensure that the control wiring between the thermostat and the unit’s terminations does not exceed 1 ohm. Resistance in excess of 1 ohm may cause component damage due to insufficient AC voltage supply.

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

<table>
<thead>
<tr>
<th>RECOMMENDED WIRE SIZE (GAUGE)</th>
<th>MAXIMUM LOW VOLTAGE WIRE LENGTH (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>18</td>
<td>75</td>
</tr>
<tr>
<td>16</td>
<td>125</td>
</tr>
</tbody>
</table>

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, VB12P). 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 on page 14.

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 9). The thermostat pigtail Molex harness ships loose for field wiring to the thermostat terminals.

![Optional Surface Mount Thermostat Connection Wiring](image_url)

![Optional Remote Mounted Thermostat Wiring](image_url)
SECTION 1 - INSTALLATION

Optional Disconnect

Optional ADA Molex Connection

FIGURE 10 - UNIT SWITCH PLATE WITH ADA THERMOSTAT CONNECTION

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 Acoustic Return Air (RA) Panel on page 20, Figure 11 on page 21, and Figure 12 on page 22.

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 28 on page 46 for electrical schematics.

CLOSET AND DRYWALL INSTALLATION

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 20, Figure 11 on page 21, and Figure 12 on page 22.

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 11 on page 21 and Figure 12 on page 22.

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.

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 in 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 11 on page 21 and Figure 12 on page 22.

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 11 on page 21.

Figure 14 on page 23 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.

**NOTE**

All dimensions are in inches.
Figure 12 on page 22 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.

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 13 on page 22 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.

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 12 - RA PANEL CROSS SECTION

**Installation at Floor Level**

### FIGURE 13 - RA PANEL DIMENSIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>Rough-In Width</th>
<th>Rough-In Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSCS09-12</td>
<td>22.75</td>
<td>52.75</td>
</tr>
<tr>
<td>VSCS15-24</td>
<td>25.75</td>
<td>52.75</td>
</tr>
<tr>
<td>VSCS30-36</td>
<td>29.75</td>
<td>52.75</td>
</tr>
</tbody>
</table>

### NOTES:
1. Acoustic panel is powder coated in appliance white
2. Acoustic panel can be installed on the right hand side or left hand side.
3. See Figure 11 on page 21 for additional RA panel and cabinet installation information.
FIGURE 14 - OPTIONAL RA PANEL WITH ADA MOUNTED THERMOSTAT

NOTES:
1. Powder coated in appliance white
2. Inside panel lined with 0.5-inch acoustical insulation
3. Hinged panel complete with magnetic latches
4. Panel comes either left or right hand opening
SECTION 1 - INSTALLATION

SUPPLY AIR (SA) DUCTWORK

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.

NOTE

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 15 on page 24 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 5 and Table 6 on page 26. Recommended face velocity at the outlet supply grille is 300–500 FPM. Table 6 gives face velocity at the unit supply openings in relation to Table 5. To calculate the face velocity at the supply grille, take the FPM from Table 6 and divide by the supply grille area factor.

![Figure 15 - Supply Grille with Volume Damper and 1/8-Inch Neoprene Tape Applied to Perimeter](LD27622)

Table 6 gives face velocity at the unit supply openings in relation to Table 5. To calculate the face velocity at the supply grille, take the FPM from Table 6 and divide by the supply grille area factor.
**SECTION 1 - INSTALLATION**

**FORM 145.18-IOM1**

**ISSUE DATE: 01/24/2019**

---

**Vertical Stack Cabinet Top View**

Wall Stud

0.5-inch Drywall

Mounting Screws

**Details**

- **1/8-inch Thick Field Supplied Gasket Tape Applied Around Full Perimeter of Supply Grilled with Volume Damper**
- **Factory Supplied 1-inch Duct Flange**
- **Optional Framing Studs for Supply Opening**
- **2.25-inch Minimum (Unit Supply Duct Flange to 0.5-inch Drywall Face)**

