# D-Series Vertical (DSV060C-300C) Air-Cooled Self-Contained Units, C Generation with Smart Equipment Controller

## Installation, Operation, and Maintenance Manual

Installation Guide

Issue Date: 2020-12-02

Form Number: 145.29-IOM4 (1220)

Supersedes: 145.29-IOM4 (1119)

# Contents

# General safety guidelines

## Important!

### Read before proceeding!

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

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

### Safety symbols

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

**DANGER**

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

**WARNING**

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

**CAUTION**

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

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

**⚠ WARNING**

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

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

## Changeability of this document

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

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

### Revision notes

| Affected section | Description | Date implemented |
|---|---|---|
| Nomenclature | Updated notes for DSV Nomenclature | November 2020 |
| Evaporator/ condenser assembly | Nitrogen Warning added | July 2020 |

## Associated literature

| Manual description | Form number |
|---|---|
| Mobile Access Portal Gateway Product Bulletin | LIT-12011884 |
| Airside Economizer Kit for Models DSH/DSV Air-Cooled Air Conditioning Units, C Generation, Installation and Operation Instructions | 145.10-NO2 |
| Low Ambient Damper Kit for Air-Cooled Self-Contained Units DSH/DSV Models, B/C Styles Installation and Operation Instructions | 145.10-IOM4 |
| DSV/DSH and CSV Air and Water-Cooled Self-Contained Units Start-Up and Performance Checklist | 145.13-CL1 |
| Variable Frequency Drive for D-Series (DSV/DSH) Air-Cooled Self-Contained Units, C Generation Installation and Operation Instructions | 145.13-NO2 |

## Technical support

If Technical Support is required, please contact the Product Technical Support team at 877-329-7430 or AppliedDXTechSupport@jci.com.

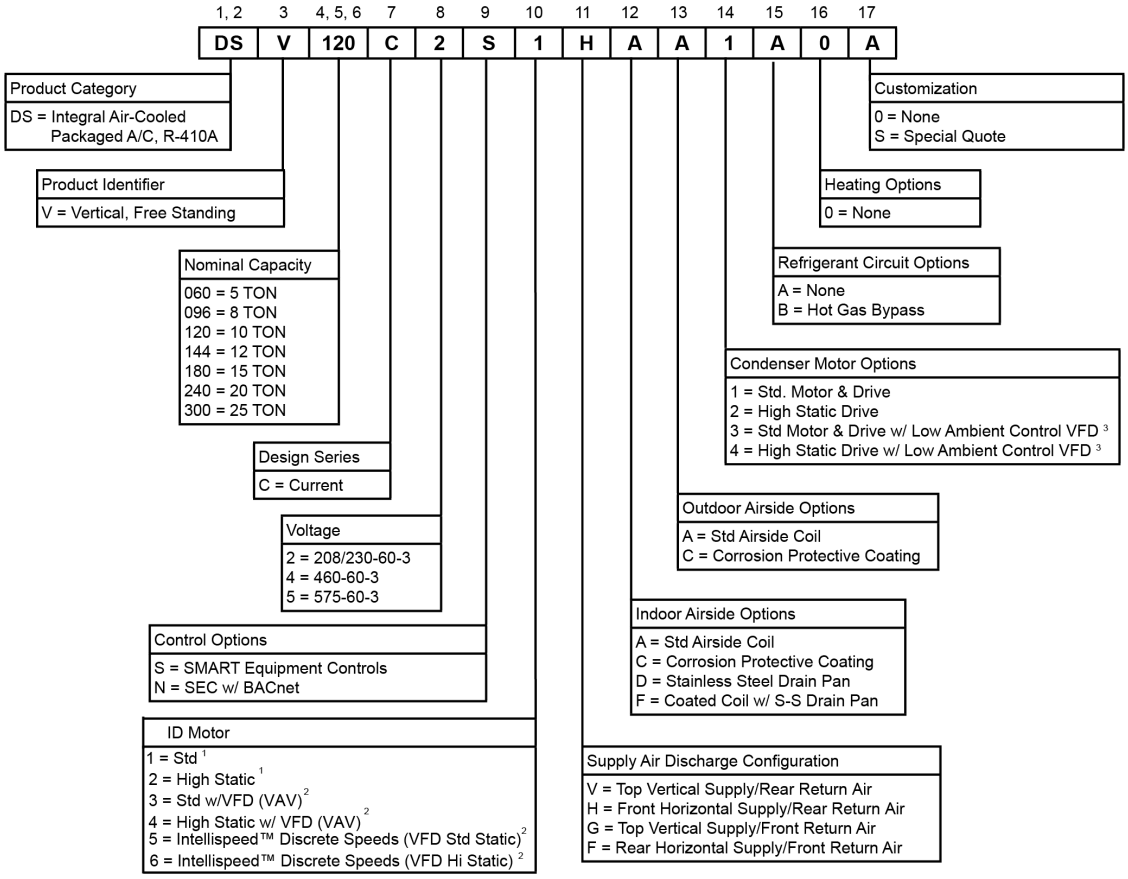
## Replacement parts

For replacement parts, please contact your local Source1 Dealer.

Source1 Parts Phone Number: 800-536-6112

Source1 Parts Website: http://www.source1parts.com

## Nomenclature




**Note:**

1. Evaporator and condenser motor VFD option available only on 8 ton units and up.
2. Evaporator motor VFD standard on 8 ton units and up.
3. Condenser VFD not available in 575V.
4. Evaporator motor without VFD available only on 2, 3, 4 and 5 ton.

# Installation

All models 8–25 tons ship in separate parts: a condensing unit and an evaporator section. The 5-ton models ship as factory charged unitized packages. All models are designed for freestanding mounting on the floor or on a field fabricated structural steel stand. All models can be ordered as either a vertical or horizontal supply fan discharge orientation. This can be combined with standard rear return air (RA) or optional front RA configuration (see dimensional drawings in Appendix A: Unit dimensional drawings for more details).

The 5 ton model utilizes a single stage compressor. The 8–25 ton models are dual compressor units with two independent refrigerant circuits. The 8–12 ton units are assembled from the following components:

- A single speed scroll compressor
- A two stage scroll compressor

This configuration gives 8–12 ton units three effective cooling stages. The 15, 20, and 25 ton units feature two 2 stage compressors. This configuration gives these units four stage cooling units.

The 8–25 ton models require the field connection of piping and charging of the refrigerant circuits. The models ship with only a nitrogen holding charge. See the Start-up and operation section for charge information.

All units come standard with a Smart Equipment (SE Controller) microprocessor control board with safety controls and troubleshooting LED (see Microprocessor controller for more details).

Units operate reliably at outdoor ambient down to 50.0°F. In applications requiring operation below this temperature, either a low ambient damper field kit accessory or low ambient control featuring a variable frequency drive (VFD) on condenser fan is available (condenser fan VFD is available as a factory installed option only on 8 and 10 ton units).

The damper is installed on the condenser air discharge and is allowed operation to 0.0°F ambient.

The VFD on the condenser is factory installed on the corner post in the condenser section of the unit. The VFD on the condenser allows operation to 0.0°F ambient, which is needed to maintain a proper refrigerant head pressure.

**⚠ CAUTION**

Only qualified personnel should perform installation and service of this equipment.

## Pre-installation inspection of equipment

All units are factory tested to ensure safe operation and quality assembly. The units are packaged and sealed on shipping skids and ship in first class condition. Report to the carrier any torn or broken packaging, or scratched or dented panels.

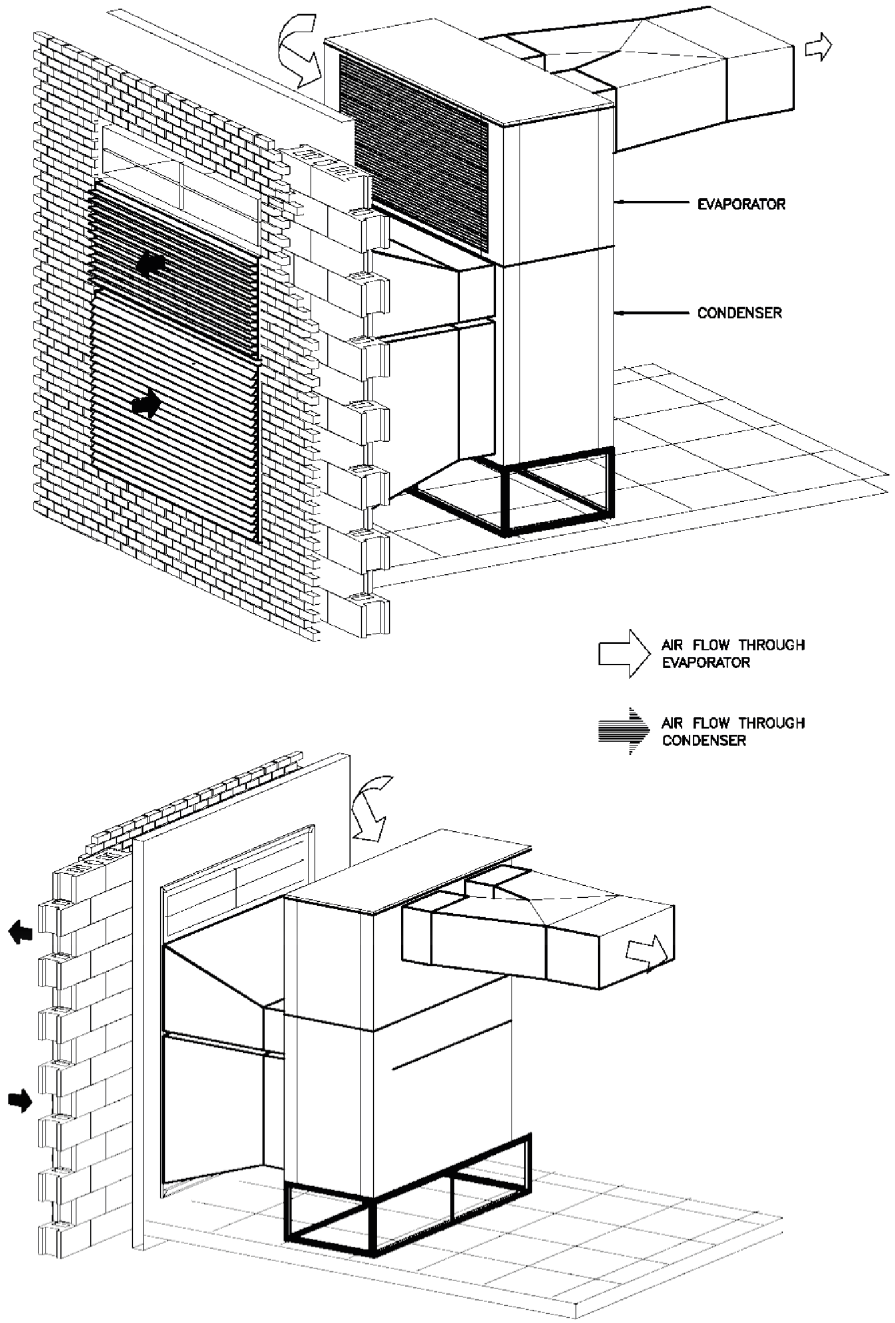
Prior to installation, internally inspect all units. Remove all the access doors and check for visual defects that can occur during transport. Any problems found internally should be immediately reported to the carrier and the manufacturer. Check the refrigerant circuit to ensure no leaks have occurred during shipment.

Install the gauge set to high and low pressure ports to confirm the pressure has been maintained and no leaks have occurred during shipment. To ensure safe operation, repair any damage.

See Appendix A: Unit dimensional drawings for unit dimensional drawings.

**Note:** Record any unit damage on the Bill of Lading and report to carrier and factory immediately. Shipping and handling damages are not warranty items.

**Figure 1: Typical installation configuration**



## Rigging

**WARNING**

Prior to mounting unit, check individual unit weights (Table 1 ) and verify lifting capacity of lifting equipment exceeds weight of units by safe margins. Failure to do so may result in unit damage, personal injury, or even death.

To ensure safe installation of the unit, ensure the base of the unit is continuously supported.

**WARNING**

Determine the actual center of gravity of the unit by performing a test lift. Lifting an unbalanced unit can cause personal injury, or even death.

## Installation site

**CAUTION**

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

### Location

To ensure the unit operates at maximum efficiencies, choose a dry indoor area where the temperature is controlled between 50.0°F and 115.0°F. When choosing a location to install the unit, consider the surrounding area. Occupants may object to common vibration and sound levels associated with the unit.

**WARNING**

Failure to allow adequate space between units, condenser intake and discharge may result in poor unit performance and possible unit failure.

Install thermostats, air supplies, and returns so that each unit operates only on an individual unit control. To assure fast drainage of the condensate run-off, the unit can be slightly pitched in the same direction as the drain pan outlet.

| Unit | Operating weight (condenser only) | Shipping weight (condenser only) |
|---|---|---|
| DSV060C | 920 (620) | 980 (675) |
| DSV096C | 1240 (810) | 1290 (865) |
| DSV120C | 1325 (860) | 1385 (915) |

| Unit | Operating weight (condenser only) | Shipping weight (condenser only) |
|---|---|---|
| DSV144C | 1560 (980) | 1645 (1035) |
| DSV180C | 1720 (1040) | 1800 (1130) |
| DSV240C | 1875 (1210) | 1960 (1270) |
| DSV300C | 2480 (1400) | 2600 (1450) |

**Note:** All weights are in lbs.

## Unit mounting

The 5 ton model ships as a fully assembled integral package. The 8–25 ton models ship with two parts that assemble into a freestanding vertical package on site. The unit is not designed for remote condenser or evaporator installation. It is installed as a packaged system. The factory does not recommend or support any installation or modification of the unit that is not described in this manual. The user is responsible for any damage arising from unrecommended or unsupported installation or modification.

Flanges for all condenser duct connections (intake and discharge), corner securing brackets (securing corners between two sections), and refrigerant tubing couplings ship in the condensing section of the unit for field installation. Duct flanges for evaporator return are incorporated into the filter rack.

Secure floor-mounted units on a solid, level pad or a sturdy stand. Ensure that the unit's base is approximately 6 inches higher than the lower edge of the wall opening. This height allows the condenser air ducts to be pitched away from the unit, offering protection from rain water entering the base pan (see Figure 1). The use of an isolating rubber sheet is recommended to reduce vibration and noise transmission. Ensure that the entire base is continuously supported. The unit can be pitched slightly to ensure efficient drainage of the condensate.

**CAUTION**

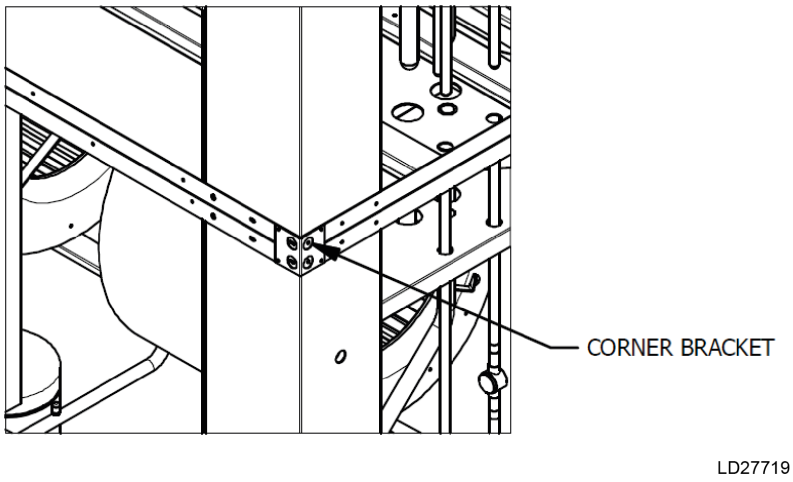
Ensure that the entire base is continuously supported. DO NOT support the unit at its corner points only!

## Evaporator/condenser assembly

### Assembling split units (8–25 ton models)

1. Place the condensing section in the required location.
2. Carefully position the evaporator section on top of the condensing section. Align all the sides, the evaporator motor wire routing hole, and the refrigerant line routing holes.
3. On the evaporator/condenser separation joint, install the securing brackets at all four corners.

**Figure 2: Securing the corner bracket**




Units are provided with couplings to mate refrigerant piping between the condenser and evaporator sections. A unit with the hot gas bypass (HGBP) option is provided with additional copper couplings for HGBP piping. Remove piping shipping brackets in both the condenser and the evaporator section. The brackets secure spun copper ends in the condenser and evaporator sections. They are only required to protect the piping during shipping. They can be discarded in the fully assembled unit.

**DANGER**

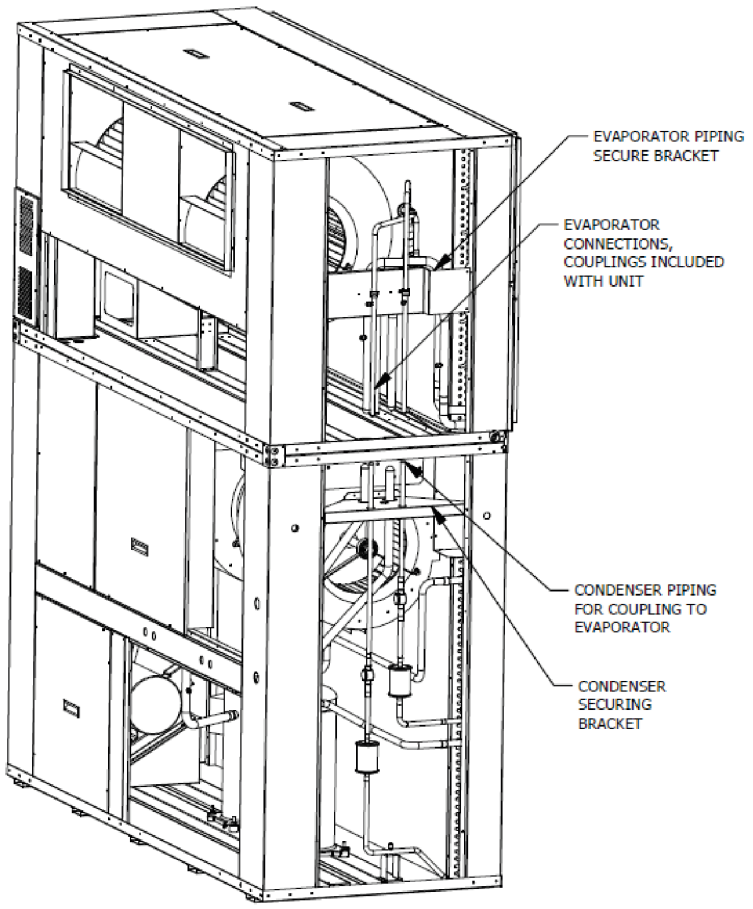
Factory nitrogen-holding charge is 200 psig. This pressure must be released from the evaporator and condenser section BEFORE cutting any refrigerant lines for installation.

4. In the evaporator and condenser, cut off the spun copper ends on each refrigerant pipe. Cut the pipe to an appropriate length to fit the couplings.
5. Ensure that circuit 1 from the condenser connects to the circuit 1 piping in the evaporator. Ensure that circuit 2 from the condenser connects to the circuit 2 piping. Do not cross the circuits.
6. Following common A/C service practices, braze the copper couplings to the refrigerant pipe using a flow of nitrogen gas (max. 1 psi) through the refrigerant piping. This flow minimizes contamination to internal piping. Otherwise, there can be damage to the unit refrigeration components.

   Use the service gauge ports for this procedure to introduce nitrogen flow. Once the procedure is complete, test the pressure with nitrogen (500 psig).
7. Evacuate each circuit to at least 350 microns. If the gauge pressure rises above 500 microns in one minute, the evacuation is incomplete or the system has a leak.
8. Charge the circuit(s) to the value on the unit nameplate (or as detailed in the Start-up and operation section).

9. Install the supplied bushing/clamp into the evaporator wiring routing hole, and pull the wires through into the electrical control panel from the evaporator. Extra plastic bushings are located inside the electrical box. Connect the indoor fan motor leads to the load terminals on VFD fuse terminals.

**Figure 3: Typical piping connections view (8–10 ton model without HGBP shown)**




**⚠ CAUTION**

Do not cross circuits when brazing refrigerant piping between sections.

## Connecting the VFD control wires

1. Connect the VFD 3-pin Molex harness (115/ OR, 116/R, or 117/WH) to the SE control (SEC) terminal P5.
2. Connect 151/R to the common terminal on the EVFR relay in the condenser box.
3. Connect 152/OR to the NO terminal on EVFR relay in the condenser box.
4. For variable air volume (VAV) units, connect the pressure transducer wiring harness (138/WH, 139/BLK) to P4.

5. Connect 140/R pressure transducer EXEC to the SEC (24V FOR OUTPUT) terminal.

### Changing fan speeds

Change the fan speeds on an SEC by changing the parameters in the controller itself. Refer to Appendix E: SEC parameters for DSV units, C generation.

### Separating the units (DSV060C model)

The DSV060C model's parts can be separated to move it though doorways and elevators. However, the unit is not designed or certified for installation as a remote condenser and evaporator.

1. Reclaim the whole refrigerant charge from each compressor circuit.
2. Disconnect the evaporator motor high voltage wires. Pull all the wiring into the evaporator compartment. Remove the bushing/clamp from the routing hole for the evaporator motor wiring.
3. Cut and remove sections of all the liquid and suction refrigerant lines. Make two cuts in each line, approximately 6 inches above and below the evaporator floor/condenser roof.

**⚠ CAUTION**

Use a TUBING CUTTER ONLY - do not use a hacksaw to cut refrigerant tubing otherwise serious damage can occur to refrigeration system!

4. Remove the corner securing the brackets from the outside corners of the cabinet, at the joint line between the evaporator and condenser sections.
5. Remove the evaporator section.
6. For assembly instructions, see Assembling split units (8–25 ton models).

## Condensate trap

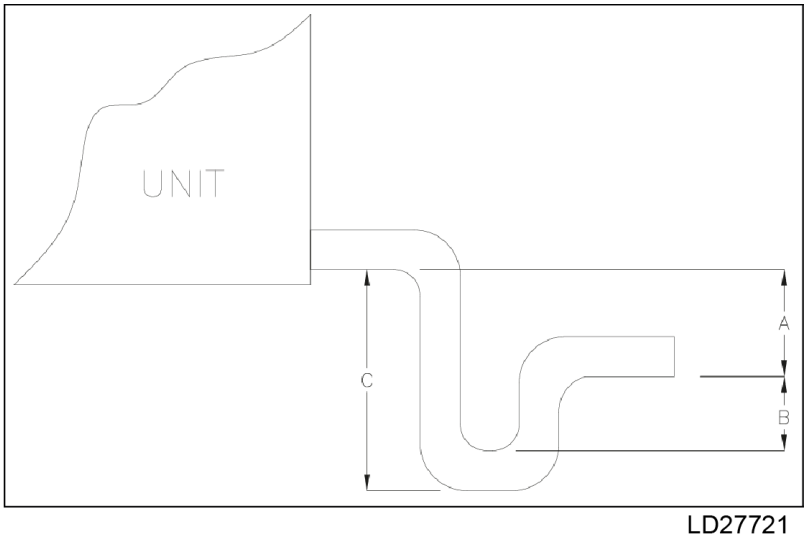
Condensate trap fitting is provided on all units and is 3/4-inch functional performance testing (FPT). The unit requires a field installed external condensate trap. Without a trap, condensate can be thrown into the airstream. This can cause water overflow, unit damage, and property damage. This system must be trapped according to a negative system pressure (draw-through). Use the dimensions in Figure 4. Adhere to local codes for piping the external trap and condensate.

**Example: trapping a system up to 2 inches external static pressure**

**ⓘ Note:**

- A = (1 inch for each inch of maximum negative static pressure) + 1 inch
- B = Half of A
- C =A + B + pipe diameter

**Figure 4: Dimensions for trapping a negative pressure system**




**Note:** A = (2 inches) + 1 inch B = A/2 C = A + B + 3/4 inches = 5-1/4 inches

## Ductwork

When installing ductwork, adhere to local codes. Where possible, minimize duct runs and avoid abrupt changes in direction. Allow ample access space to service the coils and change the filters. Perform regular maintenance on the ducts to increase the unit life, maintain efficient operation, and reduce the accumulation of dust and debris.

To not exceed the maximum external static values, refer to blower performance charts in Fan performance, engineer duct runs, and accessory pressure drop. Ensure continuous running of the condenser intake ambient air temperature does not exceed 115.0°F. The condenser exhaust discharges into an open area to prevent the short cycling of hot exhaust condenser air with the condenser intake.

### Air temperature sensors

**Figure 5: RAT SAT sensor**

**Figure 6: Extension wiring**

Each unit is equipped with standard SA temperature (SAT) and RAT sensors. Sensors ship inside the electrical box, the wire tied to the wiring. In addition to sensors, 8-foot long wiring extensions also ship inside the electrical box (see Figure 5).

In order to insert a temperature sensor, a 5/16-inch hole must be field drilled in the duct work and the sensor inserted through the hole. Small wings keep the sensor secured in the hole.

The RAT sensor can be installed in a pre-punched hole on the filter frame. There are two holes punched on both sides of the filter frame, halfway through the height of the filter frame. The extension wiring can be easily routed out of the unit through 7/8-inch prepunched holes that are located on both sides of the unit.

The location of the sensor has to be chosen according to local codes and installation practices.

## Louver sizing guidelines

An important issue in obtaining optimum performance from indoor air conditioners is proper selection of the condenser intake and discharge louvers. In practice, outdoor air-cooled units intake and discharge their cooling without restriction. However, indoor units must first overcome the resistance of grilles or louvers at the outside wall and then the restriction of any interconnecting ductwork.

The DSH's indoor air-cooled air conditioners are designed to accommodate the external static pressure loss associated with properly sized storm proof louvers. A storm proof louver typically has a free area approximately 40–45% of the actual louver size. To determine the free area required for any given unit, adhere to the following guidelines:

- The size condenser air intakes are for 350–600 feet/minute nominal velocity. The maximum recommendation is 700 feet/minute.
- The size condenser air discharge is for 1,200–1,500 feet/minute nominal velocity. The maximum recommendation is 1,700 feet/minute.

Louvers with higher velocities than stated above can be employed. This is at the discretion of the engineer or installer provided that the total air pressure drop does not exceed the capability of the condenser fan and motor.

Low restriction louvers with shallow blade angles can allow higher face velocities without excessive static pressure loss. Exceeding the static pressure capability of the condenser fan results in insufficient condenser air volume. This causes a loss in system capacity and can cause compressor shutdown during high ambient periods. Where applicable in such cases, the installation of an oversize condenser motor/drive may be considered.

**Note:** As a general rule, these velocities require an intake louver sized approximately 1.25 to 1.5 times the dimensions of the duct connection on the unit, and a discharge louver sized approximately 1.5 to 2 times the duct connection dimensions

To ensure the unit does not short circuit, only use louver sections that provide different deflection angles for air discharge and air intake. Protect the unit from weather such as rain or snow entering through the condenser air intake.

Pitch all outdoor air ducts away from the unit and toward the outside wall. Connect all ducts to the unit with canvas section duct connectors or choose another suitable noise and vibration absorbing device.

**Note:** The manufacturer will not accept any liability resulting from incorrect installation of this equipment. Follow installation instructions carefully.

# Variable frequency drive (VFD)

## Indoor fan VFD

A standard VFD controller for the evaporator (indoor) fan applies on 8–25 ton models. Mounted in the evaporator module section, the VFD allows the operator to set the duct static pressure or to control discrete indoor fan speed steps. To meet the desired supply duct static setpoint or a specific discrete speed step, the VFD controls the evaporator fan motor's frequency (or speed). For reliable operation, the unit must have a factory installed HGBP circuit on refrigeration circuit # 1 for units with a duct pressure control option. Unless requested by the customer as a selectable feature, the unit setup for discrete speed steps does not require HGBP for reliable operation.

In 8 and 12 ton units, the standard discrete speed step configuration is that the VFD has been setup for three automatically adjusted discrete speeds. 15, 20, and 25 ton units feature 4 discrete speed steps. In both cases, the discrete fan speeds are matched and adjusted automatically based on the active cooling stage.

**Note:** The unit does not carry a failsafe circuit to bypass the factory installed VFD and run the evaporator or condenser fan in the event of a VFD malfunction.

The VFD is factory mounted and wired. The installer must provide and field install two sensor tubing lines complete with static pressure probes (except to the configuration for discrete speed application). The installer must field wire the fan power wiring between the evaporator VFD and the unit electrical box (located in the condenser section) because the unit ships factory-split. For units with a static pressure control option, low voltage wiring from the pressure transducer must be connected to the unit controller (see the unit schematic for more details).

The power (and optional low voltage wiring for transducer) wiring can be found inside the VFD enclosure. No extra power wiring is required; sufficient length is provided. The VFD option does not include an evaporator fan bypass circuit in case of microdrive failure. Microdrive must be replaced to re-activate the unit. In case of a VFD failure, the evaporator fan stops running. However, unit compressors continue to run until a low pressure safety trip activates.

For detailed installation and operation instructions, refer to *Variable Frequency Drive Installation and Operation Instructions* (*Form 145.13-NO2*).

**Note:** Do not run evaporator fan motor below 30Hz otherwise coil freeze-up and nuisance lock-outs may occur.

**CAUTION**

Building excessive ductwork pressure can cause damage to unit or personnel.

### Outdoor fan VFD

If the unit must operate at an outdoor ambient temperature below 50.0°F, install the optional VFD condenser fan option to maintain an acceptable condensing pressure. The optional VFD controller for the condenser fan is available on 8–25 ton models (208-230/3/60 and 460/3/60 power supply only).

The purpose of this option is to control high head pressure during low ambient conditions. The VFD for the condenser fan is available as either a factory built option or field installed kit. The field installed kit comes complete with a manual bypass electrical circuit. In the unlikely case of VFD failure, it can be used to revert condenser fan control back to standard starter mode.