**UNIT SIZE**

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>A (SUPPLY GRILLE NOMINAL WIDTH)</th>
<th>B (GRILLE WIDTH)</th>
<th>C (GRILLE FLANGE WIDTH)</th>
<th>D (ROUGH IN WIDTH)</th>
<th>E (UNIT WIDTH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9–18</td>
<td>X</td>
<td>B=X - 0.5</td>
<td>C=X + 1.75</td>
<td>20 3/4 ± 1/8</td>
<td>17</td>
</tr>
<tr>
<td>15–24</td>
<td>X</td>
<td>B=X - 0.5</td>
<td>C=X + 1.75</td>
<td>23 3/4 ± 1/8</td>
<td>20</td>
</tr>
<tr>
<td>30–36</td>
<td>X</td>
<td>B=X - 0.5</td>
<td>C=X + 1.75</td>
<td>27 3/4 ± 1/8</td>
<td>24</td>
</tr>
</tbody>
</table>

**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.

---

**FIGURE 16 - UNIT MOUNTED SUPPLY GRILLE INSTALLATION**
### TABLE 5 - UNIT SUPPLY OPENING SIZES

<table>
<thead>
<tr>
<th>MODEL</th>
<th>NO TOP OPENING</th>
<th>TOP OPENING</th>
<th>NO TOP OPENING</th>
<th>TOP OPENING</th>
<th>NO TOP OPENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>14W x 12H</td>
<td>14W x 6H</td>
<td>14W x 8H</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>12</td>
<td>14W x 14H</td>
<td>14W x 6H</td>
<td>14W x 10H</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>15</td>
<td>16W x 14H</td>
<td>14W x 6H</td>
<td>14W x 10H</td>
<td>Not Available</td>
<td>14W x 8H</td>
</tr>
<tr>
<td>18</td>
<td>Not Available</td>
<td>14W x 6H</td>
<td>14W x 12H</td>
<td>14W x 6H</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Not Available</td>
<td>14W x 10H</td>
<td>16W x 14H</td>
<td>14W x 6H</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Not Available</td>
<td>14W x 6H</td>
<td>20W x 14H</td>
<td>14W x 6H</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Not Available</td>
<td>14W x 10H</td>
<td>Not Available</td>
<td>14W x 6H</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 6 - UNIT SUPPLY FACE VELOCITY (FPM)

<table>
<thead>
<tr>
<th>MODEL</th>
<th>NO TOP OPENING</th>
<th>TOP OPENING</th>
<th>NO TOP OPENING</th>
<th>TOP OPENING</th>
<th>NO TOP OPENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>291</td>
<td>272</td>
<td>219</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>12</td>
<td>316</td>
<td>344</td>
<td>221</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>15</td>
<td>354</td>
<td>314</td>
<td>283</td>
<td>Not Available</td>
<td>236</td>
</tr>
<tr>
<td>18</td>
<td>Not Available</td>
<td>391</td>
<td>294</td>
<td>294</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Not Available</td>
<td>397</td>
<td>273</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Not Available</td>
<td>416</td>
<td>276</td>
<td>339</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Not Available</td>
<td>410</td>
<td>Not Available</td>
<td>385</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:

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.

### TABLE 6 - UNIT SUPPLY FACE VELOCITY (FPM)

<table>
<thead>
<tr>
<th>MODEL</th>
<th>NO TOP OPENING</th>
<th>TOP OPENING</th>
<th>NO TOP OPENING</th>
<th>TOP OPENING</th>
<th>NO TOP OPENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>291</td>
<td>272</td>
<td>219</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>12</td>
<td>316</td>
<td>344</td>
<td>221</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>15</td>
<td>354</td>
<td>314</td>
<td>283</td>
<td>Not Available</td>
<td>236</td>
</tr>
<tr>
<td>18</td>
<td>Not Available</td>
<td>391</td>
<td>294</td>
<td>294</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Not Available</td>
<td>397</td>
<td>273</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Not Available</td>
<td>416</td>
<td>276</td>
<td>339</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Not Available</td>
<td>410</td>
<td>Not Available</td>
<td>385</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:

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 on page 31 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.