Mounted in the condenser corner post (or the special enclosure for a field kit VFD), the VFD allows the operator to set the high head pressure level (the factory default is 320 psig). To meet the desired refrigerant pressure setpoint, the VFD controls the condenser fan motor's frequency (speed). The pressure transducer must be only connected to circuit #1.

For detailed installation and operation instructions, refer to the *Variable Frequency Drive manual* (*Form 145.13-NO2*).

## Hot gas bypass (HGBP)

To allow for low cooling load operation, a direct-acting pressure-modulating bypass control valve is installed on the system #1 discharge line. To maintain a desired minimum evaporator pressure, use this valve to divert high temperature, high pressure refrigerant around the TXV. HGBP is standard on all units with variable air volume (VAV) and optional on units with constant volume (CV).

### Adjusting HGBP setpoint

When the HGBP valve opens, select the coil suction pressure or coil temperature by adjusting the screw on the HGBP valve.

To set the load, run the unit and cool down the evaporator coil. To do this, either shut the fans or block the airflow until the suction pressure drops at least 5 psi below the chosen evaporator coil setpoint. Next, allow the bypassed gas to raise the pressure. The screw spring adjustment can be set until the HGBP valve closes at the chosen setpoint.

The pressure of the evaporator coil is set to maintain an evaporator coil temperature above the point that frost and coil freeze-up can form.

## Airside economizer (ASE)

The optional airside economizer mixing box is designed to attach to the return air (RA) side of the evaporator. Mixing comes with low-leakage opposed blade dampers. The economizer is used to provide ventilation and free cooling for the DSH series of horizontal air handlers.

The economizer is set up through the LCD keypad display and joystick located on the unit SEC board or through a recommended mobile access portal (MAP) gateway, available for purchase from the factory - see *Mobile Access Portal Gateway Product Bulletin* (*LIT-12011884*). The control board is mounted inside of the unit main electrical box.

Access to the mixing box is not required to setup ASE sequence of operation. Communication between SEC board and ASE board automatically establishes through an SA bus connection. The factory supplied economizer includes: economizer module, mixing box, actuator, enthalpy sensor, temperature sensor, dampers, and wiring harness. See Appendix D: Low voltage unit wiring schematics for economizer electrical wiring schematics or *Airside Economizer Kit Installation and Operation Instructions* (*Form 145.10-NO2*) for more details on installation and application.

### Sequences of operation

Several functions can drive the economizer, including minimum position, free cooling, economizer loading, and minimum outdoor air supply.

### Economizer minimum position

The economizer minimum position is set during occupied mode when the outside air (OA) is not suitable for free cooling. The position of the damper is set proportionally between the Economizer Minimum Position and the Economizer Minimum Position Low Speed Fan setpoints in relation to the VFD output percentage.

ⓘ **Note:** On a constant volume single speed supply fan system both setpoints should be set to the same value.

### Free cooling

Four types of free cooling options are available: dry bulb changeover, single enthalpy, dual enthalpy changeover, and auto.

**Dry Bulb Changeover** – For dry bulb economizer operation, the outside air is suitable for free cooling if the outside air temperature (OAT) is 1.0°F below the Economizer OAT Enable setpoint and 1.0°F below the RA temperature (RAT). Free cooling is no longer available if the OAT rises above either the Economizer OAT Enable setpoint or the RAT.

**Single/Dual Enthalpy Changeover** – For single enthalpy economizer operation, the outside air is suitable for free cooling if the OA enthalpy is at least 1 Btu/lb below the economizer OA enthalpy setpoint and the OAT is no greater than the RAT plus 9.0°F.

If the OAT rises above the RAT plus 10.0°F, free cooling is no longer available. The OAT must drop to no greater than RAT plus 9.0°F to enter free cooling again.

Free cooling is no longer available if the OA enthalpy rises above the economizer OA enthalpy setpoint. For dual enthalpy economizer operation, the OA enthalpy must be lower than the RA enthalpy by 1 Btu/lb and the OAT is no greater than the RAT plus 9.0°F.

**Auto** – The control determines the type of free cooling changeover based on which sensors are present and reliable. Conditions include:

- Return and outside air dry bulb = dry bulb changeover
- Return and outside air dry bulb and outside air humidity = single enthalpy
- Return and outside air dry bulb and return and outside air humidity = dual enthalpy
- If either the return or outside air dry bulb sensors are unreliable, free cooling is not available

For detailed installation and operation instructions, refer to *Airside Economizer Kit* (*Form 145.10-NO2*).

## Dimensions

**Table 1: Dimensions**

| Vertical unit | Economizer | Mixing box dimension | | | Damper dimension | |
|---|---|---|---|---|---|---|
| | | A | B | C | D | E |
| DSV060C | VASE-060C-1 | 49.00 | 27.75 | 24.00 | 40.00 | 14.00 |
| DSV096C/120C | VASE-120C-1 | 66.50 | 36.25 | 26.50 | 58.00 | 19.50 |
| DSV144C | VASE-144C-1 | 78.00 | 35.75 | 28.50 | 70.00 | 19.50 |
| DSV180C | VASE-180C-1 | 82.00 | 37.75 | 28.50 | 74.00 | 21.50 |
| DSV240C | VASE-240C-1 | 86.00 | 41.00 | 34.00 | 78.00 | 25.00 |
| DSV300C | VASE-300C-1 | 104.00 | 45.00 | 34.00 | 90.00 | 25.00 |

Economizer -- features

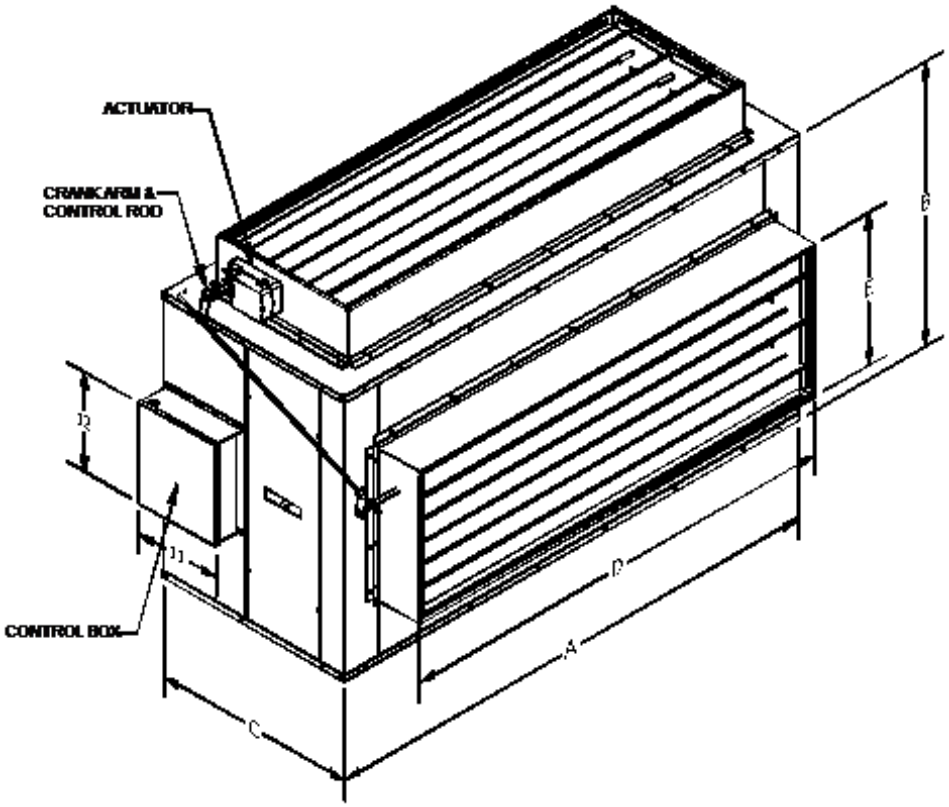
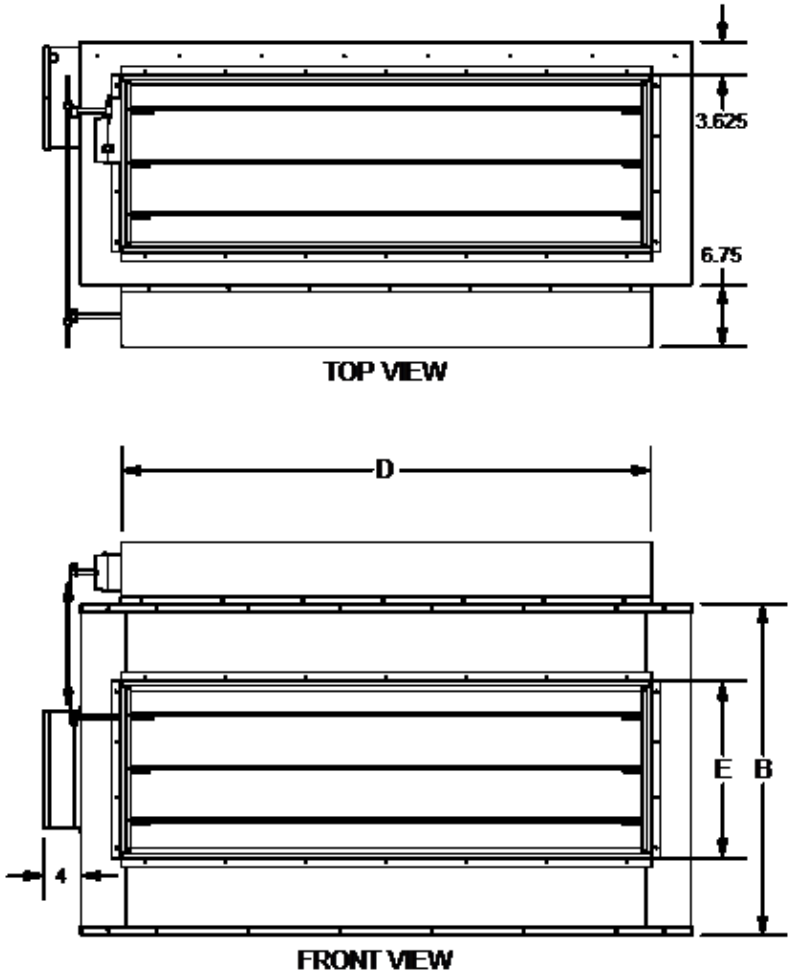


**Figure 7: Economizer -- top view and size view**




## Discharge plenum

An optional discharge plenum is available for field mounting to the top of the evaporator for 5–25 ton models. The discharge plenum is only compatible with the top (vertical) discharge evaporator blower configuration. It is a universal fit for both rear and front RA configurations of the evaporator section. For the 5–10 ton models, they come with a single front grille and single side grilles. The 12–25 ton models come with double front grilles and single side grilles.

The discharge plenum is made of heavy gauge sheet metal with supply grilles mounted on three sides (front, left, and right sides). It is secured to the unit using the included four corner brackets.

**Table 2: Plenum dimensions**

| Model | W | D | H | Side grille | Front grille |
|---|---|---|---|---|---|
| DSV060C | 52 | 29 | 24 | 16x12 (2x) | 32x12 |
| DSV096C | 71.5 | 32 | 24 | 20x18 (2x) | 48x18 |
| DSV120C | 71.5 | 32 | 24 | 20x18 (2x) | 48x18 |
| DSV144C | 82.5 | 34 | 28 | 24x20 (2x) | 28x20 (2x) |

**Table 2: Plenum dimensions**

| Model | W | D | H | Side grille | Front grille |
|---|---|---|---|---|---|
| DSV180C | 86.5 | 34 | 28 | 24x20 (2x) | 28x20 (2x) |
| DSV240C | 90.5 | 34 | 28 | 24x20 (2x) | 32x20 (2x) |
| DSV300C | 108.5 | 34 | 28 | 24x20 (2x) | 32x20 (2x) |

**Figure 8: Evaporator with discharge plenum**

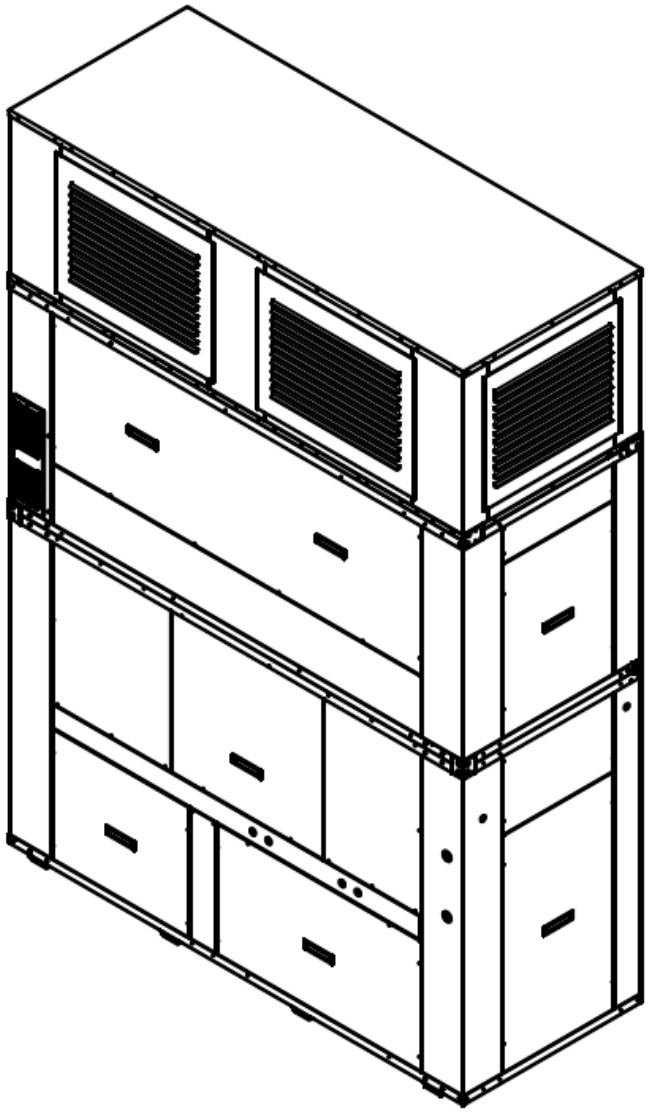


**Figure 9: Double front grille discharge plenum**

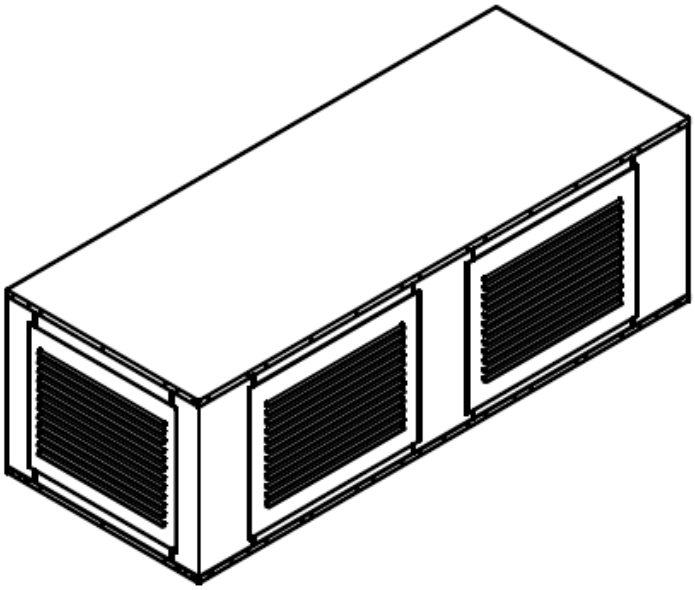
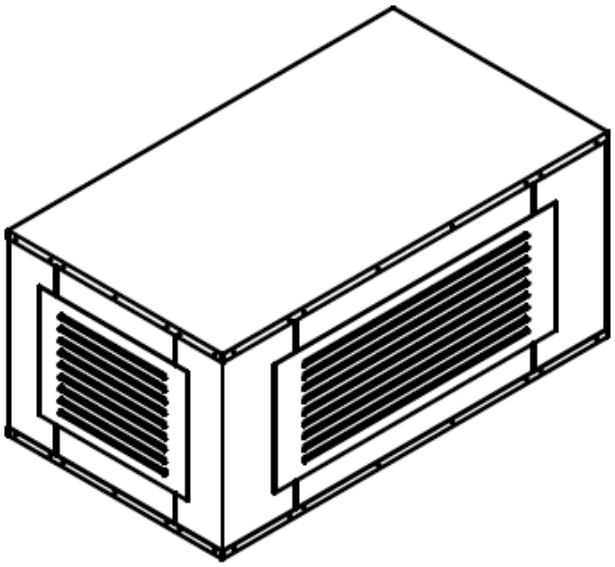


**Figure 10: Single front grille discharge plenum**



## Low ambient damper installation

If the unit must operate at an outdoor ambient below 50.0°F, install the optional low ambient damper kit. This kit maintains an acceptable condensing pressure. Install the damper directly onto the intake duct connection (see Figure 11). Determine the damper position by the refrigerant pressure. Depending on a proportional pressure control module's output signal, a direct-coupled electric damper actuator motor drives the damper open or closed.

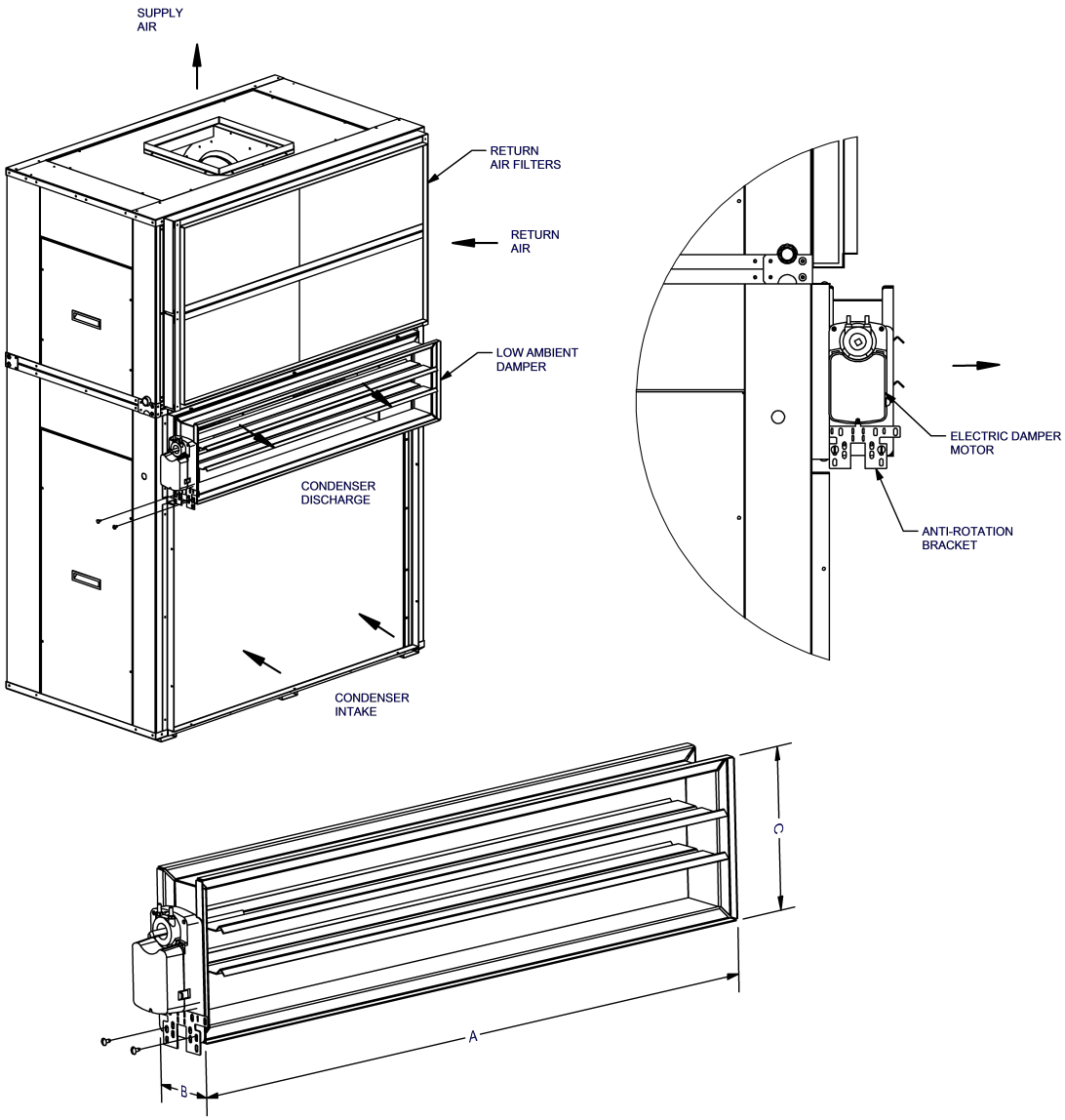
A pressure transducer senses the high-side refrigerant pressure through a service access port. The port is located on the liquid refrigerant line leaving the condenser. The pressure controller, complete with terminal connection blocks for wiring, attaches to a fieldinstalled mounting bracket.

The kit includes an appropriate mounting hardware for the pressure control module and the damper actuator motor. There is also a routing hole in the condenser corner panel, near the actuator mounting location, for installation of the plenum-rated cable between the motor and the control module.

**Note:** On dual compressor units, the pressure transducer MUST be connected to the #1 circuit liquid line fitting. Connection to the second stage refrigerant circuit will result in system malfunction.

For detailed installation instructions, refer to the supplementary *Low Ambient Damper Kit Installation and Operation Instructions* (*Form 145.10-IOM4*).

**Figure 11: Low ambient dampers**




| Kit # | Model | A | B | C |
|---|---|---|---|---|
| VADK-060C-1 | DSV060C | 47.375 in. | 5.0 in. | 11.875 in. |
| VADK-120C-1 | DSV096C/DSV120C | 66.375 in. | 5.0 in. | 14.125 in. |
| VADK-144C-1 | DSV144C | 77.5 in. | 5.0 in. | 14.125 in. |

| Kit # | Model | A | B | C |
|---|---|---|---|---|
| VADK-180C-1 | DSV180C | 81.5 in. | 5.0 in. | 12.125 in. |
| VADK-240C-1 | DSV240C | 85.5 in. | 5.0 in. | 12.875 in. |
| VADK-300C-1 | DSV300C | 103.5 in. | 5.0 in. | 12.875 in. |

# Evaporator blower discharge conversion

All models can be factory ordered with either front or top indoor fan discharge. This conversion does not apply to conversions between rear and front air return because the unit cannot be converted this way. Each unit can be field converted between vertical and horizontal air supply, but the RA configuration is not field convertible.

## Converting the fan discharge

The procedure for converting the fan discharge is similar on all models. Original drive belts must be replaced; contact Source1 for part numbers. See Drive belts for additional belt information.

1. Remove the panel attachment screws on the alternate location access panel. Remove the panel and set it aside.
2. Remove the blower drive belt on all models with base mounted motors.
3. Remove the panel attachments screws on the blower mounting panel.

**⚠ WARNING**

Do not remove fasteners securing blowers to the panel! The blowers are to remain attached to the mounting panel at all times.

4. Carefully remove the blower panel assembly from the evaporator cabinet. Do not allow blower housings to contact the evaporator coil during the removal. On some models, the housings have to be rotated to exit through the panel opening.
5. Interchange the blower panel assembly with the position of the alternate access panel.

   Exercise care in locating the panel. Do not allow blower housings to contact the evaporator coil. Install the attachment screws and tighten securely.
6. Install the blank access panel into the remaining evaporator opening. Fasten it securely.
7. Install the new drive belts.
8. Adjust the drive belts to the appropriate tension. Test run the blower and observe the operation for unusual sounds or vibration.

# Electrical wiring

## High voltage wiring

Follow local electrical codes when making electrical connections. Units are completely factory wired for normal supply voltages (for example, 208-230/460/575V/3Ph/60Hz). Confirm the unit specifications by checking the unit data plate. All electrical components are accessible through an independent electrical panel located on the front face of the condensing section. The electrical control boxes are located behind outer access panels. There are wiring diagrams printed on 11 x 17 inches paper available in plastic pouches attached to the unit.

ⓘ **Note:** Ensure evaporator motor rotation is correct upon unit start-up. Switch any two wires at contactor if blower rotation is not correct.

**WARNING**

Disconnect and lock out power when servicing unit. Unit may start automatically if power is not disconnected. Failure to do so may result in personal injury or death due to electrical shock.

If canvas flexible joints are used on the ductwork, install a ground wire to the ductwork as well.

**WARNING**

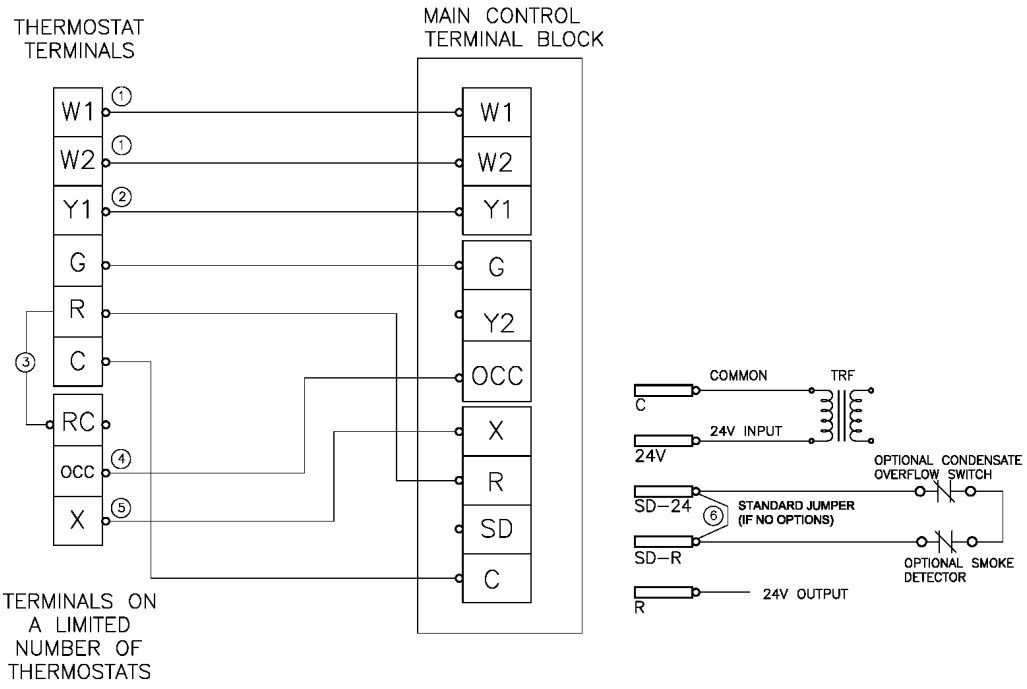
All wiring must comply with applicable local and national codes (NEC). Type and location of disconnect switches must comply with all applicable codes.

## Low voltage wiring

For low voltage thermostat wiring, an 18 gauge wire can be used for up to 100 foot lengths. A single or multiple stage thermostat (up to four cooling stages) must be used depending on size of the unit. Locate the thermostat on an inside wall approximately 56 inches above the floor. At this location, it is not subject to drafts, sun exposure, or heat from electrical fixtures or appliances.

Follow the manufacturer's instructions enclosed with the thermostat for the general installation procedure. Use the seven color-coded, insulated wires to connect the thermostat to the unit.

**Figure 12: Typical control diagram of one stage cooling/two stage heating for DSV060C, DSH024C, DSH048C and DSH060C**

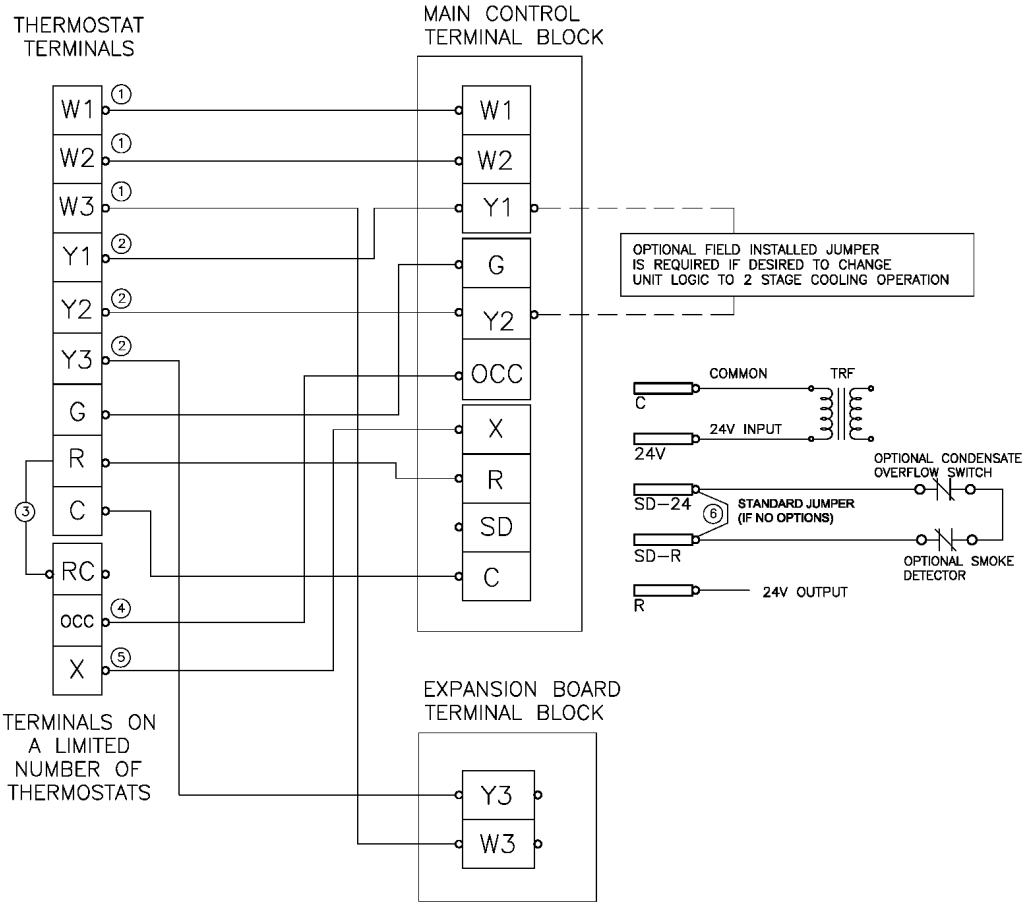



**Note:**

1. Unit is capable of supporting up to 2 stages of discrete heating.

2. Unit is designed to support 2 stages of discrete cooling.
3. Jumper is required for any combination of R, RC, or RH.
4. OCC is an output from the thermostat to indicate the Occupied condition.
5. X in an input to thermostat to display Error Status.
6. Jumper is required, if no options are installed between SD-24 and SD-R.

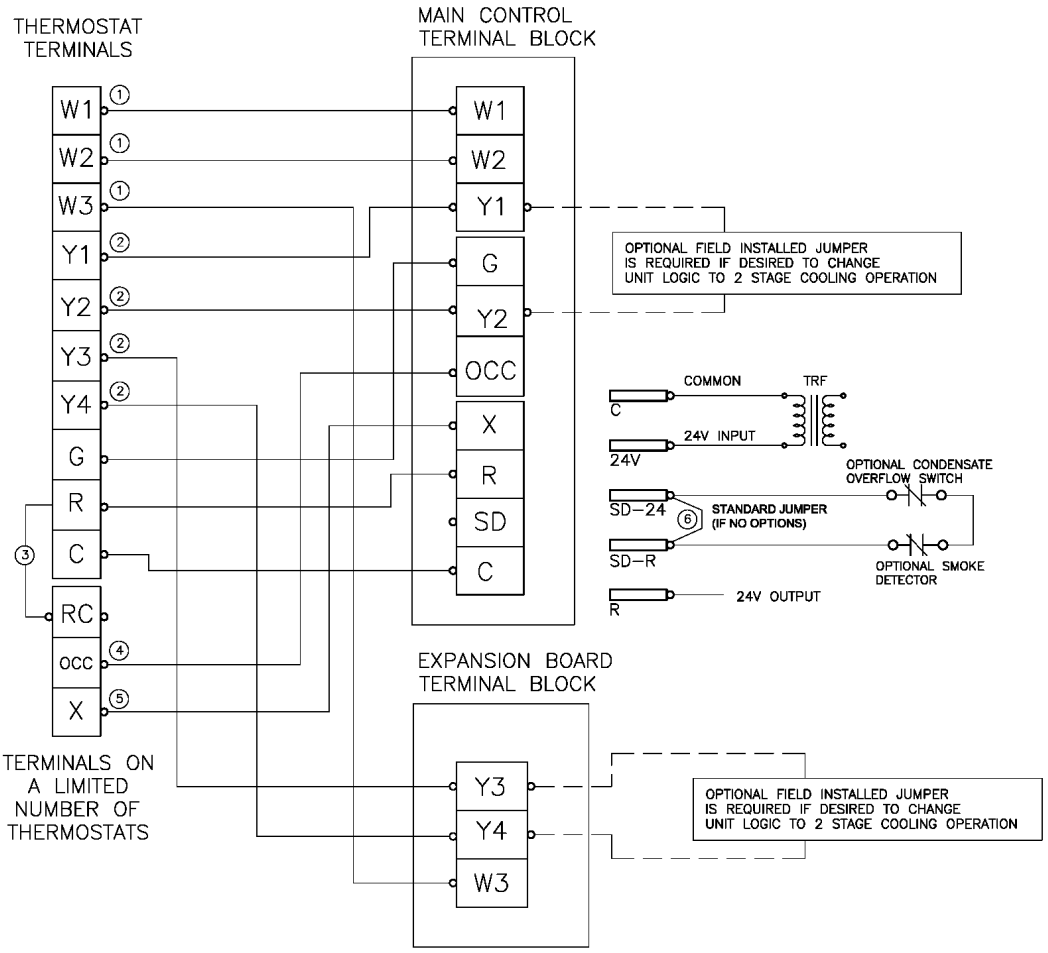
**Figure 13: Typical control diagram of three stage cooling/three stage heating for DSH096C, DSV120C, and DSV144C**




**Note:**

1. Unit is capable of supporting up to 3 stages of discrete heating.
2. Unit is designed to support 3 stages of discrete cooling.
3. Jumper is required for any combination of R, RC, or RH.
4. OCC is an output from the thermostat to indicate the Occupied condition.
5. X in an input to thermostat to display Error Status.
6. Jumper is required, if no options are installed between SD-24 and SD-R.

**Figure 14: Typical control diagram of four stage cooling/three stage heating for DSH120C, DSV180C, DSV240C, and DSV300C**




**Note:**

1. Unit is capable of supporting up to 3 stages of discrete heating.
2. Unit is designed to support 4 stages of discrete cooling.
3. Jumper is required for any combination of R, RC, or RH.
4. OCC is an output from the thermostat to indicate the Occupied condition.
5. X in an input to thermostat to display Error Status.
6. Jumper is required, if no options are installed between SD-24 and SD-R.

# Electrical data

### Table 3: Standard evaporator motor electrical data

| Model # | Voltage | Compressor #1 | | | | Compressor #2 | | | | Evaporator fan | | Condenser fan | | MCA | Max fuse/ CCT. bkr. amp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qty | | RLA | LRA | Qty | | RLA | LRA | Hp | FLA | Hp | FLA | | |
| DSV060C2 | 208-230/3/60 | 1 | @ | 15.9 | 110.0 | | | | | 1.00 | 3.1 | 1.50 | 4.5 | 27.48 | 40 |
| DSV060C4 | 460/3/60 | 1 | @ | 7.1 | 52.0 | | | | | 1.00 | 1.5 | 1.50 | 2.2 | 12.58 | 15 |
| DSV060C5 | 575/3/60 | 1 | @ | 5.1 | 39.5 | | | | | 1.00 | 1.2 | 1.50 | 1.8 | 9.38 | 15 |
| DSV096C2 | 208–230/3/60 | 1 | @ | 14.0 | 83.1 | 1 | @ | 13.8 | 83.1 | 1.00 | 3.1 | 2.00 | 5.8 | 40.20 | 50 |
| DSV096C4 | 460/3/60 | 1 | @ | 6.4 | 41.0 | 1 | @ | 6.2 | 41.0 | 1.00 | 1.5 | 2.00 | 2.9 | 18.60 | 25 |
| DSV096C5 | 575/3/60 | 1 | @ | 4.6 | 33.0 | 1 | @ | 4.9 | 33.0 | 1.00 | 1.2 | 2.00 | 2.3 | 14.15 | 15 |
| DSV120C2 | 208–230/3/60 | 1 | @ | 16.5 | 110.0 | 1 | @ | 16.0 | 110.0 | 1.50 | 4.5 | 3.00 | 8.5 | 49.63 | 60 |
| DSV120C4 | 460/3/60 | 1 | @ | 7.2 | 52.0 | 1 | @ | 7.8 | 52.0 | 1.50 | 2.2 | 3.00 | 4.2 | 23.20 | 30 |
| DSV120C5 | 575/3/60 | 1 | @ | 5.7 | 43.08 | 1 | @ | 5.7 | 38.9 | 1.50 | 1.8 | 3.00 | 3.4 | 18.03 | 20 |
| DSV144C2 | 208–230/3/60 | 1 | @ | 17.6 | 136.0 | 1 | @ | 19.0 | 123.0 | 2.00 | 5.8 | 3.00 | 8.5 | 55.30 | 70 |
| DSV144C4 | 460/3/60 | 1 | @ | 8.5 | 66.1 | 1 | @ | 9.7 | 62.0 | 2.00 | 2.9 | 3.00 | 4.2 | 27.43 | 35 |
| DSV144C5 | 575/3/60 | 1 | @ | 6.3 | 55.3 | 1 | @ | 7.4 | 50.0 | 2.00 | 2.3 | 3.00 | 3.4 | 20.98 | 25 |
| DSV180C2 | 208–230/3/60 | 2 | @ | 25.3 | 184.0 | | | | | 3.00 | 8.5 | 5.00 | 14.0 | 79.43 | 100 |
| DSV180C4 | 460/3/60 | 2 | @ | 9.6 | 84.0 | | | | | 3.00 | 4.2 | 5.00 | 6.6 | 32.40 | 40 |
| DSV180C5 | 575/3/60 | 2 | @ | 8.4 | 60.0 | | | | | 3.00 | 3.4 | 5.00 | 5.3 | 27.60 | 35 |
| DSV240C2 | 208–230/3/60 | 2 | @ | 32.6 | 240.0 | | | | | 5.00 | 14.0 | 7.50 | 20.4 | 107.75 | 125 |
| DSV240C4 | 460/3/60 | 2 | @ | 14.8 | 130.0 | | | | | 5.00 | 6.6 | 7.50 | 9.7 | 49.60 | 60 |
| DSV240C5 | 575/3/60 | 2 | @ | 11.1 | 93.7 | | | | | 5.00 | 5.3 | 7.50 | 7.8 | 38.08 | 45 |
| DSV300C2 | 208-230/3/60 | 2 | @ | 35.4 | 240.0 | | | | | 7.50 | 20.4 | 10.00 | 25.0 | 125.05 | 150 |
| DSV300C4 | 460/3/60 | 2 | @ | 16.5 | 140.0 | | | | | 7.50 | 9.7 | 10.00 | 12.5 | 59.33 | 70 |
| DSV300C5 | 575/3/60 | 2 | @ | 12.9 | 107.6 | | | | | 7.50 | 7.8 | 10.00 | 10.0 | 46.83 | 50 |

### Table 4: Oversized evaporator motor electrical data

| Model # | Voltage | Compressor #1 | | | | Compressor #2 | | | | Evaporator fan | | Condenser fan | | MCA | Max fuse/ CCT. bkr. amp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qty | | RLA | LRA | Qty | | RLA | LRA | Hp | FLA | Hp | FLA | | |
| DSV060C2 | 208-230/3/60 | 1 | @ | 15.9 | 110.0 | | | | | 1.50 | 4.5 | 1.50 | 4.5 | 28.88 | 40 |
| DSV060C4 | 460/3/60 | 1 | @ | 7.1 | 52.0 | | | | | 1.50 | 2.2 | 1.50 | 2.2 | 13.28 | 15 |
| DSV060C5 | 575/3/60 | 1 | @ | 5.1 | 39.5 | | | | | 1.50 | 1.8 | 1.50 | 1.8 | 9.98 | 15 |
| DSV096C2 | 208–230/3/60 | 1 | @ | 14.0 | 83.1 | 1 | @ | 13.8 | 83.1 | 1.50 | 4.5 | 2.00 | 5.8 | 41.60 | 50 |
| DSV096C4 | 460/3/60 | 1 | @ | 6.4 | 41.0 | 1 | @ | 6.2 | 41.0 | 1.50 | 2.2 | 2.00 | 2.9 | 19.30 | 25 |
| DSV096C5 | 575/3/60 | 1 | @ | 4.6 | 33.0 | 1 | @ | 4.9 | 33.0 | 1.50 | 1.8 | 2.00 | 2.3 | 14.75 | 15 |
| DSV120C2 | 208–230/3/60 | 1 | @ | 16.5 | 110.0 | 1 | @ | 16.0 | 110.0 | 2.00 | 5.8 | 3.00 | 8.5 | 49.63 | 60 |

## Table 4: Oversized evaporator motor electrical data

| Model # | Voltage | Compressor #1 | | | | Compressor #2 | | | | Evaporator fan | | Condenser fan | | MCA | Max fuse/ CCT. bkr. amp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qty | | RLA | LRA | Qty | | RLA | LRA | Hp | FLA | Hp | FLA | | |
| DSV120C4 | 460/3/60 | 1 | @ | 7.2 | 52.0 | 1 | @ | 7.8 | 52.0 | 2.00 | 2.9 | 3.00 | 4.2 | 23.20 | 30 |
| DSV120C5 | 575/3/60 | 1 | @ | 5.7 | 43.08 | 1 | @ | 5.7 | 38.9 | 2.00 | 2.3 | 3.00 | 3.4 | 17.43 | 20 |
| DSV144C2 | 208–230/3/60 | 1 | @ | 17.6 | 136.0 | 1 | @ | 19.0 | 123.0 | 3.00 | 8.5 | 3.00 | 8.5 | 58.00 | 70 |
| DSV144C4 | 460/3/60 | 1 | @ | 8.5 | 66.1 | 1 | @ | 9.7 | 62.0 | 3.00 | 4.2 | 3.00 | 4.2 | 28.73 | 35 |
| DSV144C5 | 575/3/60 | 1 | @ | 6.3 | 55.3 | 1 | @ | 7.4 | 50.0 | 3.00 | 3.4 | 3.00 | 3.4 | 22.08 | 25 |
| DSV180C2 | 208–230/3/60 | 2 | @ | 25.3 | 184.0 | | | | | 5.00 | 14.0 | 5.00 | 14.0 | 84.93 | 110 |
| DSV180C4 | 460/3/60 | 2 | @ | 9.6 | 84.0 | | | | | 5.00 | 6.6 | 5.00 | 6.6 | 34.80 | 40 |
| DSV180C5 | 575/3/60 | 2 | @ | 8.4 | 60.0 | | | | | 5.00 | 5.3 | 5.00 | 5.3 | 29.50 | 35 |
| DSV240C2 | 208–230/3/60 | 2 | @ | 32.6 | 240.0 | | | | | 7.50 | 20.4 | 7.50 | 20.4 | 114.15 | 125 |
| DSV240C4 | 460/3/60 | 2 | @ | 14.8 | 130.0 | | | | | 7.50 | 9.7 | 7.50 | 9.7 | 52.70 | 60 |
| DSV240C5 | 575/3/60 | 2 | @ | 11.1 | 93.7 | | | | | 7.50 | 7.8 | 7.50 | 7.8 | 40.58 | 50 |
| DSV300C2 | 208-230/3/60 | 2 | @ | 35.4 | 240.0 | | | | | 7.50 | 20.4 | 10.00 | 25.0 | 125.05 | 150 |
| DSV300C4 | 460/3/60 | 2 | @ | 16.5 | 140.0 | | | | | 7.50 | 9.7 | 10.00 | 12.5 | 59.33 | 70 |
| DSV300C5 | 575/3/60 | 2 | @ | 12.9 | 107.6 | | | | | 7.50 | 7.8 | 10.00 | 10.0 | 46.83 | 50 |

# Fan performance

### Table 5: DSV060C supply air blower performance

| Supply CFM | Available external static pressure - IWG* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Field supplied low static drive | | | | Standard drive + 1HP | | | | | | Optional hi-static + 1.5HP | | | | | |
| **1600** | 408 | 0.13 | 555 | 0.29 | 652 | 0.38 | 739 | 0.45 | 819 | 0.54 | 893 | 0.63 | 963 | 0.71 | 1029 | 0.81 |
| **1800** | 459 | 0.20 | 600 | 0.39 | 689 | 0.48 | 770 | 0.58 | 846 | 0.66 | 917 | 0.76 | 984 | 0.86 | 1047 | 0.96 |
| **2000** | 510 | 0.25 | 647 | 0.51 | 729 | 0.61 | 806 | 0.71 | 877 | 0.81 | 944 | 0.92 | 1008 | 1.00 | 1069 | 1.14 |
| **2200** | 561 | 0.35 | 695 | 0.65 | 772 | 0.76 | 843 | 0.88 | 911 | 0.99 | 975 | 1.10 | 1036 | 1.23 | 1094 | 1.34 |
| **2400** | 612 | 0.45 | 745 | 0.83 | 816 | 0.95 | 883 | 1.07 | 947 | 1.19 | 1008 | 1.31 | 1066 | 1.44 | - | - |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 6: DSV060C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive 1.5HP | | | | | | | | Hi-static drive | | | | | |
| **3100** | 513 | 0.50 | 615 | 0.65 | 706 | 0.80 | 790 | 0.98 | 867 | 1.15 | 938 | 1.33 | 1006 | 1.50 |

### Table 7: DSV096C supply air blower performance

| Supply CFM | Available external static pressure - inches W.C. | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Low static drive | | | | Standard factory drive + 1HP | | | | | | Optional hi-static + 1.5HP | | | | | | | | | |
| **2600** | 496 | 0.28 | 605 | 0.40 | 701 | 0.50 | 788 | 0.62 | 868 | 0.74 | 947 | 0.89 | 1016 | 1.04 | 1045 | 1.19 | 1075 | 1.35 | 1105 | 1.50 |
| **2900** | 514 | 0.36 | 618 | 0.48 | 710 | 0.60 | 794 | 0.72 | 872 | 0.86 | 944 | 0.98 | 1017 | 1.12 | 1075 | 1.28 | 1128 | 1.42 | - | - |
| **3200** | 538 | 0.44 | 636 | 0.58 | 725 | 0.70 | 806 | 0.84 | 881 | 0.98 | 952 | 1.12 | 1018 | 1.26 | 1081 | 1.42 | - | - | - | - |
| **3500** | 571 | 0.56 | 664 | 0.70 | 748 | 0.84 | 826 | 0.98 | 898 | 1.14 | 967 | 1.28 | 1031 | 1.44 | - | - | - | - | - | - |
| **3800** | 613 | 0.70 | 700 | 0.86 | 779 | 1.00 | 853 | 1.16 | 923 | 1.32 | 989 | 1.48 | - | - | - | - | - | - | - | - |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 8: DSV096C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive + 2HP | | | | | | | | Optional hi-static + 2HP | | | | | |
| **4400** | 478 | 0.60 | 560 | 0.78 | 634 | 0.96 | 702 | 1.14 | 765 | 1.34 | 824 | 1.54 | 880 | 1.74 |

### Table 9: DSV120C supply air blower performance

| Supply CFM | Available external static pressure - IWG* | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Field supplied low static drive | | | | Standard drive + 1.5HP | | | | | | | | Optional hi-static + 2HP | | | | | | | |
| **3200** | 573 | 0.48 | 668 | 0.62 | 754 | 0.76 | 833 | 0.88 | 906 | 1.02 | 975 | 1.18 | 1040 | 1.32 | 1102 | 1.48 | 1160 | 1.66 | 1225 | 1.86 |
| **3600** | 621 | 0.66 | 708 | 0.80 | 788 | 0.96 | 863 | 1.10 | 933 | 1.26 | 999 | 1.42 | 1061 | 1.58 | 1121 | 1.74 | 1178 | 1.90 | - | - |
| **4000** | 667 | 0.86 | 748 | 1.02 | 823 | 1.18 | 893 | 1.34 | 960 | 1.52 | 1023 | 1.68 | 1083 | 1.86 | 1141 | 2.04 | - | - | - | - |
| **4400** | 723 | 1.12 | 797 | 1.28 | 868 | 1.46 | 934 | 1.64 | 997 | 1.84 | 1057 | 2.02 | - | - | - | - | - | - | - | ~ |
| **4800** | 775 | 1.40 | 845 | 1.60 | 911 | 1.80 | 973 | 2.00 | - | - | - | - | - | - | - | - | - | - | - | ~ |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 10: DSV120C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive + 3HP | | | | | | | | | | Optional hi-static + 3HP | | | |
| **5500** | 614 | 1.22 | 680 | 1.44 | 741 | 1.66 | 799 | 1.90 | 854 | 2.14 | 906 | 2.38 | 956 | 2.62 |

### Table 11: DSV144C supply air blower performance

| Supply CFM | Available external static pressure - IWG* | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Field supplied low static drive | | | | Standard drive + 2HP | | | | | | Optional hi-static + 3HP | | | | | | | | | |
| **4000** | 436 | 0.48 | 521 | 0.64 | 597 | 0.80 | 667 | 0.98 | 730 | 1.16 | 790 | 1.34 | 845 | 1.54 | 896 | 1.75 | 946 | 2.01 | 992 | 2.29 |
| **4400** | 456 | 0.58 | 536 | 0.76 | 609 | 0.94 | 676 | 1.12 | 738 | 1.32 | 796 | 1.52 | 851 | 1.72 | 902 | 1.82 | 950 | 2.17 | 996 | 2.52 |
| **4800** | 475 | 0.70 | 555 | 0.88 | 621 | 1.08 | 686 | 1.28 | 746 | 1.48 | 803 | 1.70 | 857 | 1.92 | 908 | 2.14 | 956 | 2.36 | 1000 | 2.70 |
| **5200** | 494 | 0.84 | 567 | 1.04 | 634 | 1.24 | 697 | 1.46 | 755 | 1.68 | 811 | 1.90 | 863 | 2.12 | 913 | 2.36 | 961 | 2.60 | 1007 | 2.84 |
| **5600** | 517 | 1.00 | 587 | 1.22 | 651 | 1.44 | 711 | 1.66 | 768 | 1.90 | 822 | 2.14 | 873 | 2.38 | 922 | 2.62 | 969 | 2.86 | - | - |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 12: DSV144C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive + 3HP | | | | | | | | | Optional hi-static + 3HP | | | | |
| **6000** | 535 | 1.02 | 609 | 1.28 | 679 | 1.56 | 744 | 1.84 | 805 | 2.14 | 862 | 2.44 | 921 | 2.82 |

### Table 13: DSV180C supply air blower performance

| Supply CFM | Available external static pressure - inches W.C. | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | | 1.6 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Field supplied low static drive | | | | Standard drive + 2HP | | | | Optional hi-static + 5HP | | | | | | Field supplied hi-static drive +5 HP | | | |
| **4500** | 509 | 0.54 | 613 | 0.75 | 705 | 0.93 | 789 | 1.11 | 867 | 1.32 | 939 | 1.53 | 1006 | 1.74 | 1071 | 1.95 | 1131 | 2.19 |
| **5000** | 566 | 0.75 | 660 | 0.96 | 746 | 1.17 | 825 | 1.38 | 898 | 1.59 | 967 | 1.83 | 1032 | 2.04 | 1094 | 2.28 | 1153 | 2.52 |
| **5500** | 623 | 1.02 | 709 | 1.23 | 789 | 1.47 | 863 | 1.68 | 933 | 1.92 | 998 | 2.16 | 1061 | 2.40 | 1121 | 2.67 | 1178 | 2.91 |
| **6000** | 679 | 1.32 | 759 | 1.56 | 833 | 1.80 | 903 | 2.04 | 969 | 2.31 | 1032 | 2.55 | 1092 | 2.82 | 1150 | 3.09 | 1205 | 3.36 |
| **6500** | 736 | 1.68 | 810 | 1.95 | 879 | 2.19 | 945 | 2.46 | 1008 | 2.73 | 1068 | 3.03 | 1125 | 3.30 | 1181 | 3.57 | 1234 | 3.87 |
| **7000** | 792 | 2.10 | 862 | 2.37 | 927 | 2.67 | 989 | 2.94 | 1049 | 3.24 | 1106 | 3.54 | 1161 | 3.84 | 1214 | 4.14 | 1266 | 4.44 |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 14: DSV180C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive + 5HP | | | | Optional hi-static + 5HP | | | | Field supplied hi-static + 5HP | | | | | |
| **7200** | 548 | 1.44 | 618 | 1.74 | 682 | 2.04 | 742 | 2.37 | 800 | 2.70 | 854 | 3.03 | 906 | 3.36 |

### Table 15: DSV240C supply air blower performance

| Supply CFM | Available external static pressure - inches W.C. | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Field supplied low static drive | | | | | | Standard drive + 5HP | | | | | | Optional hi-static + 7.5HP | | | | | | Field supplied hi-static drive | | | |
| **6400** | 536 | 1.28 | 606 | 1.56 | 671 | 1.86 | 733 | 2.16 | 792 | 2.50 | 849 | 2.84 | 904 | 3.20 | 956 | 3.56 | 1007 | 3.94 | 1055 | 4.32 | 1102 | 4.72 |
| **7200** | 601 | 1.76 | 665 | 2.08 | 724 | 2.40 | 781 | 2.74 | 836 | 3.10 | 889 | 3.48 | 940 | 3.86 | 989 | 4.24 | 1037 | 4.66 | 1084 | 5.06 | 1128 | 5.48 |
| **8000** | 668 | 2.42 | 725 | 2.76 | 780 | 3.12 | 832 | 3.50 | 883 | 3.88 | 932 | 4.28 | 979 | 4.70 | 1026 | 5.12 | 1071 | 5.54 | 1115 | 5.98 | 1158 | 6.44 |
| **8800** | 735 | 3.22 | 787 | 3.60 | 837 | 3.98 | 886 | 4.40 | 932 | 4.80 | 978 | 5.24 | 1023 | 5.68 | 1066 | 6.12 | 1109 | 6.58 | 1150 | 7.06 | 1191 | 7.54 |
| **9600** | 802 | 4.18 | 850 | 4.60 | 896 | 5.02 | 941 | 5.44 | 985 | 5.90 | 1027 | 6.36 | 1069 | 6.82 | 1110 | 7.30 | 1150 | 7.80 | - | - | - | - |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 16: DSV240C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive + 7.5HP | | | | | | | | Field supplied hi-static + 7.5HP | | | | | |
| **7200** | 748 | 3.99 | 799 | 4.41 | 848 | 4.86 | 895 | 5.34 | 940 | 5.79 | 984 | 6.27 | 1026 | 6.75 |

### Table 17: DSV300C supply air blower performance

| Supply CFM | Available external static pressure - inches W.C. | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Field supplied low static drive | | | | Standard drive + 5HP | | | | | | Optional hi-static + 7.5HP | | | | | | Field supplied hi-static drive | | | |
| **8200** | 581 | 1.80 | 647 | 2.16 | 707 | 2.49 | 765 | 2.85 | 819 | 3.24 | 870 | 3.60 | 920 | 3.99 | 967 | 4.38 | 1012 | 4.80 | 1056 | 5.19 |
| **8800** | 639 | 2.31 | 699 | 2.70 | 755 | 3.06 | 809 | 3.45 | 860 | 3.84 | 910 | 4.26 | 957 | 4.65 | 1002 | 5.07 | 1045 | 5.49 | 1087 | 5.94 |
| **9200** | 676 | 2.70 | 733 | 3.09 | 787 | 3.48 | 839 | 3.87 | 888 | 4.29 | 935 | 4.71 | 981 | 5.13 | 1025 | 5.58 | 1068 | 6.00 | 1109 | 6.45 |
| **9600** | 716 | 3.15 | 771 | 3.54 | 822 | 3.96 | 872 | 4.38 | 920 | 4.80 | 965 | 5.25 | 1010 | 5.70 | 1052 | 6.15 | 1093 | 6.60 | 1113 | 7.05 |
| **10000** | 755 | 3.63 | 807 | 4.05 | 856 | 4.47 | 904 | 4.92 | 950 | 5.37 | 994 | 5.82 | 1037 | 6.27 | 1079 | 6.75 | 1119 | 7.20 | - | - |

**Note:**

At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Decrease airflow downward as necessary.

* Blower performance includes evaporator coil and 2" filters.

### Table 18: DSV300C condenser fan performance

| Outdoor CFM | Available external static pressure - IWG | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 1.2 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| | Standard factory drive + 7.5HP | | | | | | | | Field supplied hi-static + 7.5HP | | | | | |
| **12800** | 735 | 4.41 | 790 | 4.98 | 843 | 5.55 | 894 | 6.15 | 944 | 6.78 | 992 | 7.41 | 1031 | 8.01 |

## Motor and pulley data

### Table 19: Evaporator – standard blower motor and drive data

| Model | Drive range (RPM) | Motor | | Adjustable motor pulley | Fixed blower pulley |
|---|---|---|---|---|---|
| | | HP | Frame size | Pitch diameter (inches) | Pitch diameter (inches) |
| DSV060C | 596–880 | 1 | 145 | 1.9–2.9 | 6.2 |
| DSV096C | 623–919 | 1 | 145 | 1.9–2.9 | 5.9 |
| DSV120C | 645–952 | 1.5 | 145 | 1.9–2.9 | 5.7 |
| DSV144C | 555–768 | 2 | 145 | 2.4–3.4 | 8.2 |
| DSV180C | 640–854 | 3 | 184 | 2.8–3.8 | 8.2 |
| DSV240C | 686–866 | 5 | 184 | 4.4–5.4 | 9.7 |
| DSV300C | 664–818 | 7.5 | 213 | 5.2–6.4 | 13.8 |

### Table 20: Evaporator – oversized blower motor and drive data

| Model | Drive range (RPM) | Motor | | Adjustable motor pulley | Fixed blower pulley |
|---|---|---|---|---|---|
| | | HP | Frame size | Pitch diameter (inches) | Pitch diameter (inches) |
| DSV060C | 803–1112 | 1.5 | 145 | 2.4–3.4 | 5.7 |
| DSV096C | 843–1167 | 1.5 | 145 | 2.4–3.4 | 5.2 |
| DSV120C | 843–1167 | 2 | 145 | 2.4–3.4 | 5.2 |
| DSV144C | 729–972 | 3 | 184 | 2.8–3.8 | 7.2 |
| DSV180C | 811–1024 | 5 | 184 | 4.4–5.4 | 9.2 |
| DSV240C | 850–1047 | 7.5 | 213 | 5.2–6.4 | 10.4 |
| DSV300C | 813–1000 | 7.5 | 213 | 5.2–6.4 | 11.2 |

**Table 21: Condenser – standard blower motor and drive data**

| Model | Drive range (RPM) | Motor | | Adjustable motor pulley | Fixed blower pulley |
|---|---|---|---|---|---|
| | | HP | Frame size | Pitch diameter (inches) | Pitch diameter (inches) |
| DSV060C | 568–852 | 1.5 | 145 | 1.9–2.9 | 6.9 |
| DSV096C | 486–729 | 2 | 145 | 1.9–2.9 | 7.2 |
| DSV120C | 640–854 | 3 | 184 | 2.8–3.8 | 8.2 |
| DSV144C | 571–761 | 3 | 184 | 2.8–3.8 | 9.2 |
| DSV180C | 524–661 | 5 | 184 | 3.4–4.4 | 12.7 |
| DSV240C | 734–922 | 7.5 | 213 | 4.8–5.2 | 11.2 |
| DSV300C | 741–894 | 10 | 215 | 5.8–7.0 | 13.7 |

**Table 22: Condenser – oversized blower motor and drive data**

| Model | Drive range (RPM) | Motor | | Adjustable motor pulley | Fixed blower pulley |
|---|---|---|---|---|---|
| | | HP | Frame size | Pitch diameter (inches) | Pitch diameter (inches) |
| DSV060C | 677–1015 | 1.5 | 145 | 1.9–2.9 | 5.2 |
| DSV096C | 648–972 | 2 | 145 | 1.9–2.9 | 5.4 |
| DSV120C | 761–1014 | 3 | 184 | 2.8–3.8 | 6.9 |
| DSV144C | 682–909 | 3 | 184 | 2.8–3.8 | 7.7 |
| DSV180C | 621–785 | 5 | 184 | 3.4–4.4 | 10.4 |
| DSV240C | 848–1064 | 7.5 | 213 | 4.8–5.2 | 9.7 |
| DSV300C | 854–1020 | 10 | 215 | 6.2–7.4 | 12.7 |

# Blower speed adjustment

Adjust the blower speed to increase or decrease the unit CFM for both VFD and non-VFD. The RPM of the supply air (SA) and condenser air blowers depends on the required CFM and the static resistances of both the supply/discharge and the return/intake duct systems. For units with VFD, perform the required static and drive setup at the 100% fan speed condition.