*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 on page 31).

The damper assembly can be easily removed for servicing (see Removing the Actuator on page 27). The motorized damper assembly opens during FAN ON operation. See Figure 28 on page 46 for the electrical schematic. For other control options, please contact the factory.

---

**Removing the Actuator**

1. Remove the damper plate:
   a. Look underneath the top of the RA flange to notice the damper assembly.
   b. Remove the seven fasteners holding the damper plate (see Figure 19 on page 28).
   c. Drop the plate and disconnect the quick-connect terminals from the harness.

2. Remove the red cover from the actuator body (see Figure 18 on page 27).
SECTION 1 - INSTALLATION

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 20 on page 29).

Flushing the System

1. Ensure the supply and return riser shut-off valves are closed at each unit.

2. 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 20 on page 29).

3. Open the shut-off valves in the units that have had the supply and return risers interconnected.

4. 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.

5. Close the air vents, and start the circulating pump.

6. Ensure that all air is bled from the system by cracking each air vent.

Make-up water must be available in sufficient volume to replace the volume occupied by the air that is bled off.

7. When all the air is vented and the water is circulating under pressure, check the entire system for leaks. Repair any leaks as required.

8. 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.

9. Open the drain at the lowest point in the system.

The make-up water flow rate must be equal to the rate of the drain bleed.

FIGURE 19 - POSITION BLACK COVER

3. If the black cover is loose, position it in place and slide it back onto the actuator (see Figure 19 on page 28).

4. Secure the red cover back over the actuator assembly.

5. Ensure the plastic tabs are secured to the metal body bracket.

6. Connect the quick-connect terminals, and insert the damper assembly into the discharge collector box.

7. Fasten the assembly using the seven fasteners.

8. Ensure the make-up water flow rate is maintained.

9. When all the air is vented and the water is circulating under pressure, check the entire system for leaks. Repair any leaks as required.
10. Continue to bleed the system until the water leaving the drain is clear, no less than 2 hours.

11. Completely drain the piping system.

**Cleaning the System**

1. After the initial flushing, chemically clean the system. Repeat the method in *Flushing the System on page 28* 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 startup.

   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.
CABINET DIMENSIONS (INCHES)

<table>
<thead>
<tr>
<th>MODEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>09–12</td>
<td>17</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>15–24</td>
<td>20</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>30–36</td>
<td>24</td>
<td>16</td>
<td>18</td>
</tr>
</tbody>
</table>

1. Optional fresh air option comes with 2.5-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.

FIGURE 21 - FRESH AIR OPENING WITHOUT MOTORIZED DAMPER – LEFT AND RIGHT HAND UNIT SHOWN
### CABINET DIMENSIONS (INCHES)

<table>
<thead>
<tr>
<th>MODEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>09–12</td>
<td>17</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>15–24</td>
<td>20</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>30–36</td>
<td>24</td>
<td>16</td>
<td>18</td>
</tr>
</tbody>
</table>

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.

**FIGURE 22 - FRESH AIR OPENING WITH MOTORIZED DAMPER – LEFT AND RIGHT HAND UNIT SHOWN**
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 28.

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

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

Always use a backup wrench when installing hoses.

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

Hoses must be hand tightened 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, 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. Units shipped after June 2013 feature NPSH fittings (straight thread), while previous generation hose kits are NPT type (tapered thread). Refer to Riser Loop on page 16 for more information.

For Units with NPSH Valve Connection and Hose Sets

NPSH flexible connection hoses do not require any pipe dope or sealant tape. DO NOT ADD THREAD SEALANT OR PIPE DOPE TO NPSH 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 hoses to the NPSH 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 on page 32.