Perform an air balance after installation to verify the airflow and static. This may require adjustments to the drive. Refer to the Variable Frequency Drive manual (*Form 145.13-NO2*). Only operate the unit in the regions defined by the fan tables. The units can be ordered with oversized motors or drive kits for high static requirements.

ⓘ **Note:** Units with oversized motors or oversized drive kits are designed to operate in the shaded region of the fan table otherwise motor amp draw will exceed overload setting resulting in overload trips and possible damage to unit. Refer to fan tables for recommended operating range of standard and oversized motors and drive kits.

## Adjusting the blower speed

Determine the RPM for the blowers from Fan performance. To adjust the blower speed, take the following steps:

1. Loosen the belt tension by moving the motor towards the blower shaft via the adjustable mounting.
2. Loosen the setscrew in the adjustable motor pulley flange.
3. Remove the external key on the pulleys 4 inches diameter and larger.
4. Open or close the pulley an appropriate number of turns.

   The blower speed increases when the moveable flange is adjusted towards the fixed flange (closed). The blower speed decreases when the moveable flange is adjusted away from the fixed flange (opened).

Pulleys are adjustable only in half-turn increments. For 4L and A belts, do not open the pulley more than five full turns. For B belts, do not open the pulley more than six full turns.

5. Replace the external key and tighten the adjustment setscrew. Proper torque is 110-130 inches-lbs.
6. Install the drive belt and adjust the motor mount to the tension belt (for further information, see the Maintenance and service section).

# Start-up and operation

Start the unit. Refer to the *Startup and Performance Checklist* (*Form 145.13-CL1*) to check the rotation of the fans and compressors. Scroll compressors only compress in one rotational direction. Three phase compressors rotate in either direction depending upon phasing of the power. There is a 50-50 chance of connecting power in a way that causes rotation in the reverse direction. It is important to ensure the proper rotation direction is achieved when installing and operating the system.

ⓘ **Note:** Prior to start-up it is important to ensure proper compressor and fan rotation direction is achieved when the system is installed and operated.

To ensures proper unit operation, monitor the microprocessor board for any fault codes. Verify the proper compressor direction by observing that, when the compressor energizes, the refrigerant suction pressure drops and the refrigerant discharge pressure rises. Reverse compressor rotation also results in an elevated sound level and a substantially reduced current draw.

There is no negative impact on durability caused by operating three phase scroll compressors in the reversed direction for a short period of time (under one hour). However, after several minutes of operation, the compressors' internal protectors trip. If opposite rotation is needed, disconnect and reverse any two leads of the three phase supply. Then, reconnect the power.

**Table 23: Pressure switch settings – all models**

| | High | Low |
|---|---|---|
| Cut out (PSIG) | 625 | 68 |
| Cut in (PSIG) | 500 | 107 |

**Table 24: Refrigerant charge (lbs)**

| Unit | Circuit 1 | Circuit 2 |
|---|---|---|
| DSV060C | 13.25 (13 lbs 4 oz) | - |
| DSV096C | 11.35 (11 lbs 6 oz) | 11.60 (11 lbs 10 oz) |
| DSV120C | 13.90 (13 lbs 14 oz) | 14.20 (14 lbs 3 oz) |
| DSV144C | 16.60 (16 lbs 10 oz) | 15.60 (15 lbs 10 oz) |
| DSV180C | 19.50 (19 lbs 8 oz) | 22.00 (22 lbs 0 oz) |
| DSV240C | 25.00 (25 lbs 0 oz) | 24.10 (24 lbs 2 oz) |
| DSV300C | 32.00 (32 lbs 0 oz) | 32.80 (32 lbs 13 oz) |

ⓘ **Note:** Observe unit operation and check for unusual noise or vibration.

ⓘ **Note:** Always charge with liquid when adding R-410A refrigerant. Failure to do so compromises the properties of the refrigerant being added to the rooftop unit and results in substandard performance of the unit.

**⚠ WARNING**

The Air Conditioning section of this equipment is charged with R-410A; a high pressure refrigerant. Only qualified technicians, using appropriately pressure rated test instruments, should perform troubleshooting or service on this equipment.

# Checking superheat and subcooling

R-410A temperature charts list the associated saturation temperature in one column and the associated pressure in another column. See Table 25.

## Subcooling

When the refrigerant charge is correct, there is no vapor in the liquid sight glass with the system operating under full load conditions.

The subcooling temperature of each system can be calculated:

1. Record the temperature of the liquid line at the outlet of the condenser.
2. Subtract it from the saturation temperature listed in Table 25 for the corresponding discharge pressure.
3. If the unit lacks an access port for liquid access, subtract the condenser coil pressure drop value from Table 25 from the discharge pressure to determine the equivalent saturation temperature.

For example, when the discharge pressure is 388 psig and the liquid line temperature is 95.0°F:

- Liquid Pressure = Discharge Pressure (388 psig) minus 33 psig = 355 psig
- Saturation Temperature for 355 psig = 108.0°F
- Liquid Line Subcooling = Saturation Temperature (108.0°F) minus Liquid Line Temperature (95.0°)= 13.0°F

Subcooling should be 10.0–15.0°F at design conditions.

**Table 25: R-410A pressure and temperature chart**

| PSIG | Temp ˚F | PSIG | Temp ˚F |
|---|---|---|---|
| 0 | -60 | 78 | 20 |
| 2 | -58 | 80 | 21 |
| 4 | -54 | 85 | 24 |
| 6 | -50 | 90 | 26 |
| 8 | -46 | 95 | 29 |
| 10 | -42 | 100 | 32 |
| 12 | -39 | 105 | 34 |
| 14 | -36 | 110 | 36 |
| 16 | -33 | 115 | 39 |
| 18 | -30 | 120 | 41 |
| 20 | -28 | 125 | 43 |
| 22 | -26 | 130 | 45 |
| 24 | -24 | 135 | 47 |
| 26 | -20 | 140 | 49 |
| 28 | -18 | 145 | 51 |
| 30 | -16 | 150 | 53 |
| 32 | -14 | 160 | 57 |
| 34 | -12 | 170 | 60 |
| 36 | -10 | 180 | 64 |

**Table 25: R-410A pressure and temperature chart**

| PSIG | Temp ˚F | PSIG | Temp ˚F |
|---|---|---|---|
| 38 | -8 | 190 | 67 |
| 40 | -6 | 200 | 70 |
| 42 | -4 | 210 | 73 |
| 44 | -3 | 220 | 76 |
| 46 | -2 | 225 | 78 |
| 48 | 0 | 235 | 80 |
| 50 | 1 | 245 | 83 |
| 52 | 3 | 255 | 85 |
| 54 | 4 | 265 | 88 |
| 56 | 6 | 275 | 90 |
| 58 | 7 | 285 | 92 |
| 60 | 8 | 295 | 95 |
| 62 | 10 | 305 | 97 |
| 64 | 11 | 325 | 101 |
| 66 | 13 | 355 | 108 |
| 68 | 14 | 375 | 112 |
| 70 | 15 | 405 | 118 |
| 72 | 16 | 500 | 134 |
| 74 | 17 | 600 | 149 |
| 76 | 19 | 700 | 159 |

## Superheat

Only check superheat after establishing the steady state operation of the unit, pulling down the discharge air temperature to within the control range, and running the unit in a fully loaded condition.

The superheat is calculated as the difference between the actual temperature of the refrigerant gas in the suction line and the temperature corresponding to the suction pressure as shown in Table 25.

For example, when the suction pressure is 130 psig and the suction line temperature is 57.0°F:

- Saturation Temperature for 130 psig = 45.0°F
- Evaporator Superheat = Suction Line Temperature (57.0°F) minus Saturation Temperature (45.0°F) = 12.0°F

When adjusting the expansion valve, do not turn the adjusting screw more than one turn at a time This allows sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and stabilize.

The superheat setting should be adjusted to 8.0–11.0°F at design conditions.

## Leak checking

Leak check compressors, fittings, and piping to ensure there are no leaks. Verify the evaporator distributor tubes do not have bare copper touching each other or are against a sheet metal edge. If leak checking a unit charged with R-410A, ensure the leak test device is capable of sensing refrigerant R-410A.

# Start-up (cooling)

## Prestart checklist

After installation has been completed, make the following checks:

1. Check the electrical supply voltage. Ensure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the OFF position.
3. Turn ON the unit electrical power.
4. Set the room thermostat fan switch to ON.
5. Check the indoor blower rotation.
6. Check the blower drive belt tension.
7. Check the unit's supply air (CFM).
8. Measure the evaporator fan motor's amp draw.
9. Set the room thermostat fan switch to OFF.
10. Turn the unit electrical power OFF.

## Operating instructions

1. Turn the unit's electrical power ON.
2. Set the room thermostat to lower than the room temperature.
3. After the built-in time delay (5 minutes), the first stage compressors energize.

## Post start checklist

1. Verify the proper system pressures.
2. Measure the temperature drop across the evaporator coil.

# Microprocessor controller

Units come with the state of the art Smart Equipment control (SEC) system. All units are factory commissioned, configured, and run tested. The SEC can be configured to use with a standard thermostat, a zone sensor, or to communicate with the field controller (FC) bus using BACnet® MS/TP, Modbus™ or N2 protocols.

## Temperature sensors

Each unit comes with standard supply air temperature (SAT) and return air temperature (RAT) sensors. The outside air temperature (OAT) is provided with the airside economizer option. All sensors are field wired and installed.

## USB port

The controller comes with a long list of features including data logging, current and previous system faults, and software update capabilities using the onboard USB port and a common flash drive. Energy use monitoring capabilities allow custom tailoring. This allows a system to work more efficiently at all times and occupancy levels. Self-test and startup reports are also available from the board through the USB port.

## LCD display

The board has an easy to read, built-in LCD display and easy to use buttons and a navigation joystick. These features allow the user to quickly navigate the menus that display the unit status, options, current function, supply, return and outdoor temperatures, fault codes, and other information.

## Safety monitoring

The control monitors the following values:

- Outdoor, supply, and return air temperatures
- The high and low pressure switch status on the independent refrigerant circuits
- The voltage supplied to the unit. If the low voltage is due to a brown out, or some other electrical issue occurs, the control protects the unit

## Low ambient

With a low ambient damper kit or VFD on the condenser installed, an integrated low ambient control allows units to operate in the cooling mode down to 0.0°F outdoor ambient. Optionally, when the OAT is low and with the airside economizer option installed, the control board can be programmed to lock out the compressors.

## Anti-short cycle delay (ASCD) protection

To assist compressor life, the standard control incorporates an ACSD. The compressor reliability is further ensured by programmable minimum runtimes.

## Fan delays

Fan on and fan off delays are fully programmable. Furthermore, the heating and cooling fan delay times are independent of one another. All units are programmed with default values based upon their cooling or heating capacity configuration.

## Nuisance trip protection and three strikes

To prevent nuisance calls, the control board has three soft faults before a hard lock out operation. The high/ low-pressure switch, anti-freeze protection, low voltage, or heating high limit must trip three times within two hours before the unit control board locks out the associated compressor. The LCD screen displays an alarm message.

## Lead-lag

An integrated lead-lag option is available However, never enable it on DSH units. This option can be selected on the unit control board. The default factory setup is always disabled.

ⓘ **Note:** Enabling lead-lag function will affect logic of DSV unit and disable unit operation.

## Condensate overflow switch

A condensate overflow fault occurs when the condensate overflow switch opens for the first time, as the switch is connected to the onboard shutdown (SD) contact. The compressor is shut down regardless of minimum runtime. The ASCD is initiated and the alarm is tripped. The fan continues to operate in its current state. The compressor re-energizes once the condensate overflow switch closes, the ASCD has been satisfied, and a call for cooling is still present.

# Operation

## Compressor operation

Compressor operation includes the following features:

1. Compressors are controlled by the Y1 through a maximum of Y4 thermostat inputs.

**⚠ CAUTION**

As lead-lag function must be turned OFF, Y1 input energizes the C1 output when the compressor #1 ACSD is at 0 and all refrigerant safety devices are closed (default 5 minutes).

2. The fan output for indoor fan operation energizes with any cooling output after the indoor fan cool on delay expires.
3. When the thermostat cooling inputs are lost and the minimum runtime expires, the compressor outputs stage off (the default is 3 minutes).
4. A 30 second interstate delay occurs when multiple stages are requested.
5. Here is the sequence of operation for a four stage unit:

    - Y1 energizes Compressor 1 stage 1
    - Y2 energizes Compressor 2 stage 1
    - Y3 energizes Compressor 2 stage 2
    - Y4 energizes Compressor 1 stage 2

6. Here is the sequence of operation for a three stage unit:

    - Y1 energizes Compressor 1 stage 1
    - Y2 energizes Compressor 1 stage 2
    - Y3 energizes Compressor 2

## IntelliSpeed™ supply fan control

Setpoints and related data are shown in Table 26.

**Table 26: Setpoints and related data**

| Stages | Fan control type | Fixed |
|---|---|---|
| **Four stage** | Occupied, no heat or cool % command | 50% |
| | Occupied, one stage of cool % command | 50% |
| | Occupied, two stage of cool % command | 60% |
| | Occupied, three stage of cool % command | 75% |
| | Occupied, four stage of cool % command | 100% |

**Table 26: Setpoints and related data**

| Stages | Fan control type | Fixed |
|---|---|---|
| **Three stage** | Occupied, one stage of heat % command | 50% |
| | Occupied, two stage of heat % command | 60% |
| | Occupied, three stage of heat % command | 100% |
| Economizer minimum position for low speed fan | | 100% |

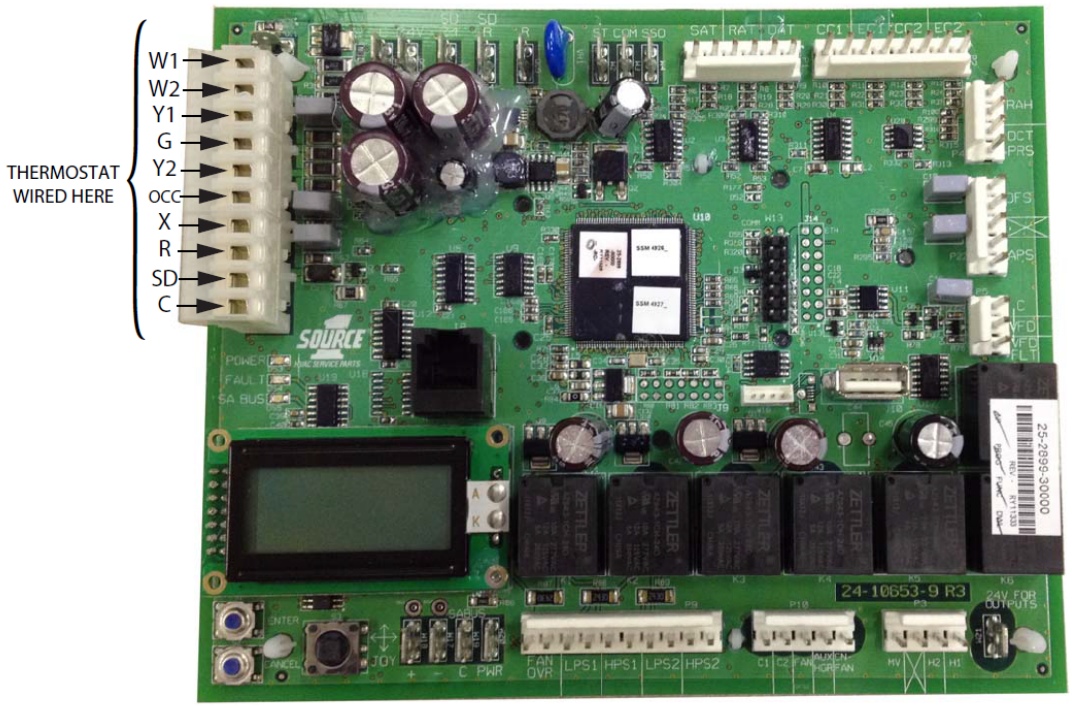
- The outputs have the following values:
  - 24 VAC from fan on the unit control board (UCB) to enable indoor VFD
  - 2–10 VDC from VFD terminal on UCB to control the speed of the indoor VFD
- The VFD operation has the following values:

  2–10 VDC output from VFD terminal on UCB operates the supply fan VFD proportional to the minimum and maximum frequency settings of the VFD (the defaults are 30–60hz)
- The supply fan only operation is as follows:

  When there is no demand for heating or cooling, to run, the supply fan operates at the percent output of the no heat or cool % command setpoint
- The cooling supply fan operation is as follows:

  With a demand for cooling, the VFD operates at the frequency relating to the setpoint occupied, # stage of cool % command as defined under the indoor fan setting menu on the SE controller.

**Figure 15: Compressor controller**



# Maintenance and service

**⚠ WARNING**

Disconnect and lock out power when servicing unit. Failure to do so may result in personal injury or death due to electrical shock.

**⚠ CAUTION**

Exercise care when working around the sharp metal edges of door panels or door frames, etc. These edges can cause injury.

## Evaporator and condenser coils

Inspect the evaporator coil at filter change intervals. Inspect the condenser coil at least semi-annually. A dirty condenser coil results in elevated condensing pressures and poor unit performance. Dirty or clogged evaporator coils cause low suction pressure and lost capacity. If the coils appear dirty, clean them using a mild detergent or a commercial coil cleaning agent.

## Refrigerant circuits

During unit operation, check and record the compressor discharge and suction pressures. Also record the compressor running current. A maintenance log of these readings can indicate if the unit is operating within its normal limits. Investigate abnormal readings and correct the cause.

## Blowers

Inspect both the evaporator and condenser blowers at each regular service interval. As required, clean the blower wheels. Bearings are a permanently sealed ball type and do not require lubrication. Check the bearings for signs of wear (movement between the inner and outer races). Ensure that the bearing locking collars are secure to the shaft and that the collar locking screw is properly set. Check that the blower wheel is tight on the shaft and that the hub set screws are properly torqued.

## Drive belts

Examine the belts periodically for wear. Glazed areas on the drive surfaces indicate overheating due to belt slippage. The ideal tension is the lowest tension at which the belt does not slip under peak load conditions. Overtensioning shortens the belt and bearing life (see Motor and pulley data).

Adjust the tension on the belt for a deflection of 1/64-inch per inch of belt span, with the appropriate force applied at the midpoint of the span. Tension new belts at the maximum value indicated. Maintain used belts atthe minimum value.

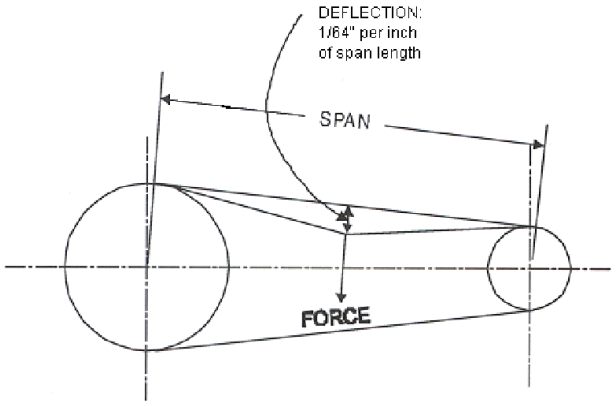
## Filters

Inspect the filters monthly and replace them as required. Use UL Class 2 rated filters. Factory supplied filters are the medium efficiency, extended surface pleated type. To maintain optimum airflow performance, ensure the replacements are of the same type. See Table 27.

**Table 27: Filter sizes**

| Filters | Qty/size |
|---|---|
| DSV060C | 4/25x14x2 |
| DSV096C | 4/24x18x2<br>2/20x18x2 |
| DSV120C | 4/24x18x2<br>2/20x18x2 |
| DSV144C | 8/20x18x2 |
| DSV180C | 3/20x18x2<br>1/24x18x2<br>3/20x20x2<br>1/24x20x2 |
| DSV240C | 4/24x20x2<br>4/20x20x2 |
| DSV300C | 6/25x18x2<br>6/20x18x2 |

**Figure 16: Belt tension adjustment**




| Cross Section | POUNDS FORCE Min. | Max. |
|---|---|---|
| 4L | 1-1/2 | 2-1/2 |
| A | 3-1/2 | 6-1/2 |
| B | 5-1/2 | 8 |
| BX | 8 | 11 |