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.

*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.*

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

2. Lift chassis from the front of chassis (see *Figure 22 on page 33*).

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 23 on page 33*).

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 24 on page 33*).

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 25 on page 34*).
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 26 on page 34).

To avoid damage from clogged coil surfaces, plugged motor ventilation openings, and potential unit failure, DO NOT operate unit without compete 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 27 on page 34).

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.

If necessary, pull the chassis forward slightly to ensure an adequate seal between the chassis and the service panel.

12. 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.

13. Install service panel.

14. Install the RA panel into the drywall opening if not already installed. Refer to Acoustic Return Air (RA) Panel on page 20. Secure the panel into the drywall with six screws.
SECTION 2 - 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

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:
   - Water temperature leaving the heat exchanger is warmer than the entering water temperature (EWT) (approximately 9.0–12.0°F).
   - The blower operation is smooth.
   - The compressor and blower amps are within the nameplate data values.
   - 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:
   - Warm air is detected at the supply register.
   - The water temperature decreases approximately 5.0–9.0°F across the heat exchanger.
• 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.

**TABLE 7 - OPERATING LIMITS**

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINIMUM EWT</td>
<td>30.0°F</td>
</tr>
<tr>
<td>MAXIMUM EWT</td>
<td>110.0°F</td>
</tr>
</tbody>
</table>

**FAN SPEED ADJUSTMENT**

Multi-speed direct drive motors are used in all units as standard. Permanent split capacitor (PSC) fan motors have a minimum of three selectable speeds. EC motors (ECMs) have five speeds, however only two speeds are recommended and available for selection.

Optional ECMs increase operating efficiency by consuming fewer watts than standard PSC motors. 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 on page 37 for factory blower speed settings and minimum operating airflow.

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.

**NOTE**

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

**WARNING**

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

**CAUTION**

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.
### TABLE 8 - PSC STANDARD BLOWER PERFORMANCE (CFM)

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>MOTOR SPEED</th>
<th>RATED CFM</th>
<th>MIN. CFM</th>
<th>EXTERNAL STATIC PRESSURE (IN W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>HIGH</td>
<td>340</td>
<td>220</td>
<td>0.0  0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>340 330 320 310 300 285 270 255 240 225 -</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>255 250 240 230 220 210 - - - - -</td>
</tr>
<tr>
<td>12</td>
<td>HIGH</td>
<td>430</td>
<td>290</td>
<td>445 435 425 415 400 385 370 355 340 320 295</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>350 345 335 325 315 305 290 - - - - -</td>
</tr>
<tr>
<td>15</td>
<td>HIGH</td>
<td>550</td>
<td>335</td>
<td>580 570 560 550 535 520 505 485 465 445 425</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>385 380 375 370 365 355 345 335 - - - - -</td>
</tr>
<tr>
<td>18</td>
<td>HIGH</td>
<td>685</td>
<td>430</td>
<td>700 690 675 660 635 615 595 575 550 525 495</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>450 445 440 435 430 425 - - - - -</td>
</tr>
<tr>
<td>24</td>
<td>HIGH</td>
<td>850</td>
<td>575</td>
<td>880 855 835 815 795 770 740 710 680 650 615</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>715 710 705 690 670 650 630 605 580 - - -</td>
</tr>
<tr>
<td>30</td>
<td>HIGH</td>
<td>1075</td>
<td>700</td>
<td>1115 1100 1075 1050 1020 990 960 930 895 850 800</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>965 960 950 935 915 895 870 840 810 780 745</td>
</tr>
<tr>
<td>36</td>
<td>HIGH</td>
<td>1220</td>
<td>840</td>
<td>1230 1200 1170 1140 1110 1075 1040 1000 960 915 870</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>1115 1100 1075 1050 1020 990 960 930 895 850 805</td>
</tr>
</tbody>
</table>