# Appendices

## Appendix A: Unit dimensional drawings

**Figure 17: DSV060C dimensional data: top discharge**

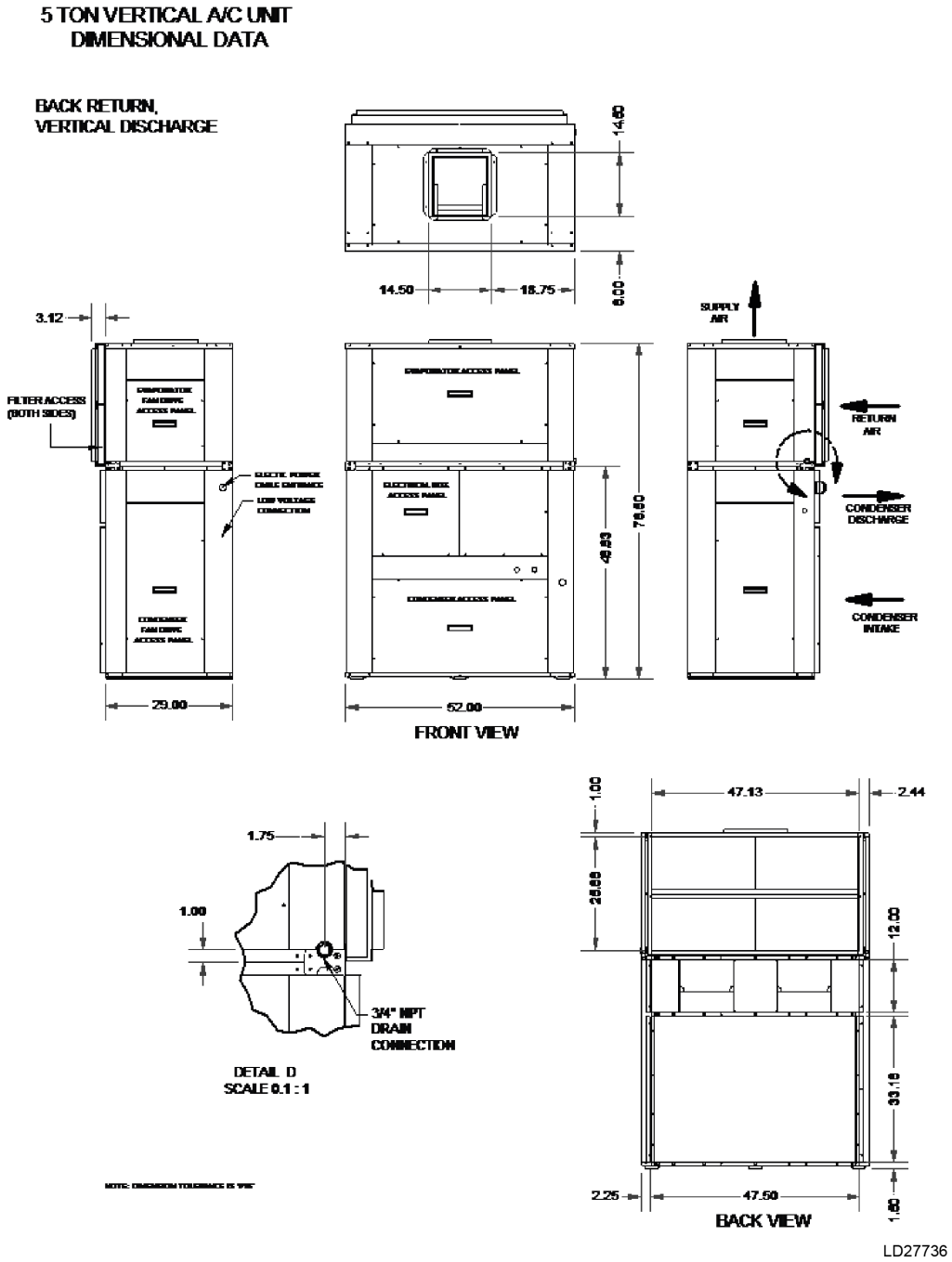


**Figure 18: DSV096C and DSV120C dimensional data: front discharge**

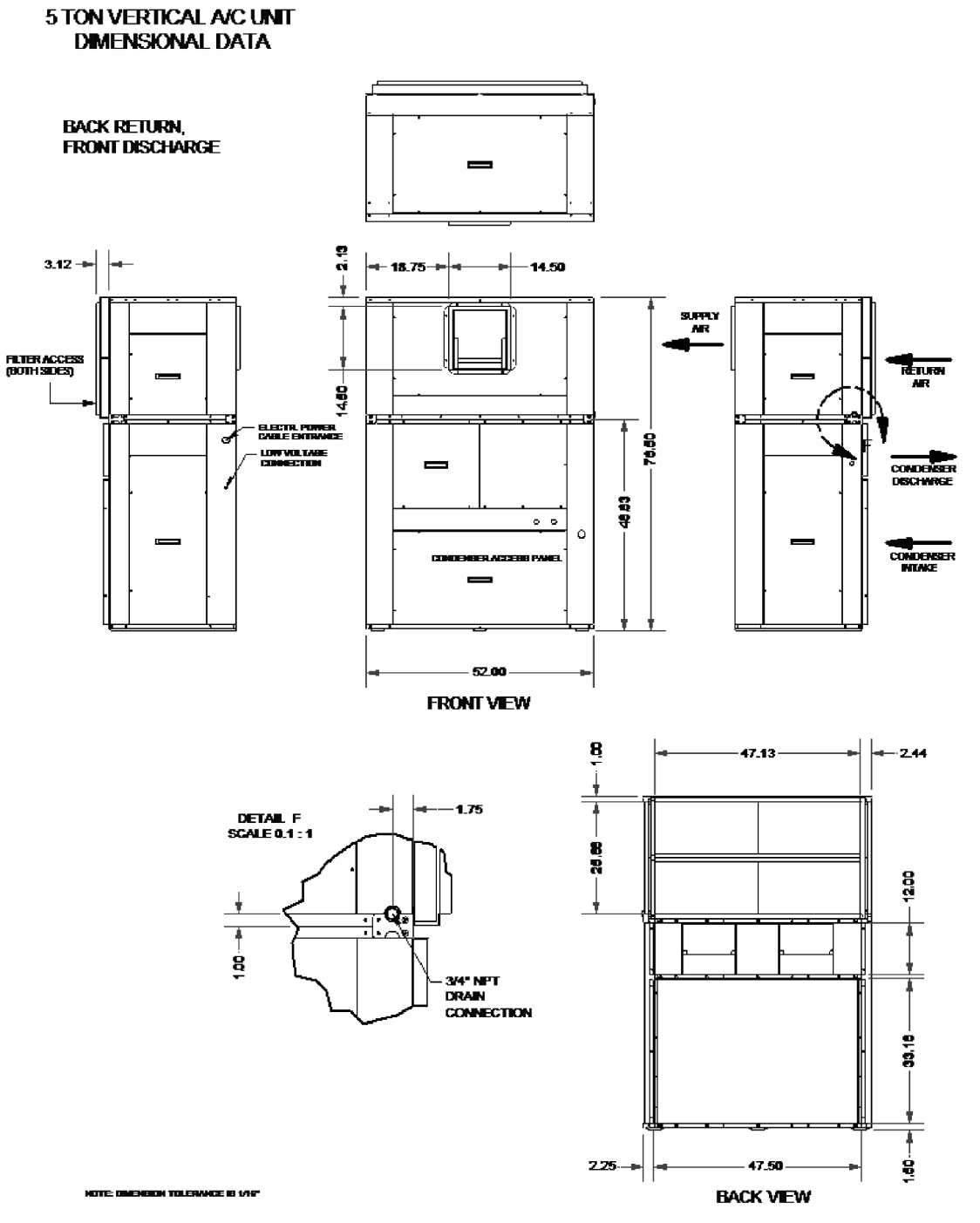


**Figure 19: DSV096C and DSV120C dimensional data: front discharge**

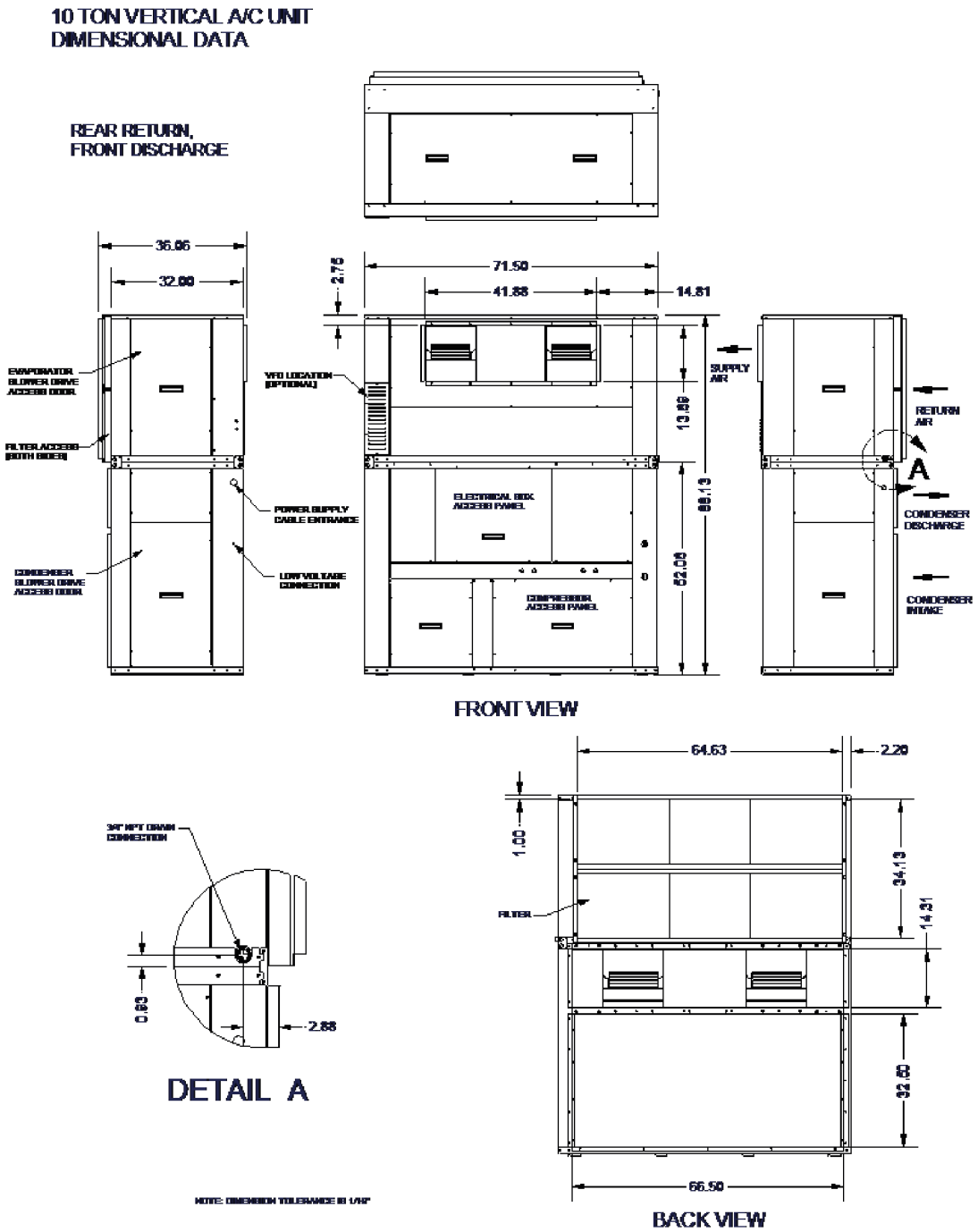


**Figure 20: DSV096C and DSV120C dimensional data: top discharge**

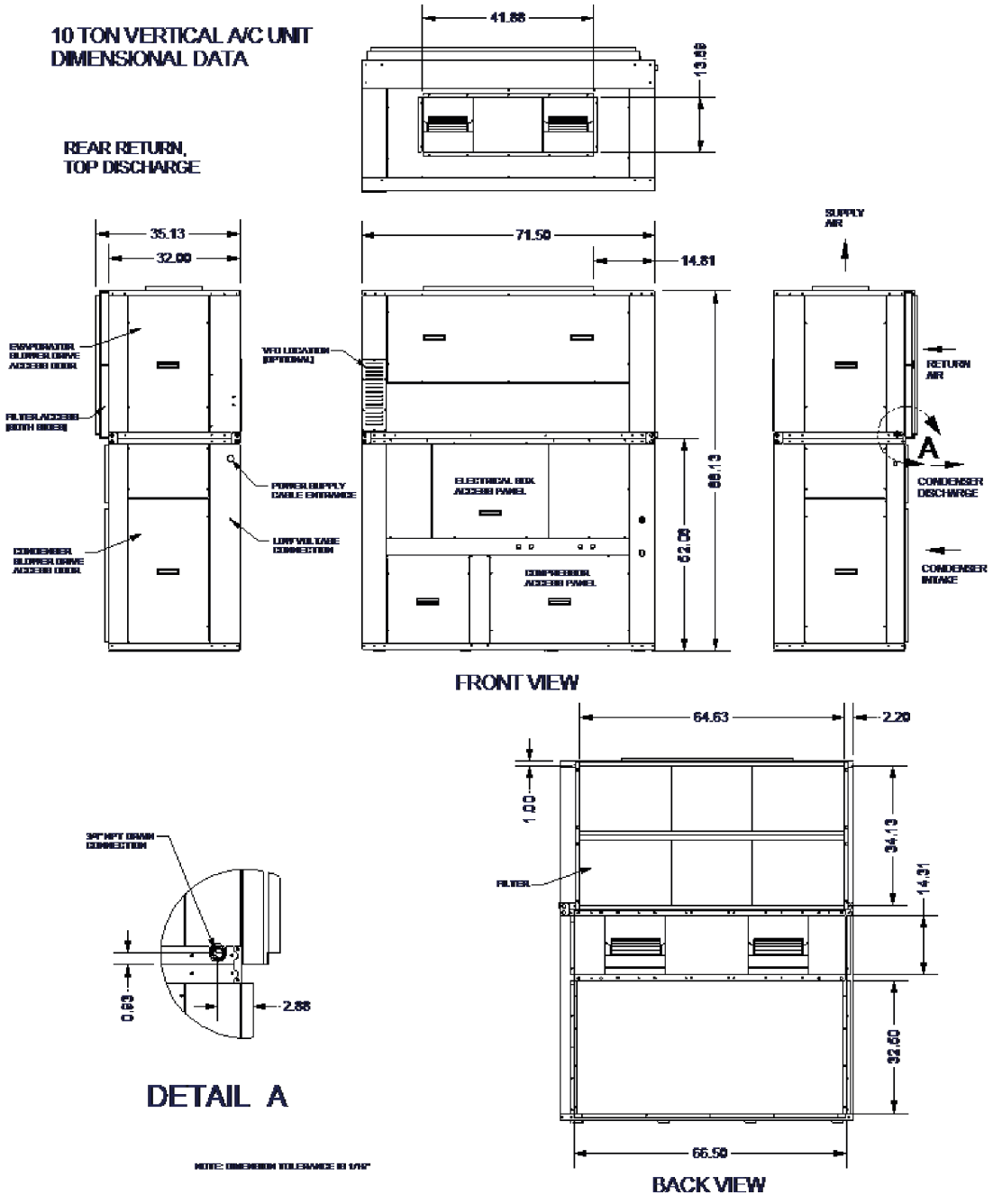


**Figure 21: DSV144C dimensional data: front discharge**

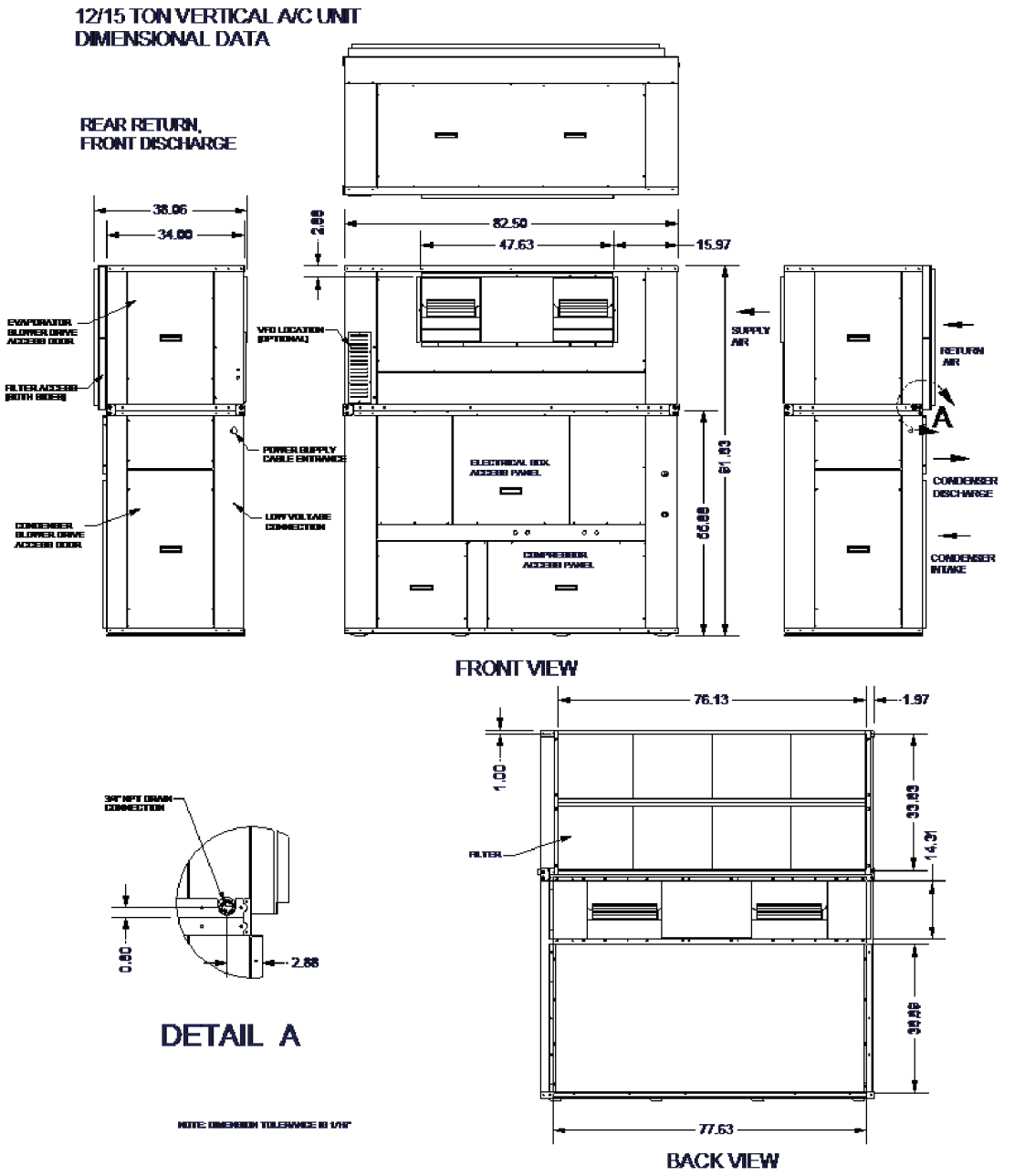


**Figure 22: DSV144C dimensional data: top discharge**

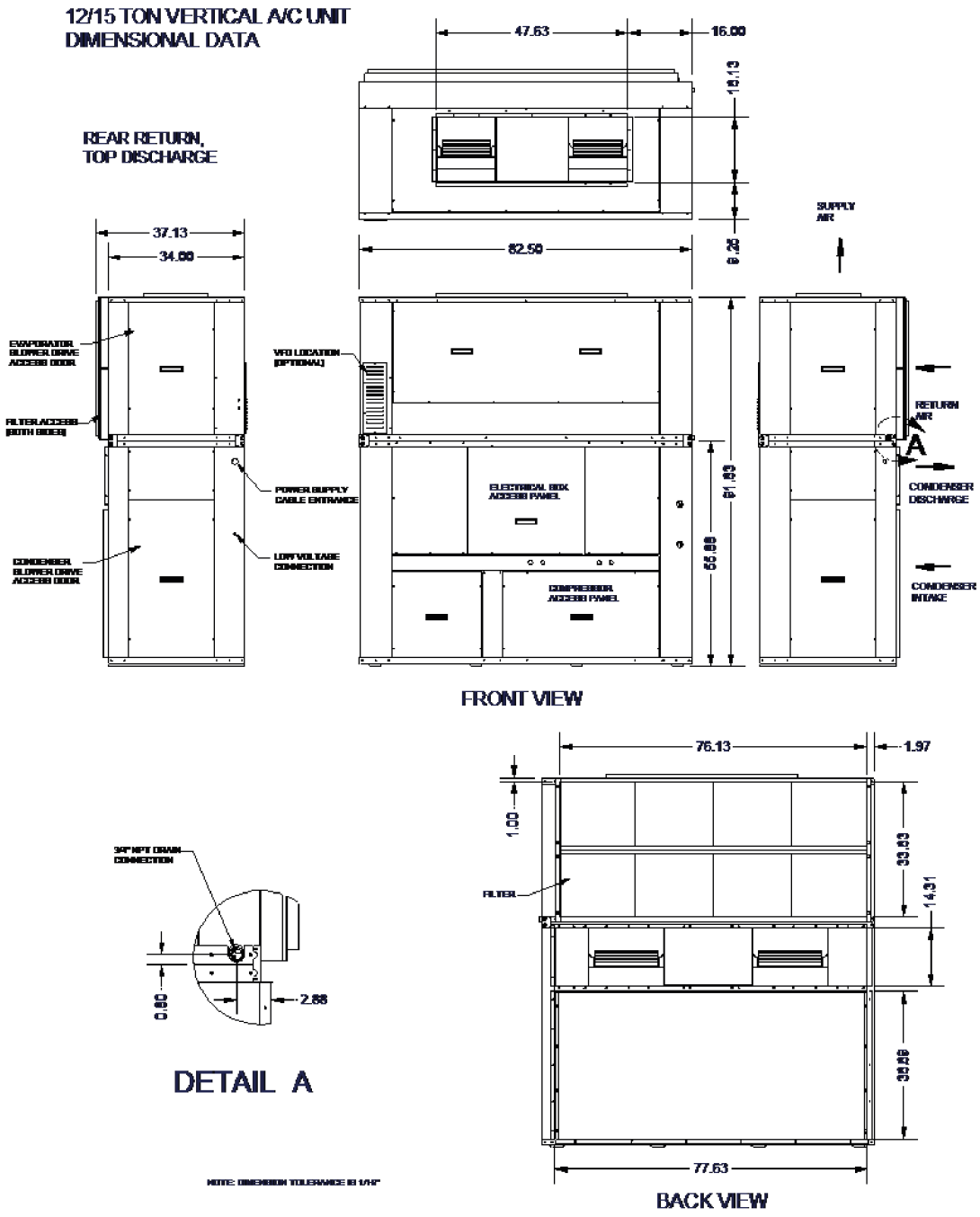



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**Figure 23: DSV180C dimensional data: front discharge rear return**