### TABLE 9 - PSC HIGH STATIC BLOWER PERFORMANCE (CFM)

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>MOTOR SPEED</th>
<th>RATED CFM</th>
<th>MIN. CFM</th>
<th>EXTERNAL STATIC PRESSURE (IN W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>HIGH</td>
<td>340</td>
<td>220</td>
<td>0.0  0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75 0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>375 370 360 350 340 330 315 300 285 265 245 220 - - - - -</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>330 320 310 300 290 280 270 255 240 225 - - - - -</td>
</tr>
<tr>
<td>12</td>
<td>HIGH</td>
<td>430</td>
<td>290</td>
<td>485 475 465 455 440 425 410 395 380 360 340 315 - - - - -</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>390 385 380 370 360 350 335 320 305 - - - - - - - - -</td>
</tr>
<tr>
<td>15</td>
<td>HIGH</td>
<td>550</td>
<td>335</td>
<td>665 650 635 615 595 575 555 540 520 500 475 450 420 395 370 340 -</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>580 570 560 550 535 520 505 485 465 445 425 400 375 350 - - -</td>
</tr>
<tr>
<td>18</td>
<td>HIGH</td>
<td>685</td>
<td>430</td>
<td>750 735 715 695 675 655 630 605 580 555 525 495 465 435 - - - - -</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>670 655 640 625 605 585 560 535 510 485 460 435 - - - - -</td>
</tr>
<tr>
<td>24</td>
<td>HIGH</td>
<td>850</td>
<td>575</td>
<td>990 970 950 930 910 890 865 845 820 795 770 740 710 680 650 615 575</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>795 785 775 760 745 730 715 695 675 655 630 605 580 - - - - -</td>
</tr>
<tr>
<td>30</td>
<td>HIGH</td>
<td>1075</td>
<td>700</td>
<td>1180 1170 1160 1145 1130 1110 1090 1070 1050 1025 1000 970 940 910 875 840 800</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>985 980 975 970 960 950 940 935 920 905 895 875 850 825 795 765 730</td>
</tr>
<tr>
<td>36</td>
<td>HIGH</td>
<td>1220</td>
<td>840</td>
<td>1340 1320 1295 1270 1245 1220 1190 1160 1130 1100 1070 1040 1010 980 945 910 870</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>1180 1170 1160 1145 1130 1110 1090 1070 1050 1025 1000 970 940 910 875 840 800</td>
</tr>
</tbody>
</table>
### TABLE 10 - ECM STANDARD BLOWER PERFORMANCE (CFM)

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>MOTOR SPEED</th>
<th>RATED CFM</th>
<th>MIN. CFM</th>
<th>EXTERNAL STATIC PRESSURE (IN W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>09</td>
<td>HIGH</td>
<td>340</td>
<td>220</td>
<td>342</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>278</td>
</tr>
<tr>
<td>12</td>
<td>HIGH</td>
<td>430</td>
<td>290</td>
<td>463</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>342</td>
</tr>
<tr>
<td>15</td>
<td>HIGH</td>
<td>550</td>
<td>335</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>495</td>
</tr>
<tr>
<td>18</td>
<td>HIGH</td>
<td>685</td>
<td>430</td>
<td>760</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>24</td>
<td>HIGH</td>
<td>850</td>
<td>575</td>
<td>891</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>760</td>
</tr>
<tr>
<td>30</td>
<td>HIGH</td>
<td>1075</td>
<td>700</td>
<td>1131</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>918</td>
</tr>
<tr>
<td>36</td>
<td>HIGH</td>
<td>1220</td>
<td>840</td>
<td>1265</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>1065</td>
</tr>
</tbody>
</table>