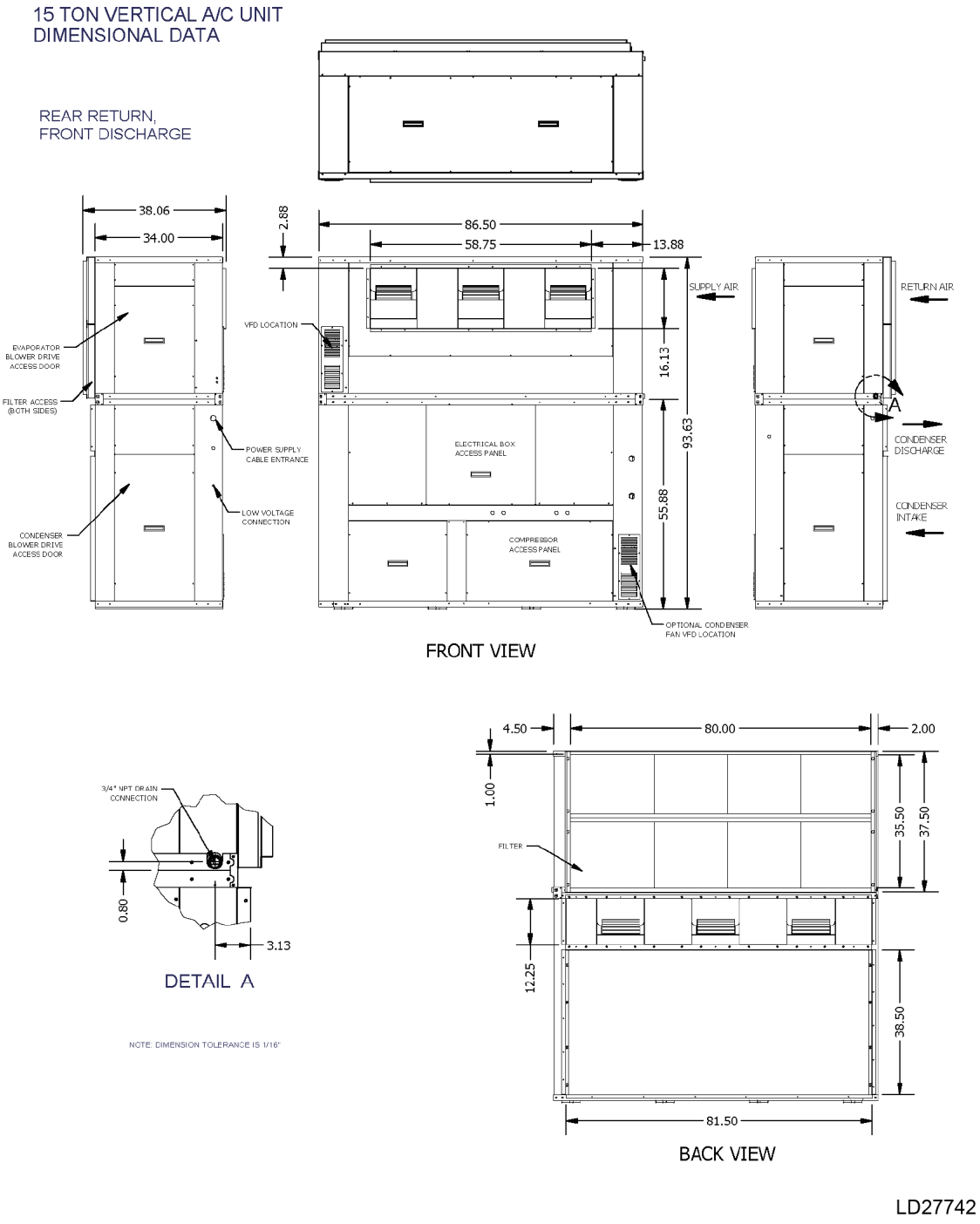


**Figure 24: DSV180C dimensional data: top discharge rear return**

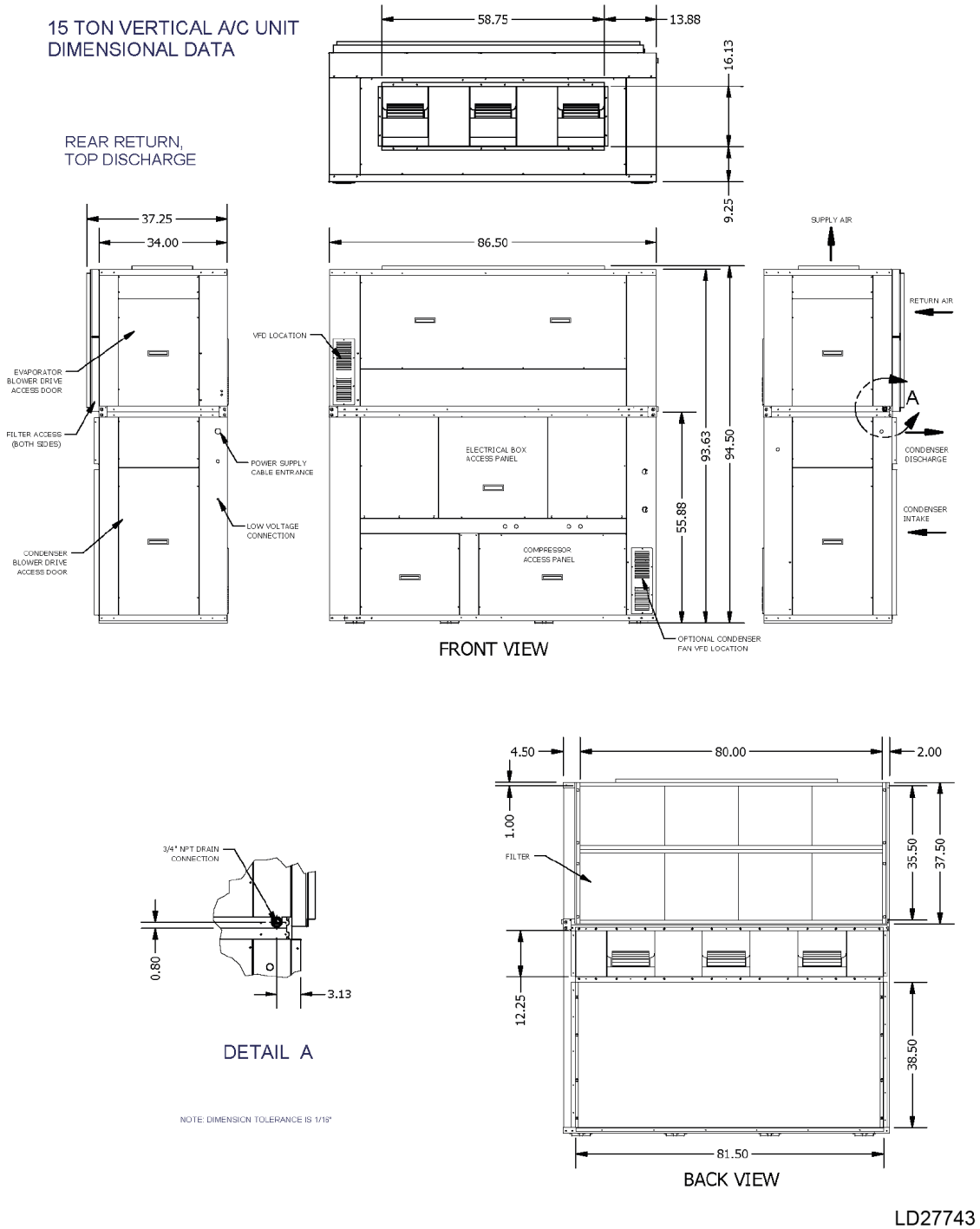


**Figure 25: DSV180C dimensional data: front return rear discharge**

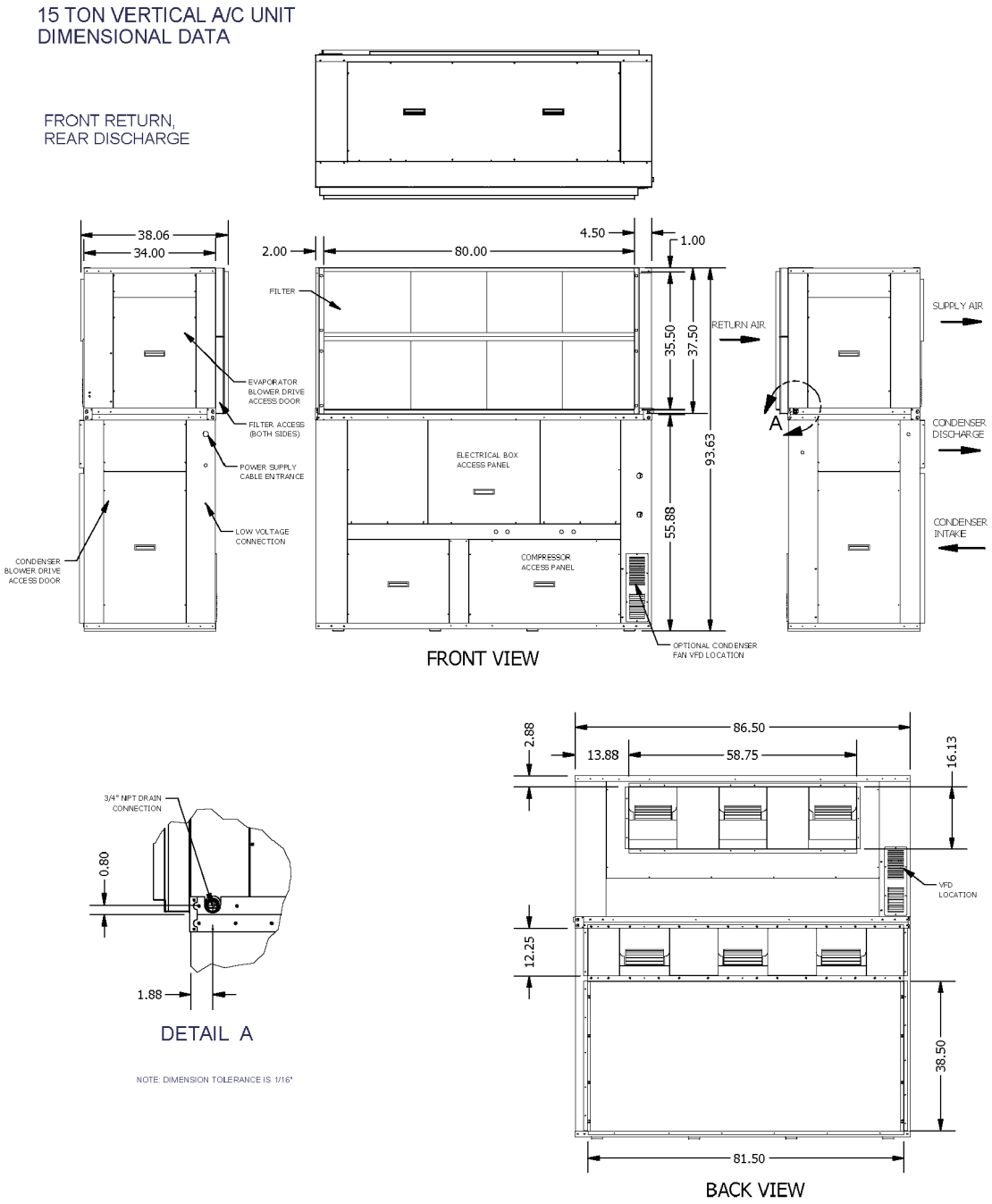


**Figure 26: DSV180C dimensional data: front return top discharge**

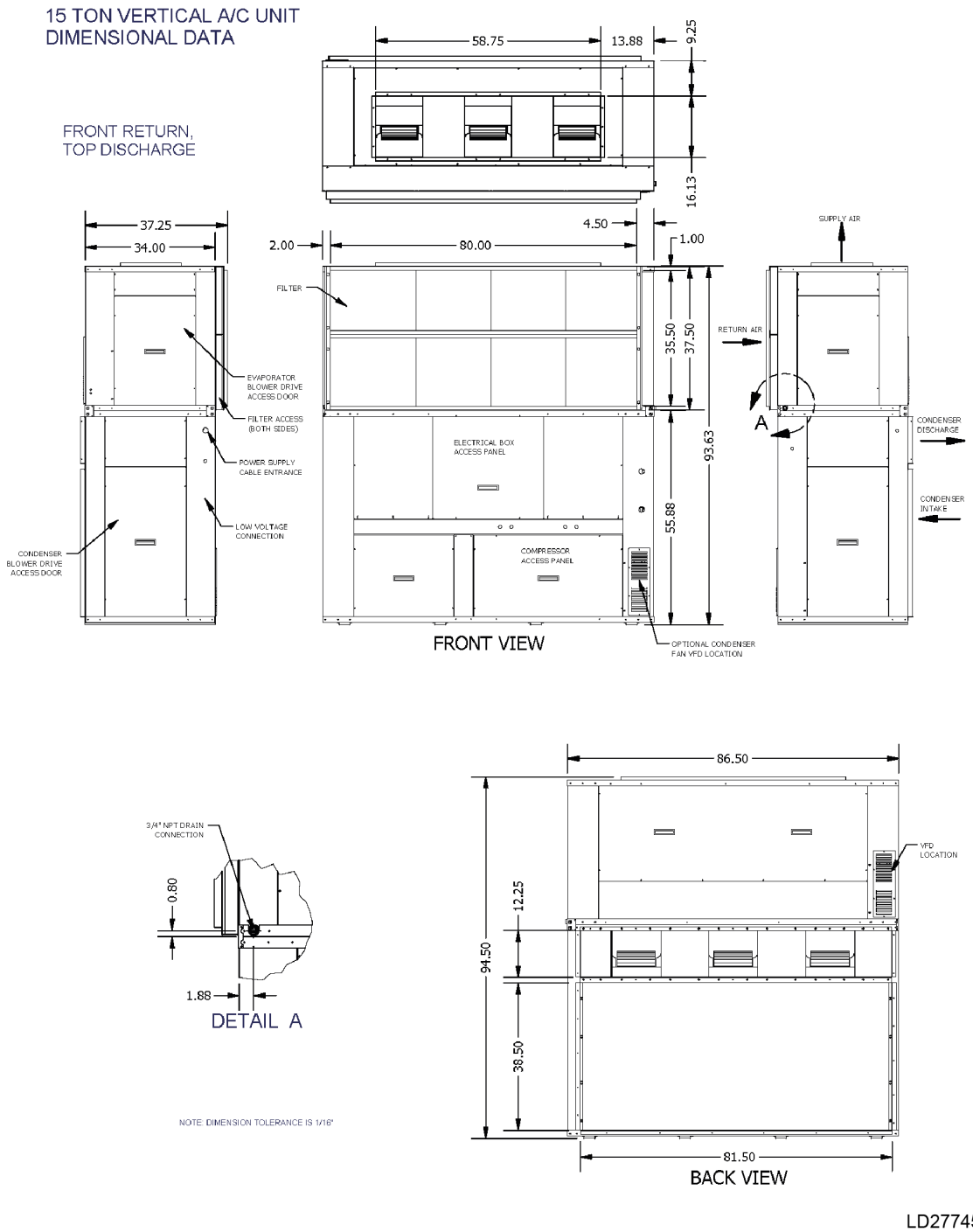


**Figure 27: DSV240C dimensional data: front discharge rear return**

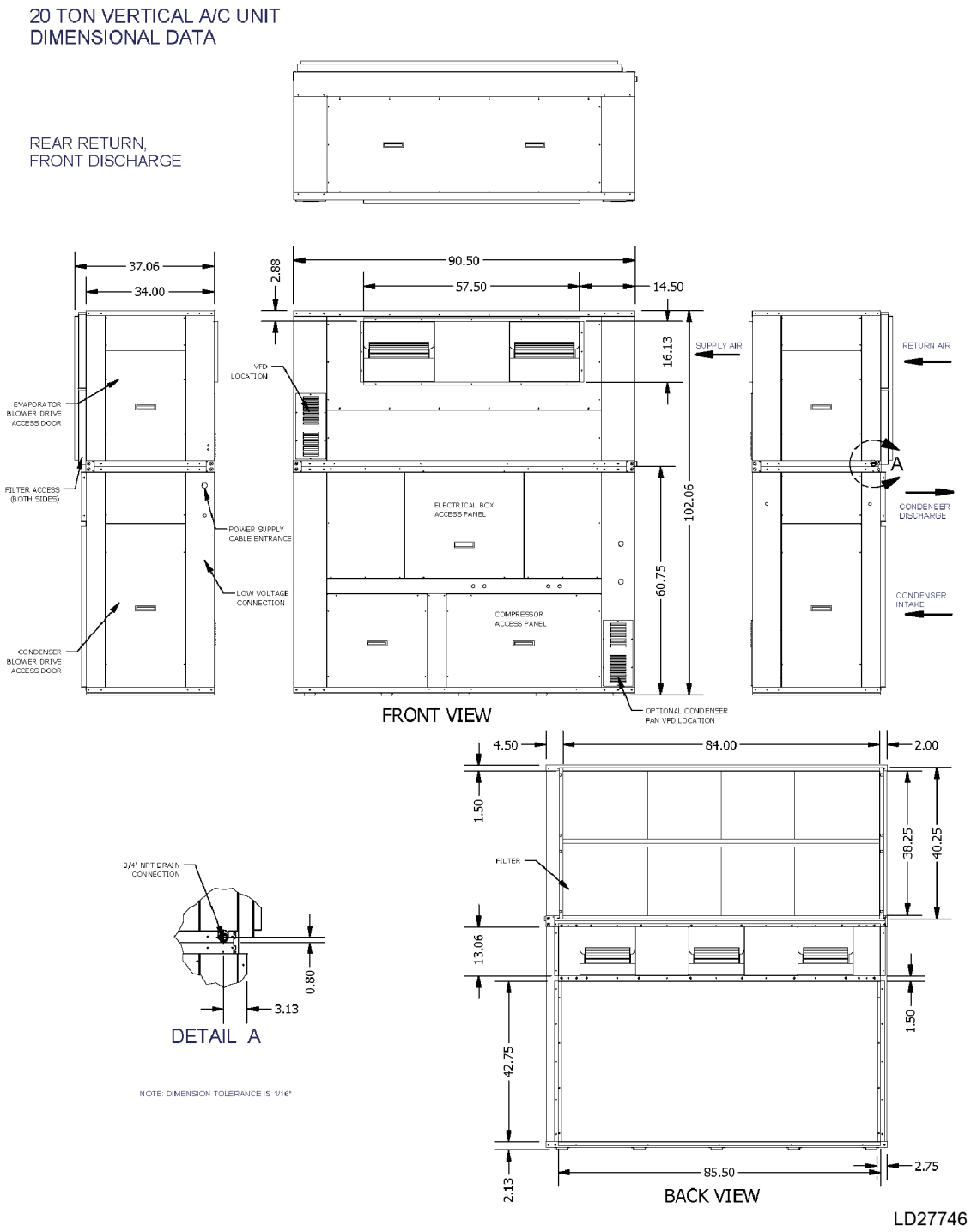


**Figure 28: DSV240C dimensional data: top discharge rear return**

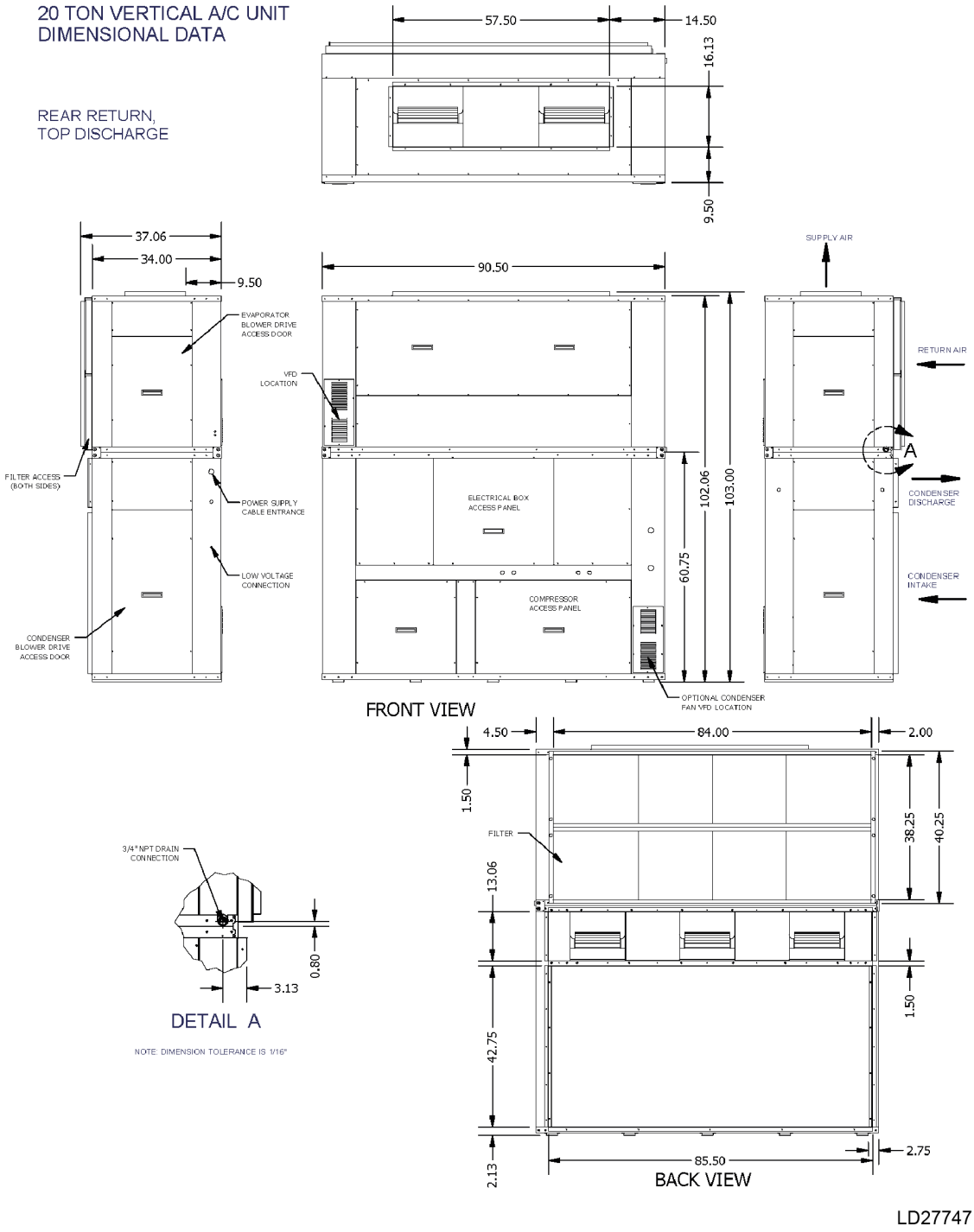


**Figure 29: DSV240C dimensional data: rear discharge front return**

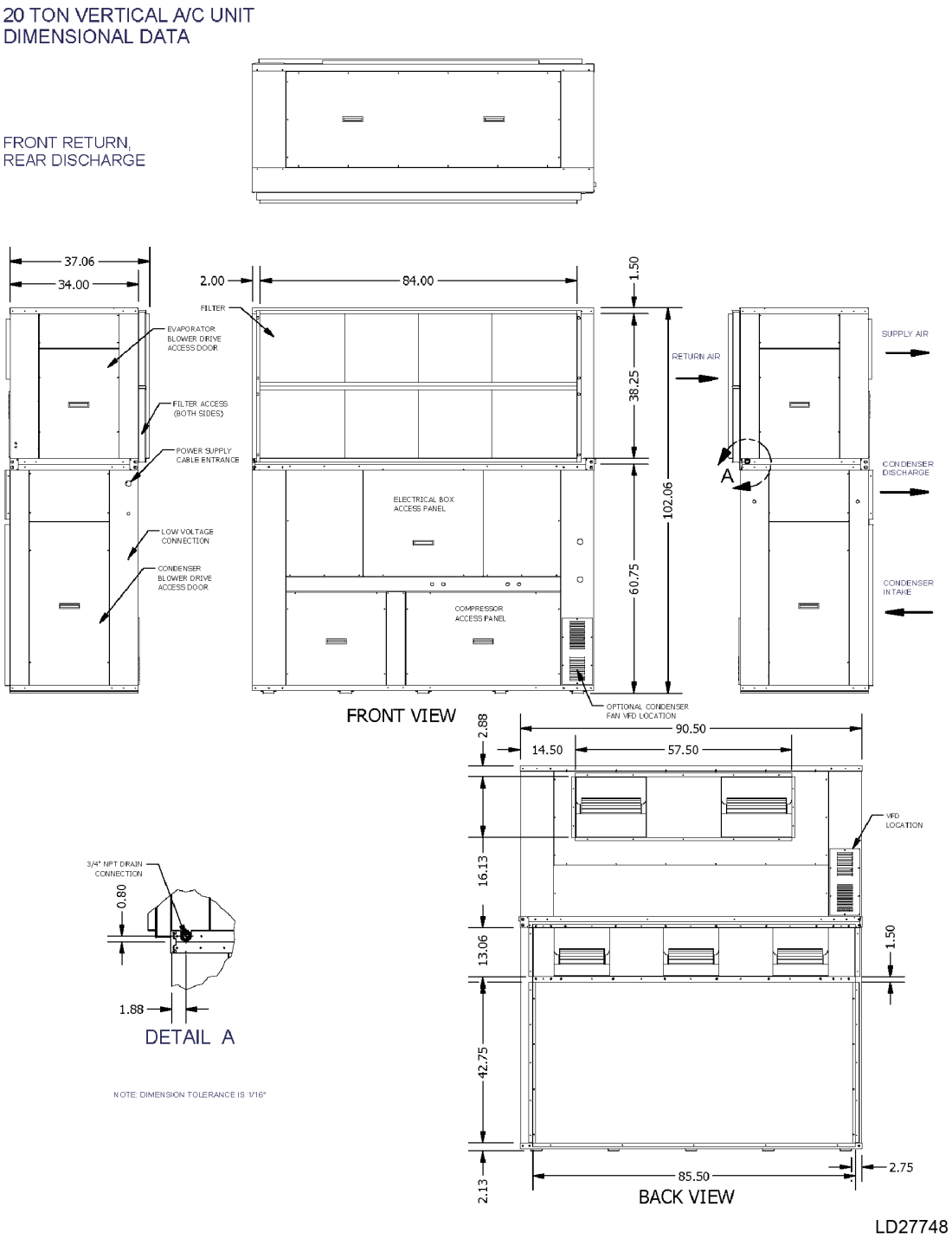


**Figure 30: DSV240C dimensional data: top discharge front return**

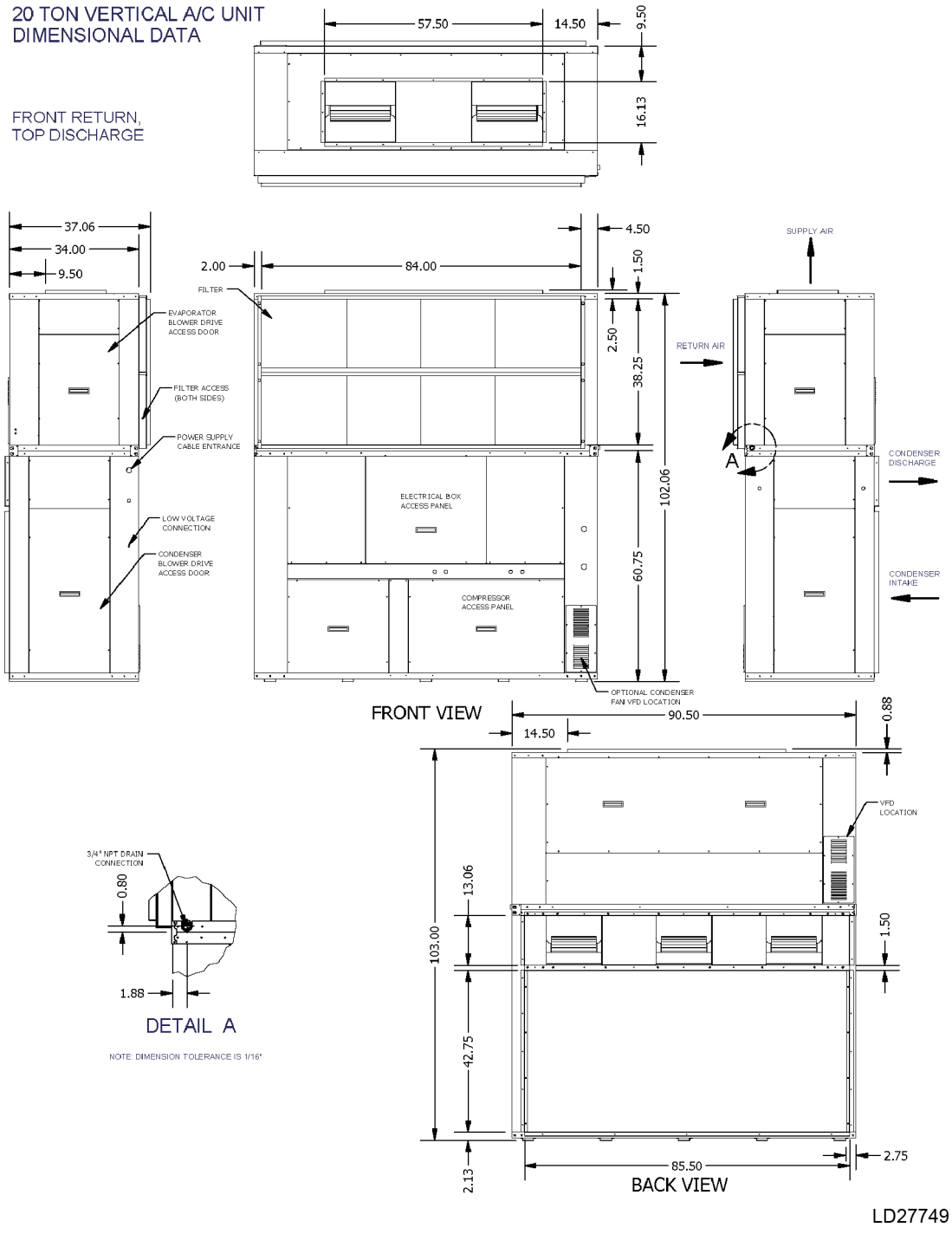


**Figure 31: DSV300C dimensional data: front discharge rear return**

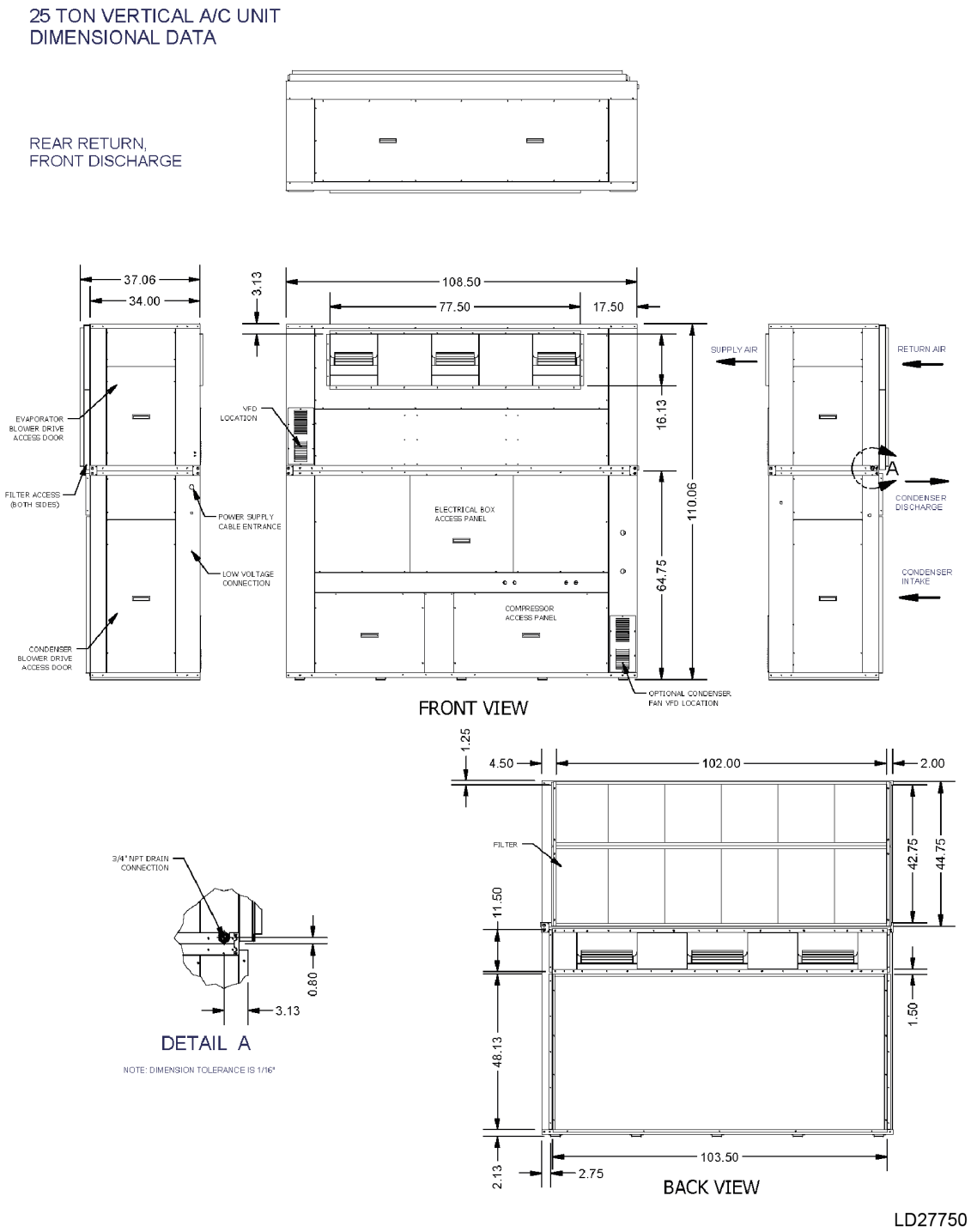


**Figure 32: DSV300C dimensional data: top discharge rear return**

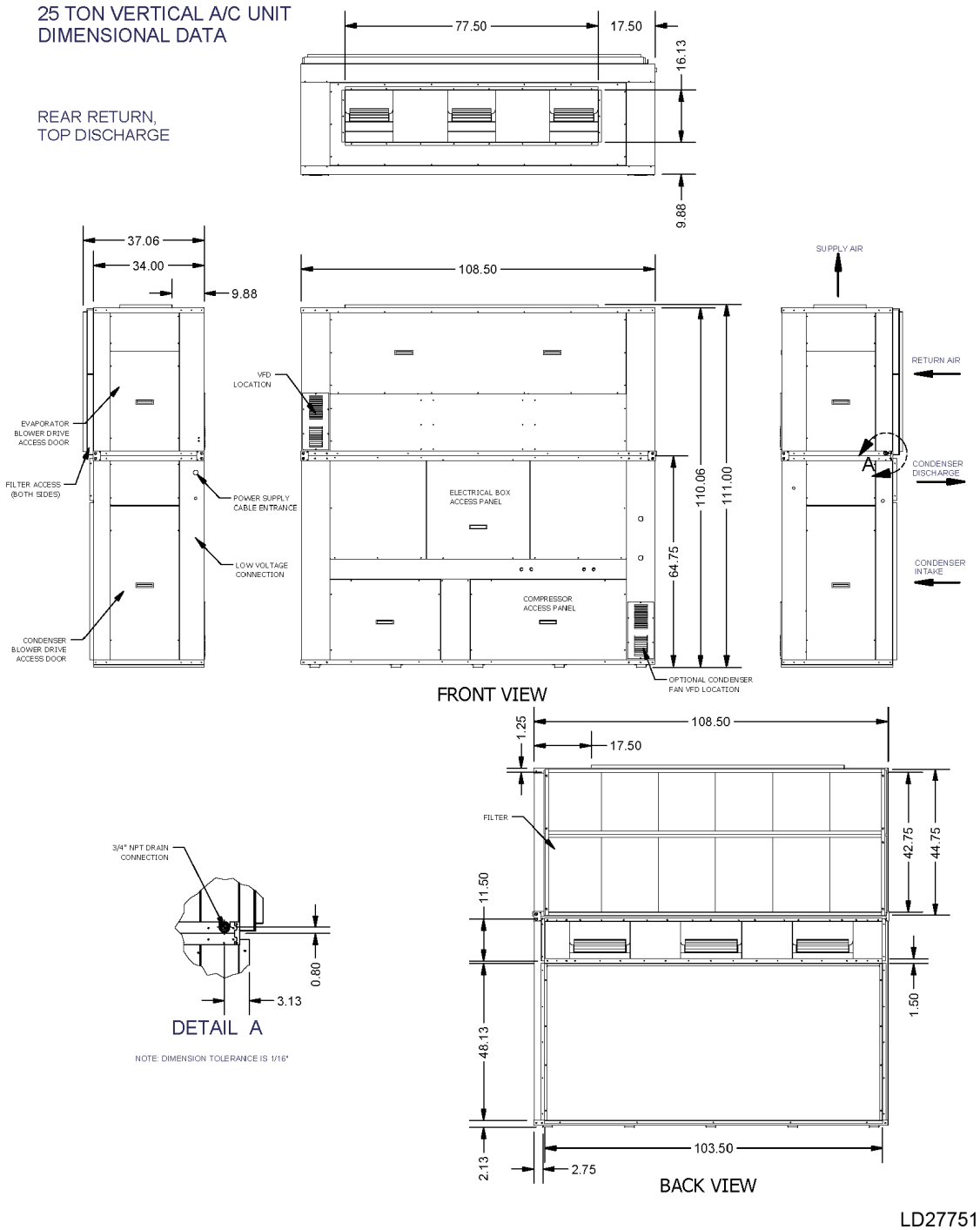


**Figure 33: DSV300C dimensional data: rear discharge front return**

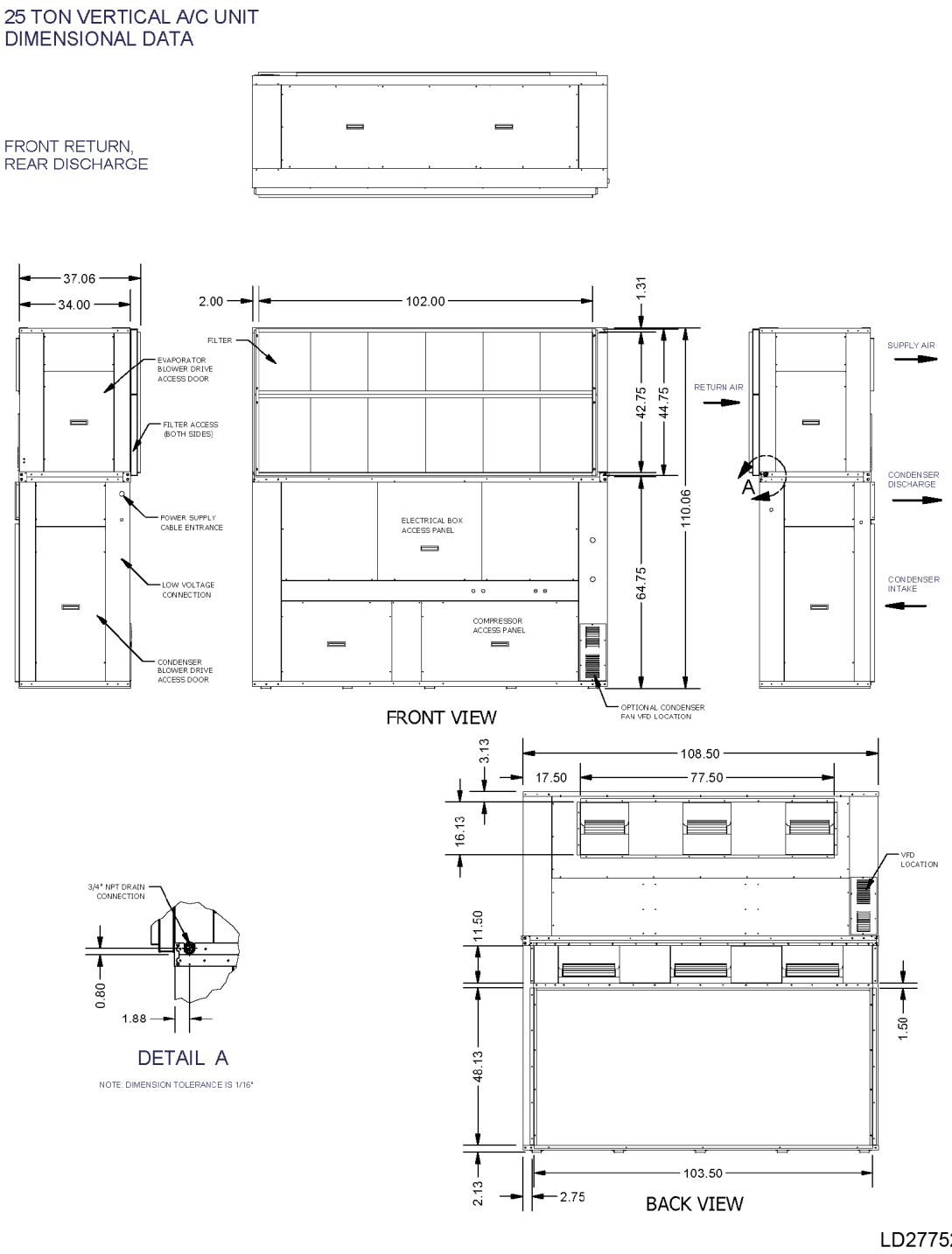
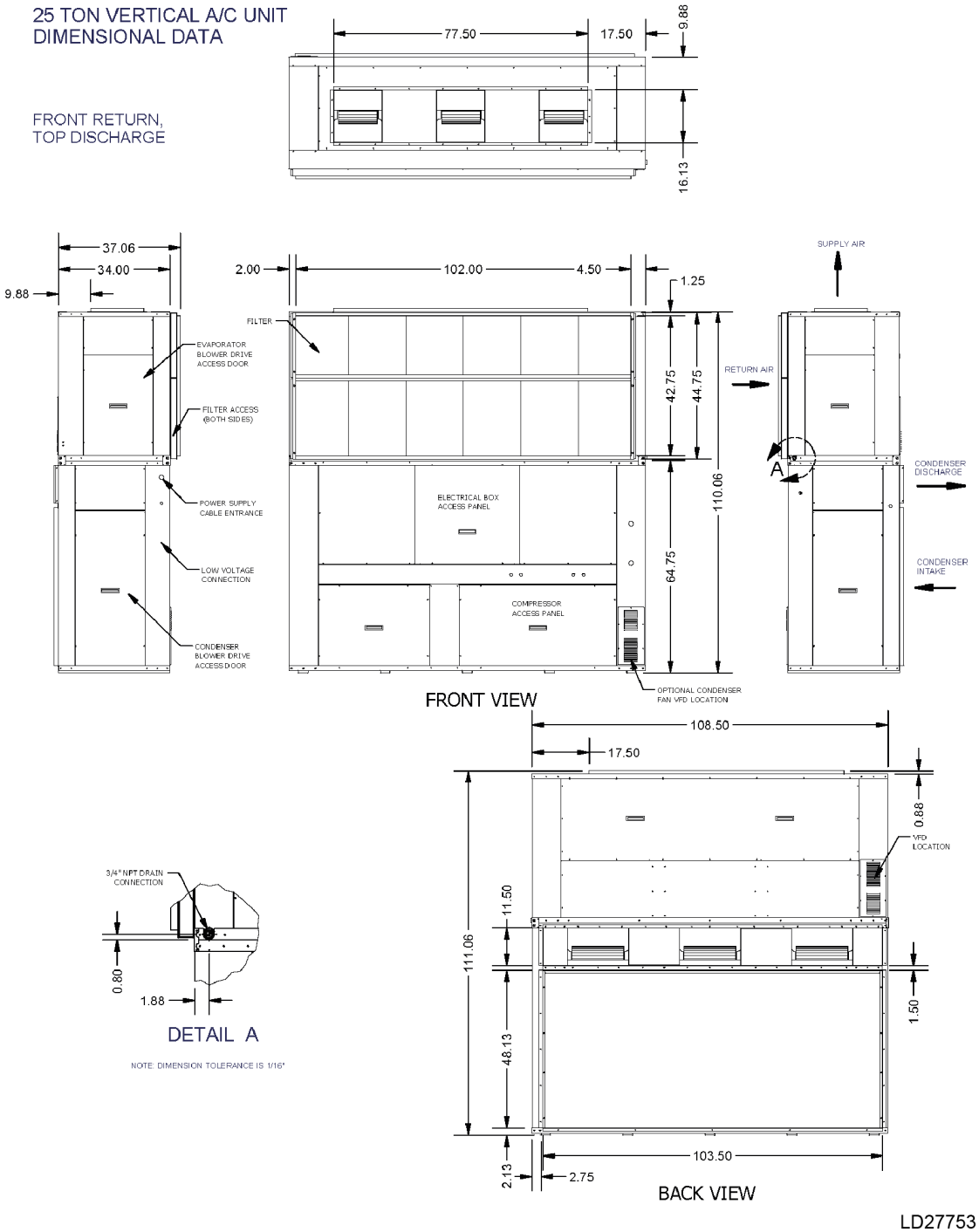