### TABLE 11 - ECM HIGH STATIC BLOWER PERFORMANCE (CFM)

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>MOTOR SPEED</th>
<th>RATED CFM</th>
<th>MIN. CFM</th>
<th>EXTERNAL STATIC PRESSURE (IN W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>09</td>
<td>HIGH</td>
<td>340</td>
<td>220</td>
<td>411</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>342</td>
</tr>
<tr>
<td>12</td>
<td>HIGH</td>
<td>430</td>
<td>290</td>
<td>554</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>463</td>
</tr>
<tr>
<td>15</td>
<td>HIGH</td>
<td>550</td>
<td>335</td>
<td>659</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>18</td>
<td>HIGH</td>
<td>685</td>
<td>430</td>
<td>891</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>760</td>
</tr>
<tr>
<td>24</td>
<td>HIGH</td>
<td>850</td>
<td>575</td>
<td>1002</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>866</td>
</tr>
<tr>
<td>30</td>
<td>HIGH</td>
<td>1075</td>
<td>700</td>
<td>1265</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>1065</td>
</tr>
<tr>
<td>36</td>
<td>HIGH</td>
<td>1220</td>
<td>840</td>
<td>1462</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
<td></td>
<td></td>
<td>1265</td>
</tr>
</tbody>
</table>
### TABLE 12 - ECM BLOWER PERFORMANCE - ALL SPEED TAPS (CFM)

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>MOTOR SPEED</th>
<th>RATED CFM</th>
<th>MIN. CFM</th>
<th>EXTERNAL STATIC PRESSURE (IN W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>1</td>
<td>340</td>
<td>180</td>
<td>0.0  0.05  0.1  0.15  0.2  0.25  0.3  0.35  0.4  0.45  0.5  0.55  0.6  0.65  0.7  0.75</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>278  252  226  212  198  189  180  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>342  317  292  276  259  247  236  228  220  214  207  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>411  382  354  334  315  300  286  279  272  263  254  242  231  220  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>463  431  399  378  356  340  324  317  310  299  290  -  -  -  -  -</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>430</td>
<td>236</td>
<td>278  252  226  212  198  189  180  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>342  317  292  276  259  247  236  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>411  382  354  334  315  300  286  279  272  263  254  242  231  220  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>463  431  399  378  356  340  324  317  310  299  290  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>554  529  504  477  451  430  408  393  378  360  341  330  319  300  -  -</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>550</td>
<td>268</td>
<td>495  447  399  372  346  307  268  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>600  567  534  500  466  445  424  396  367  340  312  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>659  623  587  564  541  511  482  462  441  419  397  372  346  320  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>760  726  693  667  642  615  587  574  561  529  497  469  441  412  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>891  863  835  809  784  757  730  689  648  601  554  518  482  446  408  -</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>685</td>
<td>396</td>
<td>495  447  399  372  346  307  268  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>600  567  534  500  466  445  424  396  367  340  312  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>659  623  587  564  541  511  482  462  441  419  397  372  346  320  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>760  726  693  667  642  615  587  574  561  529  497  469  441  412  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>891  863  835  809  784  757  730  689  648  601  554  518  482  446  408  -</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>850</td>
<td>574</td>
<td>495  447  399  372  346  307  268  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>600  567  534  500  466  445  424  396  367  340  312  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>659  623  587  564  541  511  482  462  441  419  397  372  346  320  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>760  726  693  667  642  615  587  574  561  529  497  469  441  412  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>891  863  835  809  784  757  730  689  648  601  554  -  -  -  -  -</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>1075</td>
<td>718</td>
<td>495  447  399  372  346  307  268  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>600  567  534  500  466  445  424  396  367  340  312  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>659  623  587  564  541  511  482  462  441  419  397  372  346  320  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>760  726  693  667  642  615  587  574  561  529  497  469  441  412  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>891  863  835  809  784  757  730  689  648  601  554  -  -  -  -  -</td>
</tr>
<tr>
<td>36</td>
<td>1</td>
<td>1220</td>
<td>861</td>
<td>495  447  399  372  346  307  268  -  -  -  -  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>600  567  534  500  466  445  424  396  367  340  312  -  -  -  -  -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>659  623  587  564  541  511  482  462  441  419  397  372  346  320  -  -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>760  726  693  667  642  615  587  574  561  529  497  469  441  412  -  -</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>891  863  835  809  784  757  730  689  648  601  554  -  -  -  -  -</td>
</tr>
</tbody>
</table>

**NOTES**

1. All airflow ratings are at lowest voltage rating of dual rating (for example, 208 volt).
2. Airflow ratings include 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 Y1 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 W1. 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 Y1 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 Y1. 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.
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 13 on page 42).