**Figure 34: DSV300C dimensional data: top discharge front return**



# Appendix B: Typical service clearances

**Figure 35: Typical clearance services**

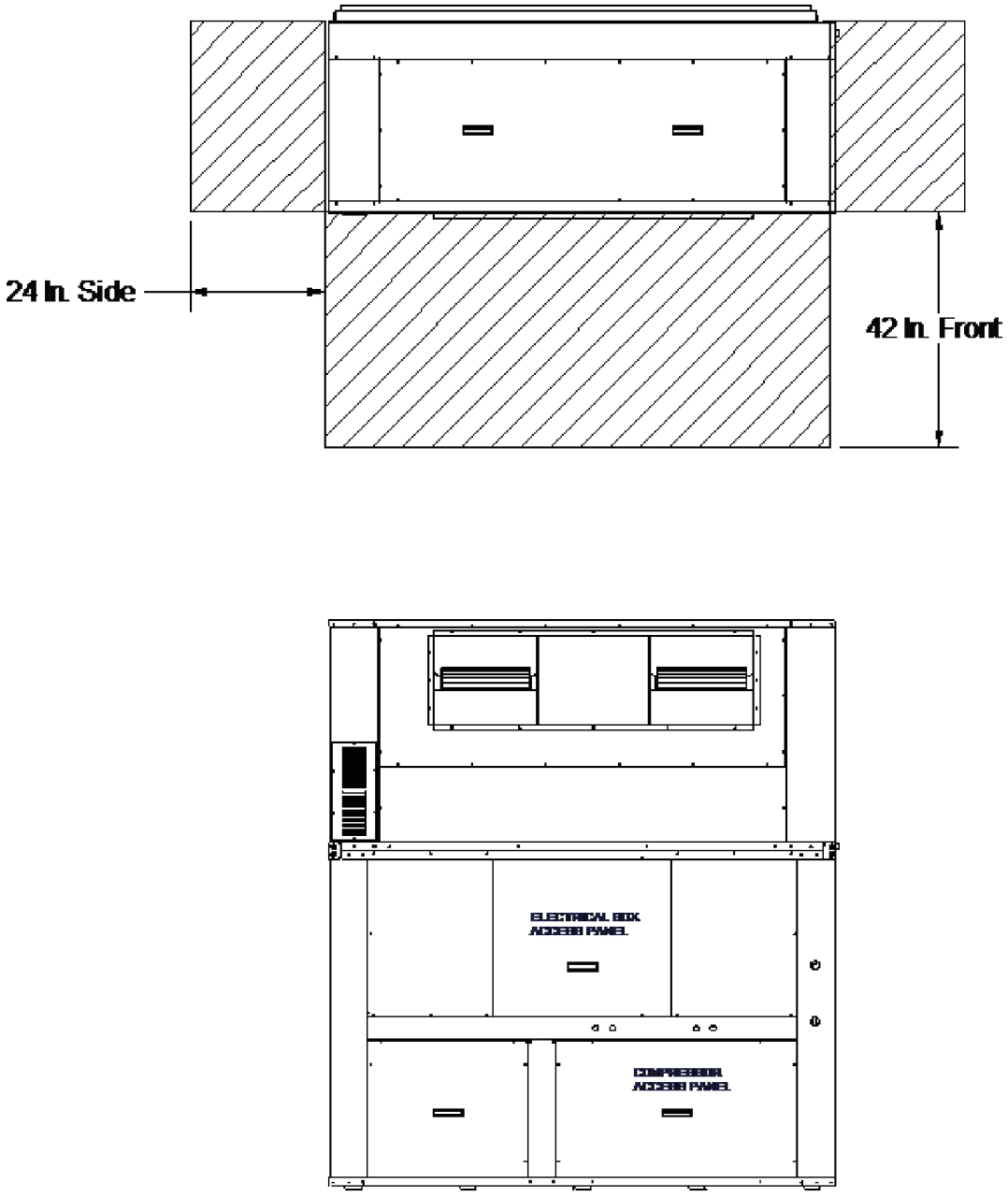
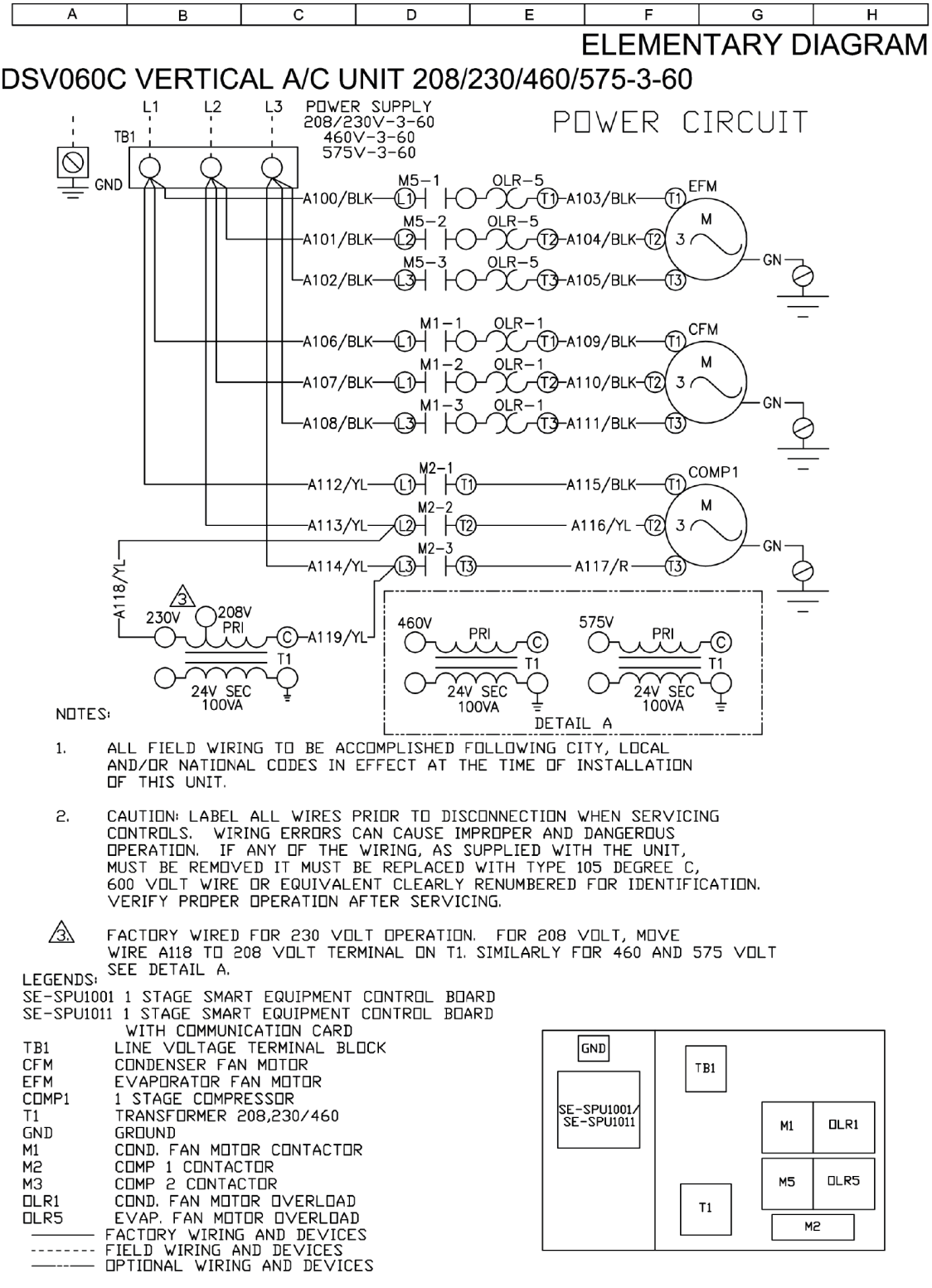
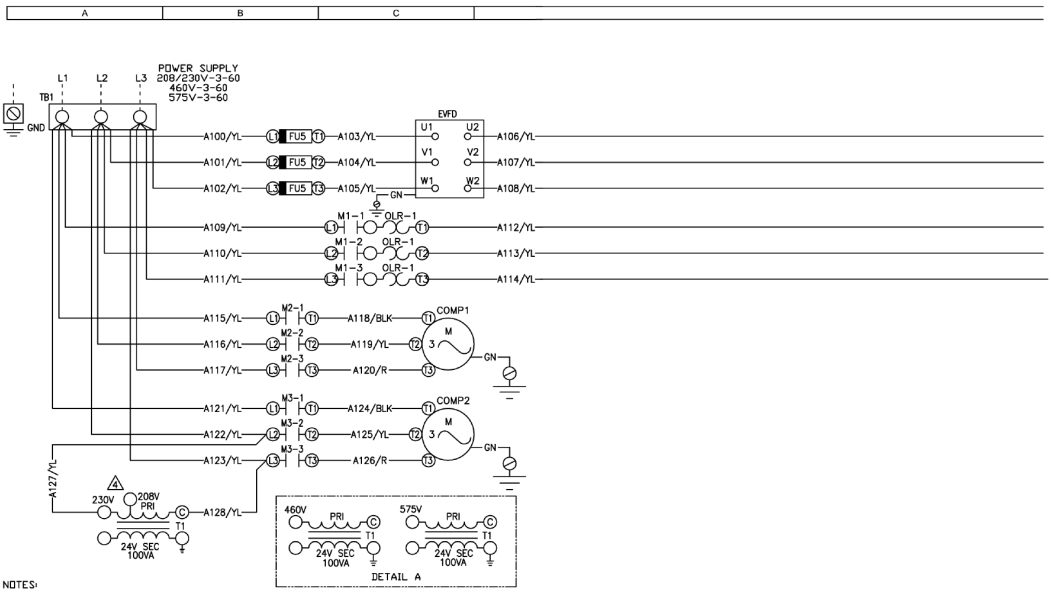


**Figure 36: DSV060C vertical A/C unit 208/230/460/575-3-60**



## Figure 37: DSV096/120/144C vertical A/C unit 208/230/460/575-3-60




NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT THE TIME OF INSTALLATION OF THIS UNIT.
2. CAUTION: LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. IF ANY OF THE WIRING, AS SUPPLIED WITH THE UNIT, MUST BE REMOVED IT MUST BE REPLACED WITH TYPE 105 DEGREE C, 600 VOLT WIRE OR EQUIVALENT CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. VFD NON BYPASS OPTION WILL NOT HAVE M1 AND OLR AS MOTOR CONTROL IS HANDELED BY VFD.
4. FACTORY WIRED FOR 230 VOLT OPERATION. FOR 208 VOLT, MOVE WIRE A127 TO 208 VOLT TERMINAL ON T1. SIMILARLY FOR 460 AND 575 VOLT SEE DETAIL A
5. VFD WITH BYPASS OPTION WILL HAVE M1 CONTACTOR AND OLR AS FACTORY INSTALLED OPTION AND BYPASS KIT WILL BE INSTALLED AT FIELD.

——— FACTORY WIRING AND DEVICES
- - - - - - - FIELD WIRING AND DEVICES
———— OPTIONAL WIRING AND DEVICES

LEGENDS:

| | |
|---|---|
| SE-SPU1004 | 4 STAGE SMART EQUIPMENT CONTROL BOARD |
| SE-SPU1002 | 2 STAGE SMART EQUIPMENT CONTROL BOARD |
| SE-SPU1012 | 2 STAGE SMART EQUIPMENT CONTROL BOARD WITH COMMUNICATION CARD |
| TB1 | LINE VOLTAGE TERMINAL BLOCK |
| TB2 | VFD BYPASS TERMINAL BLOCK |
| CFM | CONDENSER FAN MOTOR |
| EFM | EVAPORATOR FAN MOTOR |
| COMP1 | 2 STAGE COMPRESSOR |
| COMP2 | 1 STAGE SCROLL COMPRESSOR |
| T1 | TRANSFORMER 208-230/24V |
| GND | GROUND TERMINAL |
| FU1 | EVAP. FAN MOTOR VFD FUSE |
| FU4 | COND. FAN VFD BYPASS FUSE |
| FU5 | EVAP. FAN MOTOR FUSE |
| M1 | COND. FAN MOTOR CONTACTOR |
| M2 | COMP 1 CONTACTOR |
| M3 | COMP 2 CONTACTOR |
| M4 | COND. VFD BYPASS CONTACTOR |
| OLR1 | COND MOTOR OVERLOAD |
| CVFD | COND FAN VFD |
| EVFD | EVAP FAN VFD |
| CVFDR | COND VFD RELAY |
| EVFDR | EVAP VFD RELAY |

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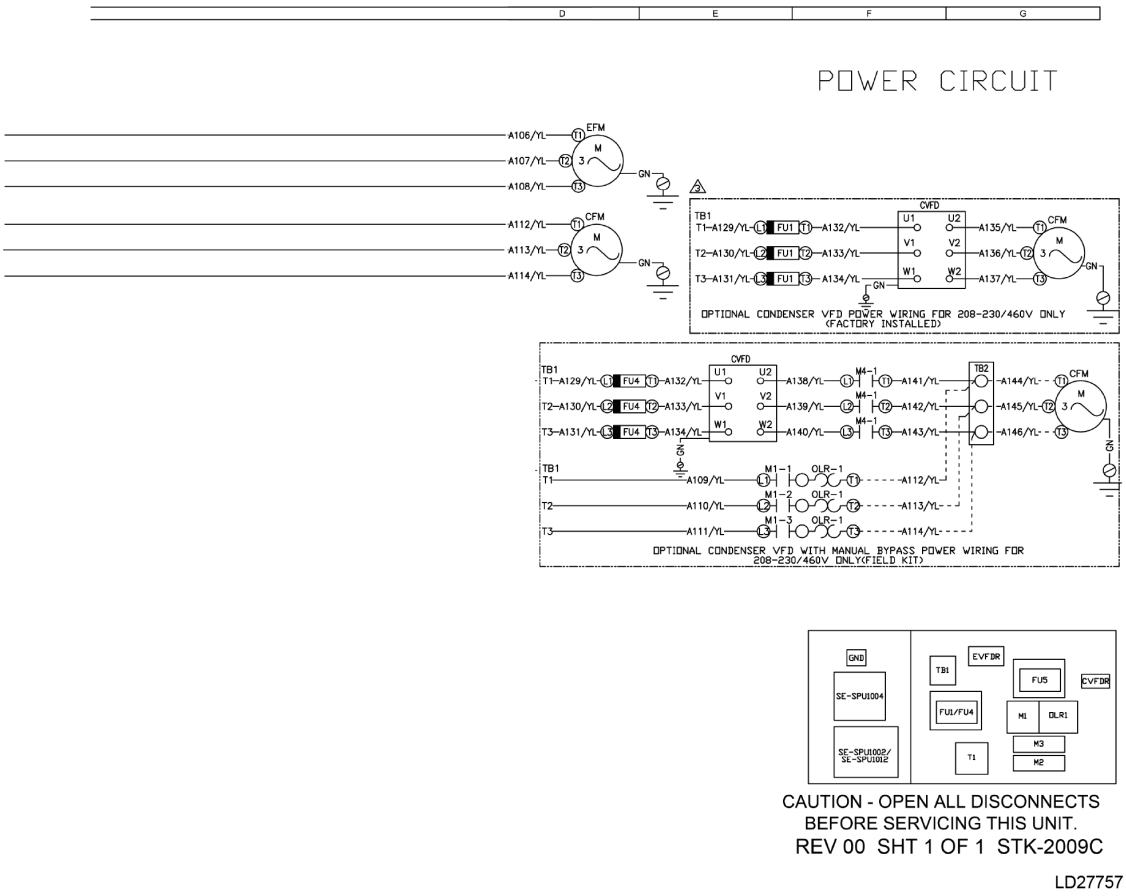

D
E
F
G
POWER CIRCUIT
A106/YL
A107/YL
A108/YL
EFM
M
3
GN
A112/YL
A113/YL
A114/YL
CFM
TB1
T1-A129/YL
T2-A130/YL
T3-A131/YL
FU1
A132/YL
A133/YL
A134/YL
CVFD
U1
U2
V1
V2
W1
W2
A135/YL
A136/YL
A137/YL
OPTIONAL CONDENSER VFD POWER WIRING FOR 208-230/460V ONLY
(FACTORY INSTALLED)
FU4
A138/YL
A139/YL
A140/YL
M4-1
A141/YL
A142/YL
A143/YL
TB2
A144/YL
A145/YL
A146/YL
T1
A109/YL
A110/YL
A111/YL
M1-1
M1-2
M1-3
OLR-1
A112/YL
A113/YL
A114/YL
OPTIONAL CONDENSER VFD WITH MANUAL BYPASS POWER WIRING FOR
208-230/460V ONLY(FIELD KIT)
GND
SE-SPU1004
SE-SPU1002/
SE-SPU1012
TB1
EVFDR
FU5
FU1/FU4
M1
OLR1
M3
M2
T1
CAUTION - OPEN ALL DISCONNECTS
BEFORE SERVICING THIS UNIT.
REV 00 SHT 1 OF 1 STK-2009C
LD27757