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 13 on page 42).

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 34.0°F and resets at 48.0°F).
2. A high pressure limit switch to protect against excessive discharge pressures (opens at 600 psig ± 25 psig).
3. A low pressure limit switch to protect against loss of refrigerant charge (opens at 55 psig ± 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 35.0°F (resets at 48.0°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 low water applications with adequate antifreeze protection, otherwise damage can occur.

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 13 on page 42.

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 13 - Flash Codes

<table>
<thead>
<tr>
<th>FLASH CODES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Steady</td>
<td>Control failure – replace control</td>
</tr>
<tr>
<td>Heart Beat</td>
<td>Normal operation</td>
</tr>
<tr>
<td>2 Flashes</td>
<td>Control waiting on ASCD ¹</td>
</tr>
<tr>
<td>3 Flashes</td>
<td>HPS1 - Compressor lockout</td>
</tr>
<tr>
<td>5 Flashes</td>
<td>LPS1 - Compressor lockout</td>
</tr>
<tr>
<td>13 Flashes</td>
<td>Compressor held off due to low voltage ¹</td>
</tr>
<tr>
<td>14 Flashes</td>
<td>EEPROM storage failure (control failure)</td>
</tr>
<tr>
<td>15 Flashes</td>
<td>Condensate overflow switch - compressor lockout</td>
</tr>
<tr>
<td>16 Flashes</td>
<td>Coaxial freeze thermostat - compressor lockout</td>
</tr>
</tbody>
</table>

NOTES

1. These flash codes do not represent alarms.

Communication

The communication protocol is Modbus™ using the RTU method of packet framing at 19200-baud rate.
SECTION 3 - 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.

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.
THIS PAGE INTENTIONALLY LEFT BLANK.
FIGURE 29 - PSC MOTOR WIRING DIAGRAM
FIGURE 30 - ECM WIRING DIAGRAM
VSCS SERIES w/ ECM MOTOR; 208-230V/1Ph/60Hz
265V/1Ph/60Hz

FIGURE 31 - CONTINUOUS FAN WITH ECM WIRING DIAGRAM

LD27633
FIGURE 32 - MOTORIZED DAMPER ECM WIRING DIAGRAM
HEATING AND COOLING DATA RECORD SHEET

JOB NAME: ________________________________
JOB ADDRESS: ________________________________
INSTALLER: ________________________________
SPECIAL QUOTES/OPTIONS (YES/NO): __________

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

Air Coil

Airflow

Coil Inlet (Dry Bulb) °F
Coil Outlet (Dry Bulb) °F
Coil Inlet (Wet Bulb) °F
Coil Outlet (Wet Bulb) °F
Air Relative Humidity (%) %

Expansion Valve

Coaxial Coil

Reversing Valve

Compressor

Suction

Discharge

Internal Pump Voltage: L1 L2
Internal Pump Amp Draw: L1 L2
*If installed

Fan Motor Speed: __________
Fan Amp Draw: L1 L2 L3
Fan Voltage: L1 L2 L3
*May only need L1 and L2 lines

Water In °F psi
Water Out °F psi

Liquid Line

Water Flow: _____ GPM

Compressor Amp Draw: L1 L2 L3
Compressor Voltage: L1 L2 L3
*May only need L1 and L2 lines

NOTES

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
R-410A QUICK REFERENCE GUIDE

See Section 1 - 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.