**Figure 38: DSV180C vertical A/C unit 208/230-3-60**

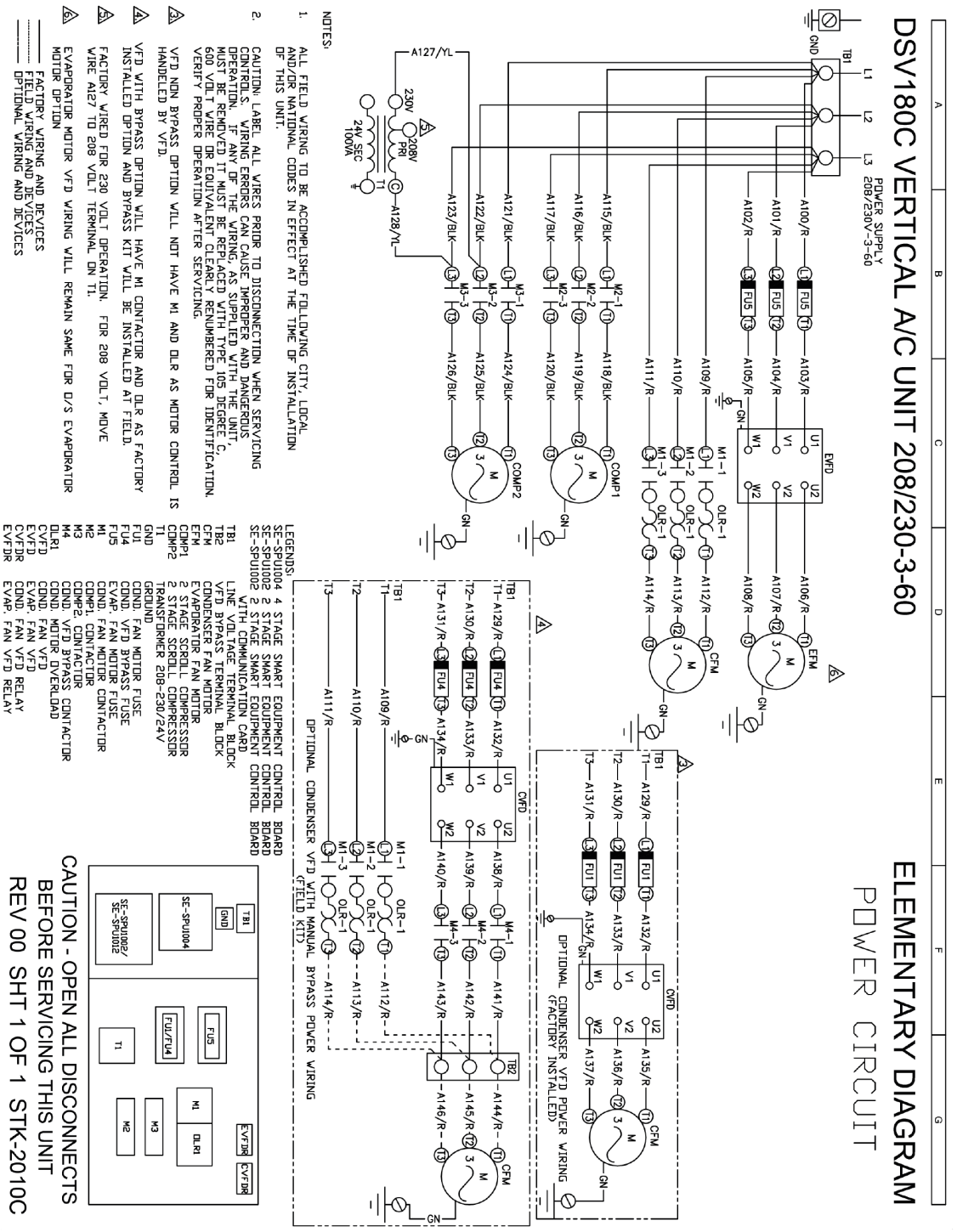


**Figure 39: DSV180C vertical A/C unit 460/575-3-60**

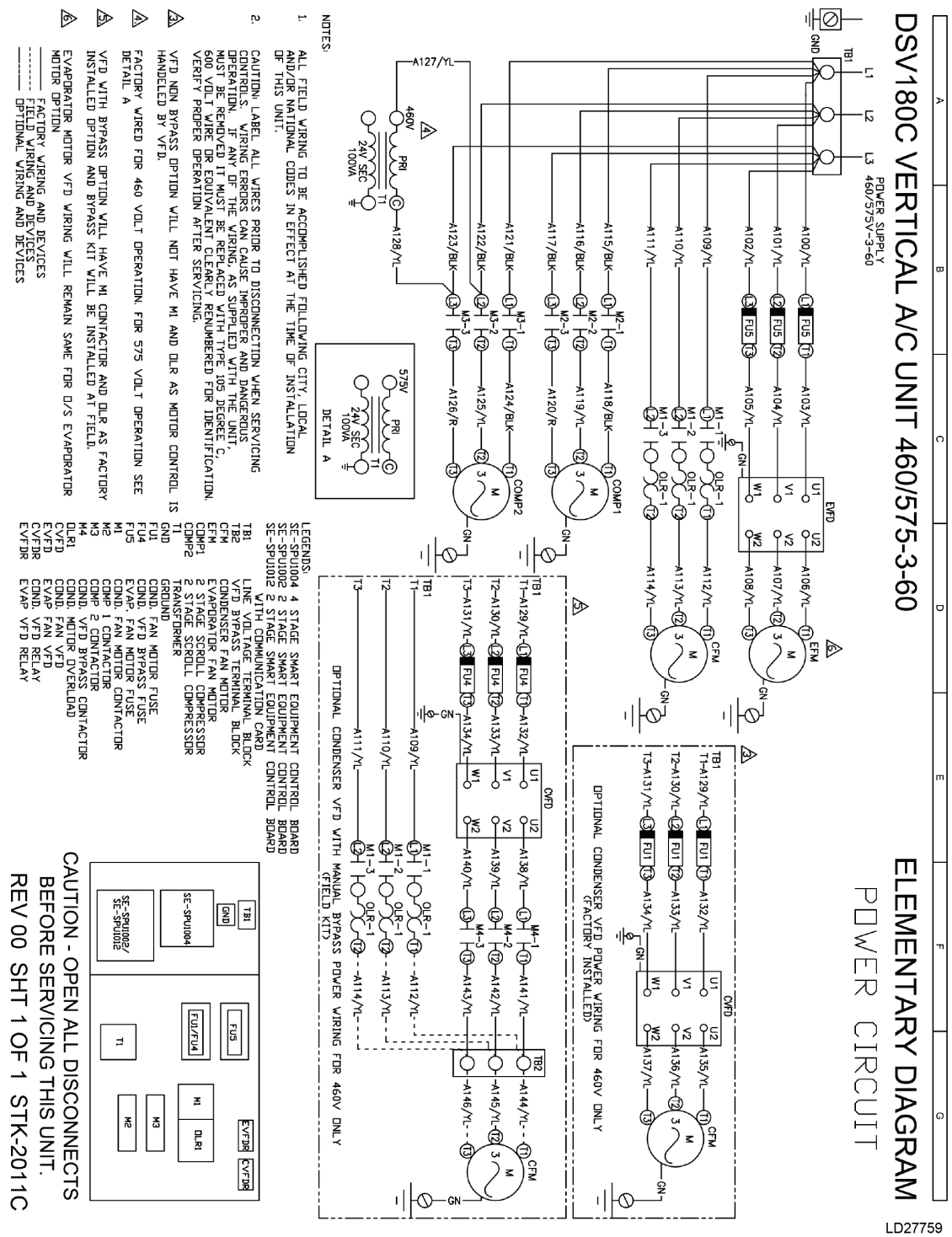


**Figure 40: DSV240C vertical A/C unit 208/230-3-60**

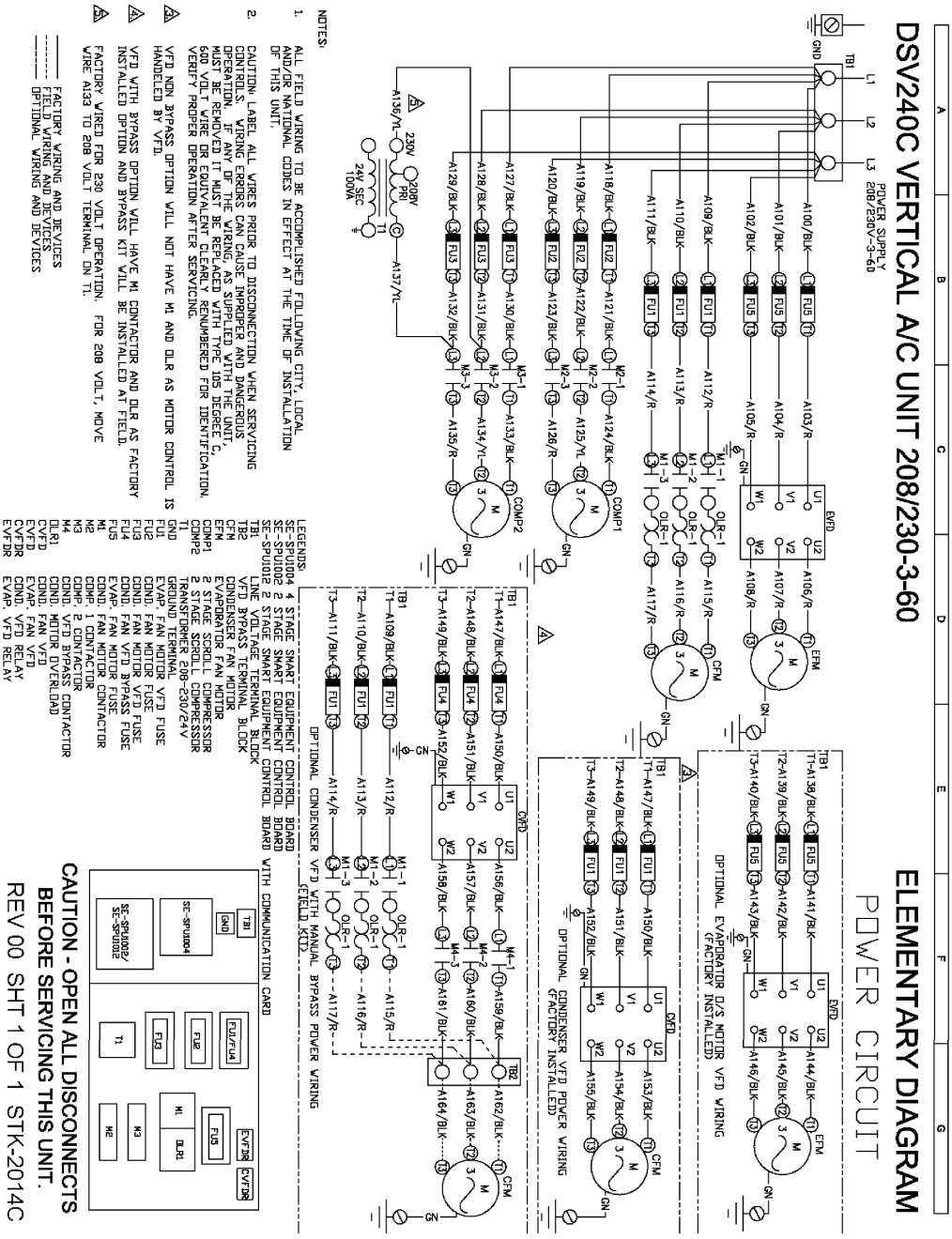


**Figure 41: DSV240C vertical A/C unit 460/575-3-60**

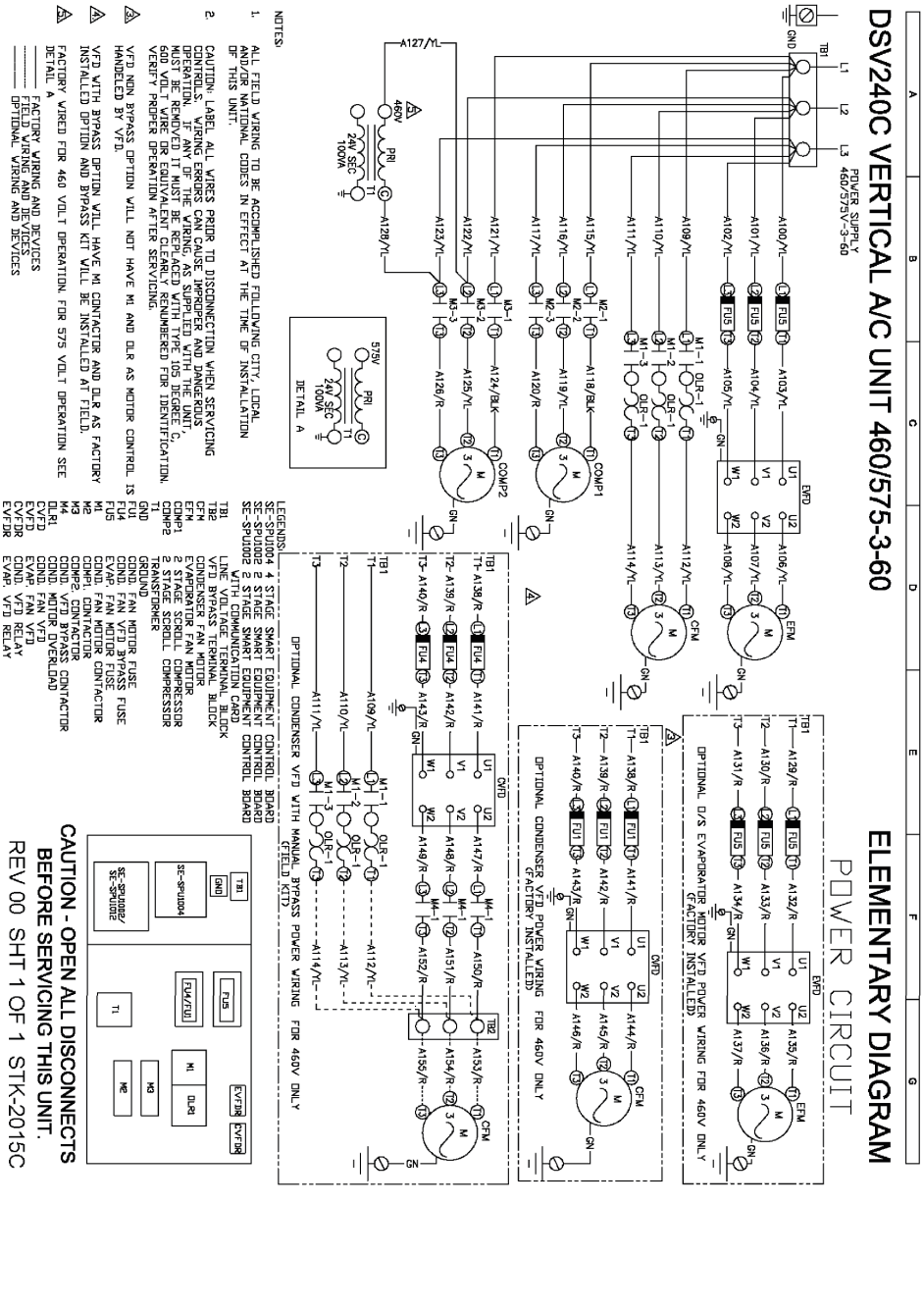
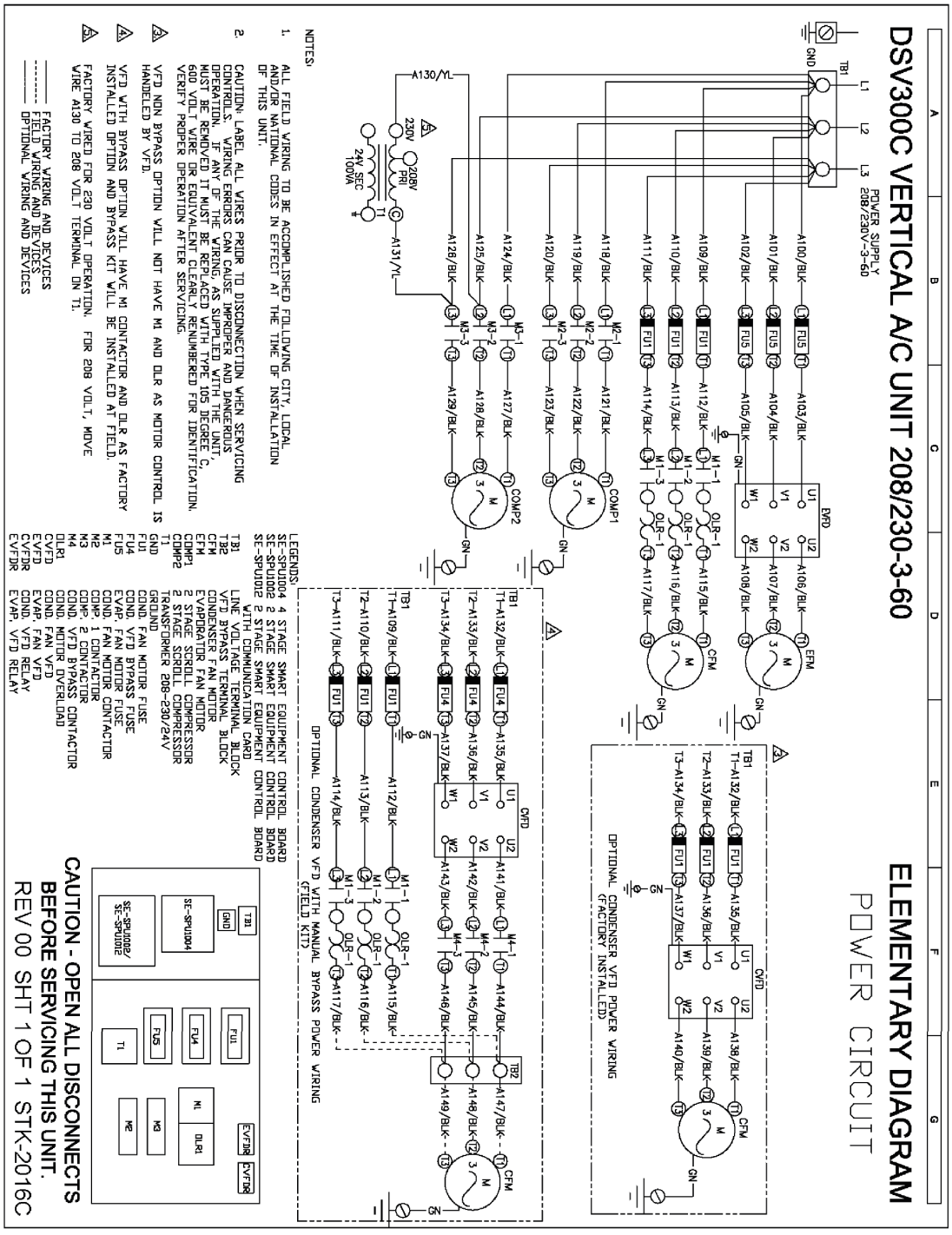
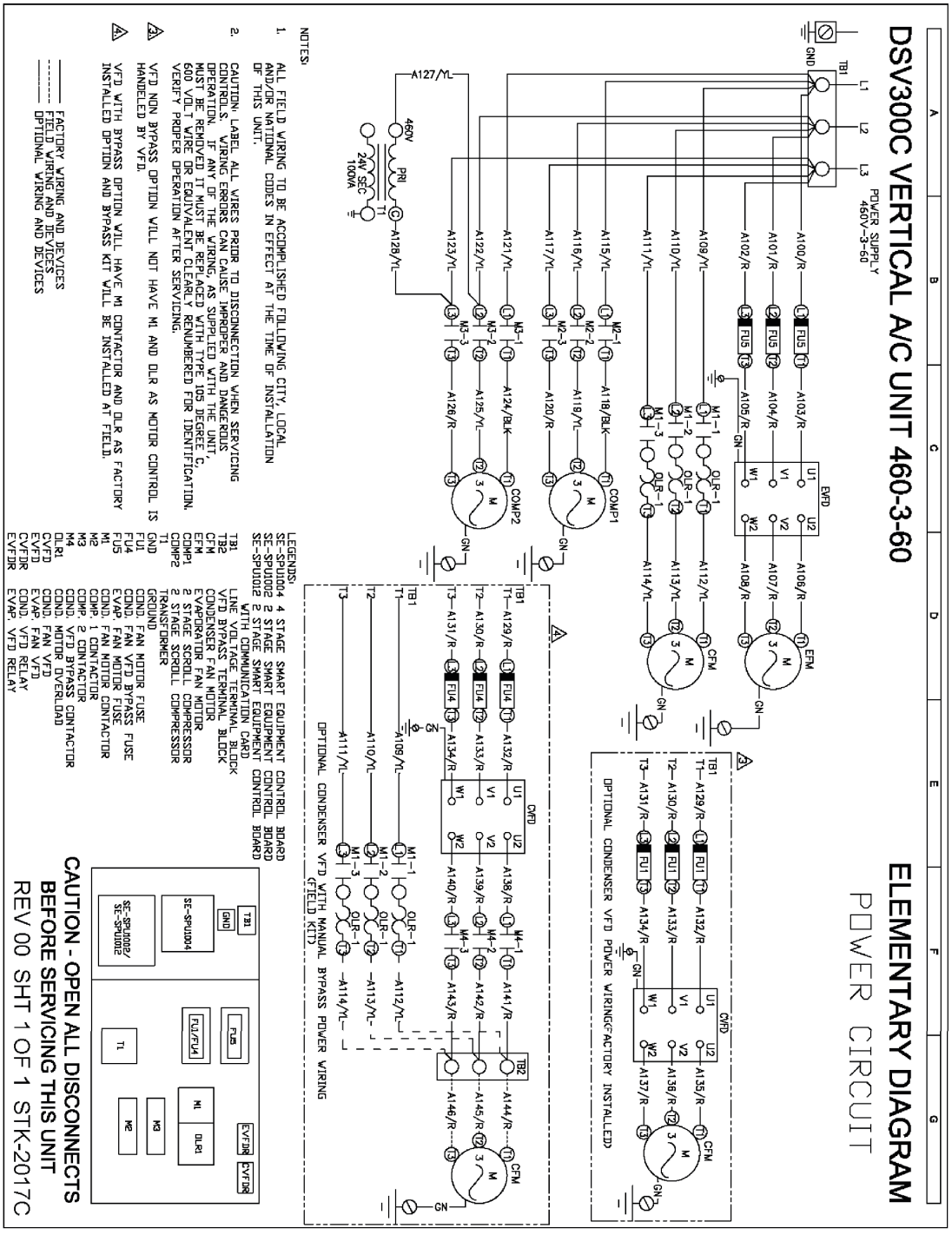


**Figure 42: DSV300C vertical A/C unit 208/230-3-60**



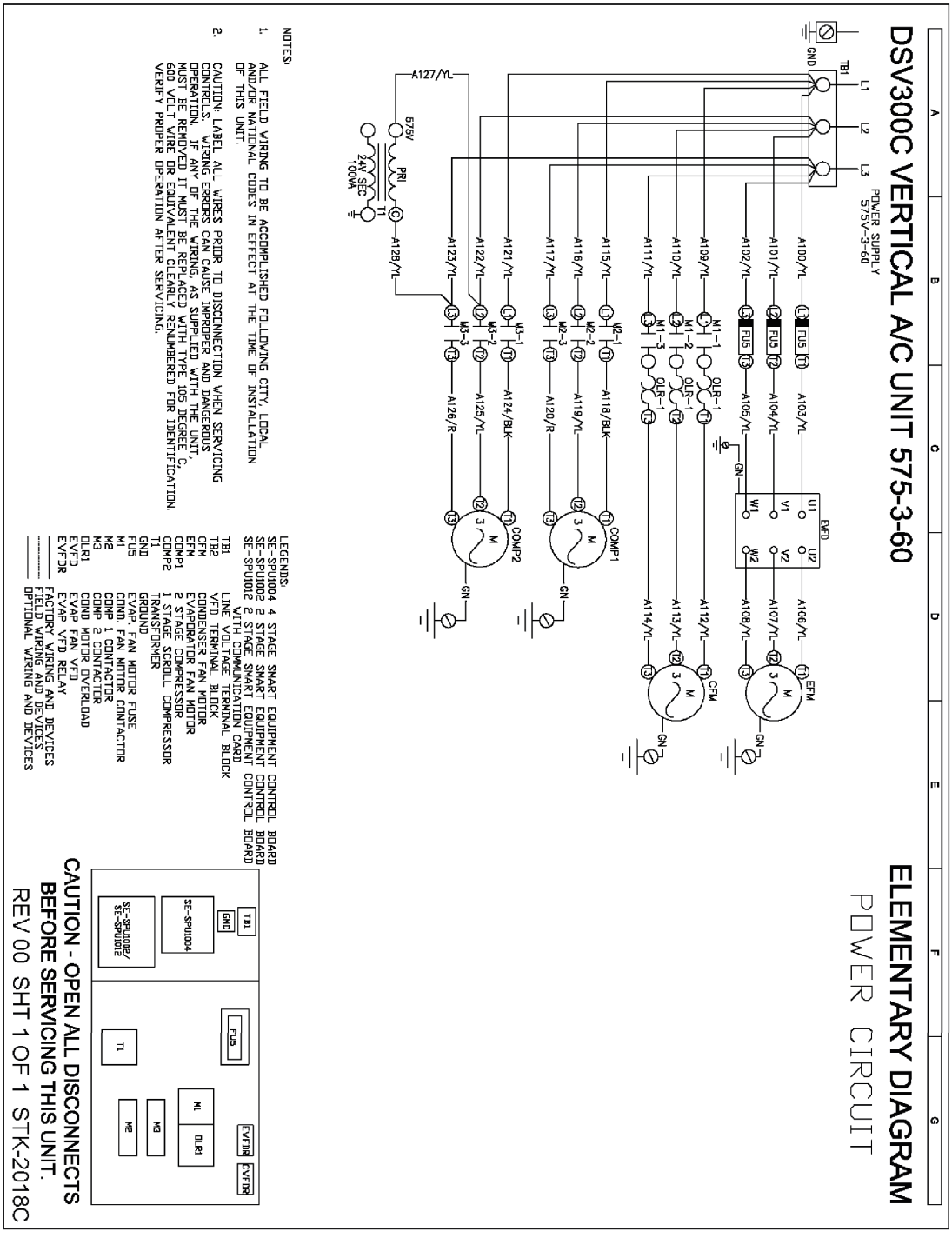

LD27762

**Figure 43: DSV300C vertical A/C unit 460-3-60**




LD27763

**Figure 44: DSV300C vertical A/C unit 575-3-60**



# Appendix D: Low voltage unit wiring schematics

**Figure 45: DSV060C vertical A/C unit – control wiring**

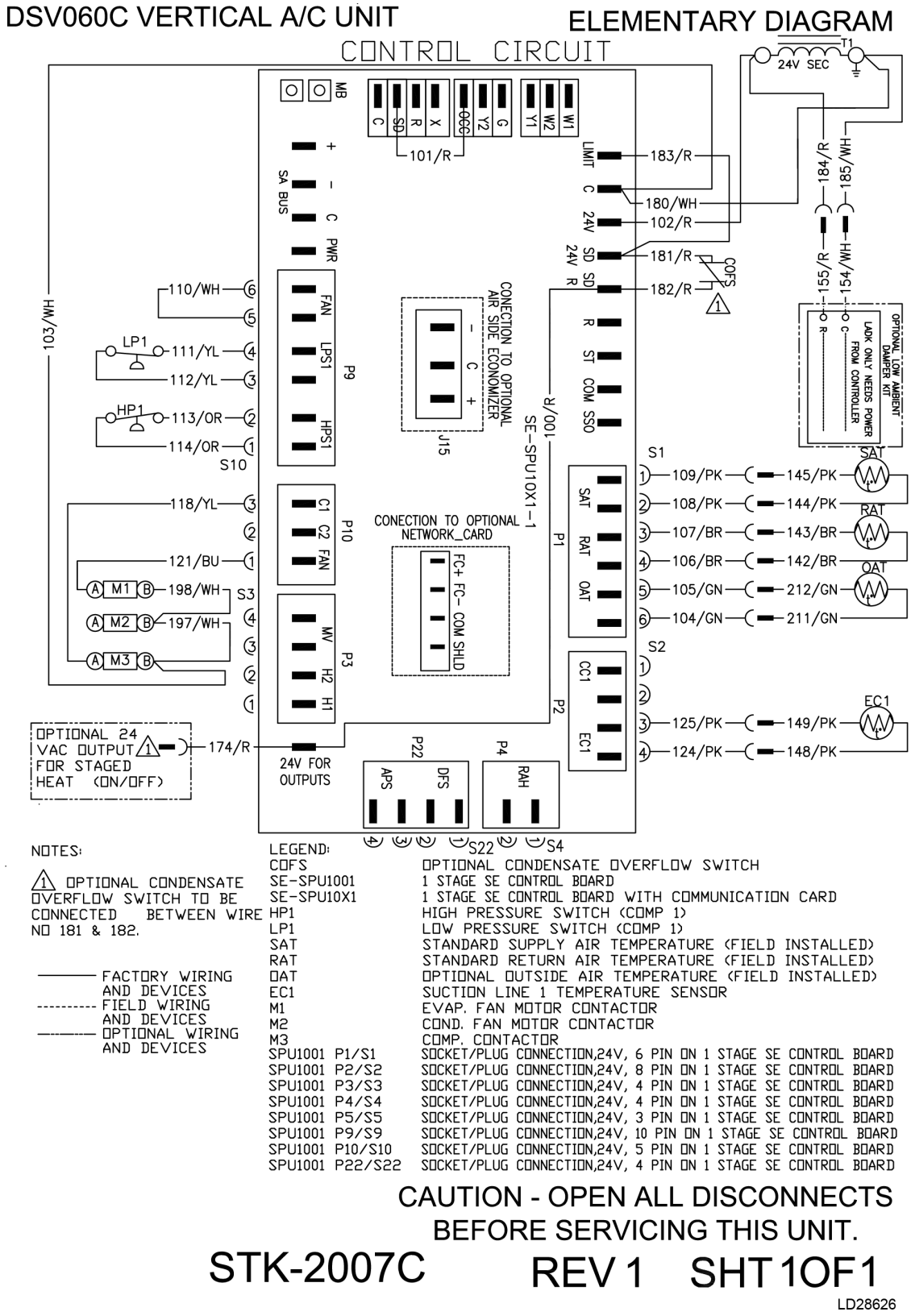
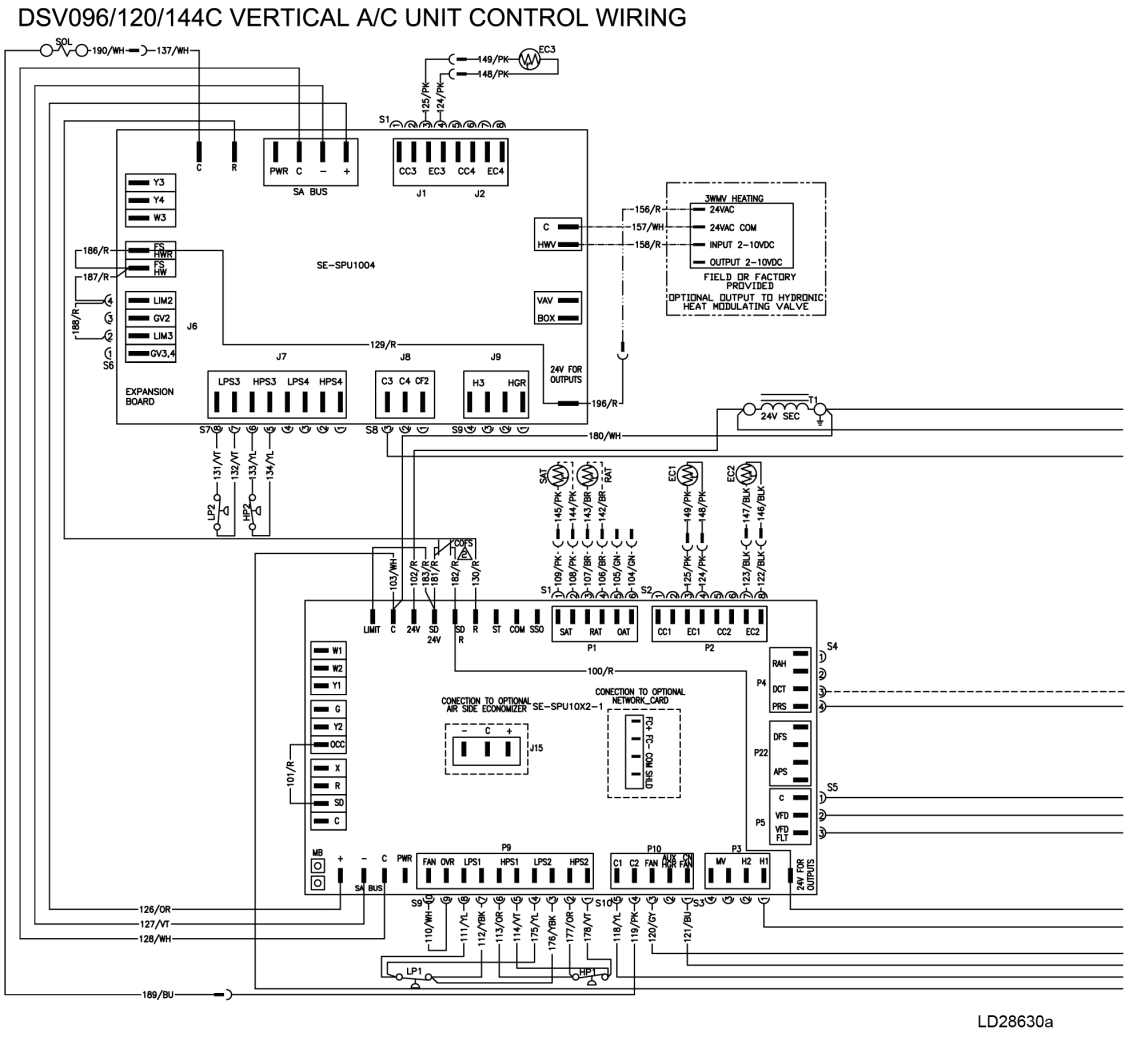


**Figure 46: DSV096/120/144C vertical A/C unit – control wiring**



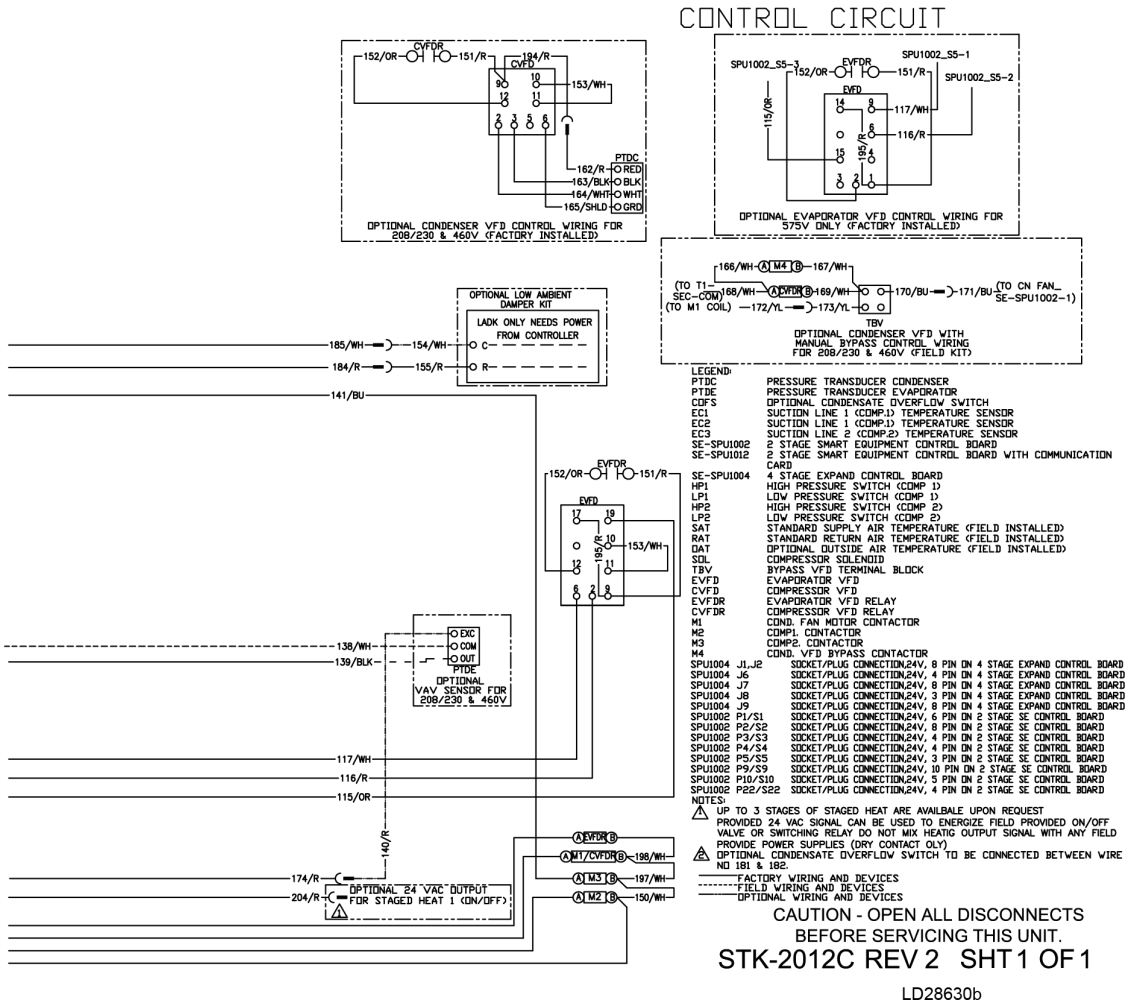
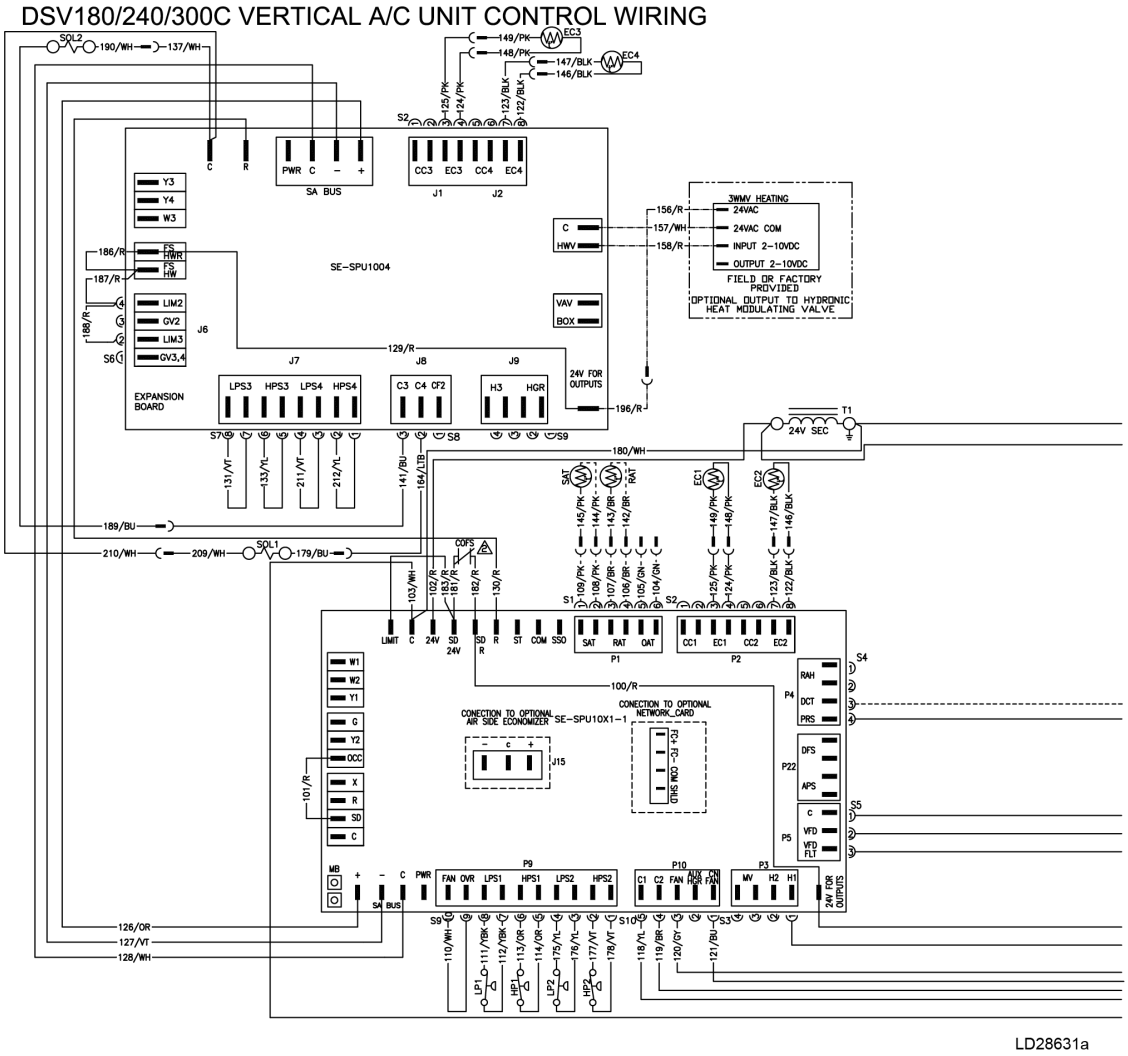

CONTROL CIRCUIT
OPTIONAL CONDENSER VFD CONTROL WIRING FOR 208/230 & 460V (FACTORY INSTALLED)
OPTIONAL EVAPORATOR VFD CONTROL WIRING FOR 575V ONLY (FACTORY INSTALLED)
OPTIONAL CONDENSER VFD WITH MANUAL BYPASS CONTROL WIRING FOR 208/230 & 460V (FIELD KIT)
OPTIONAL LOW AMBIENT DAMPER KIT
LADK ONLY NEEDS POWER FROM CONTROLLER
OPTIONAL VAV SENSOR FOR 208/230 & 460V
OPTIONAL 24 VAC OUTPUT FOR STAGED HEAT 1 (ON/OFF)
LEGEND:
PTDC PRESSURE TRANSDUCER CONDENSER
PTDE PRESSURE TRANSDUCER EVAPORATOR
COFS OPTIONAL CONDENSATE OVERFLOW SWITCH
EC1 SUCTION LINE 1 (COMP.1) TEMPERATURE SENSOR
EC2 SUCTION LINE 1 (COMP.1) TEMPERATURE SENSOR
EC3 SUCTION LINE 2 (COMP.2) TEMPERATURE SENSOR
SE-SPU1002 2 STAGE SMART EQUIPMENT CONTROL BOARD
SE-SPU1012 2 STAGE SMART EQUIPMENT CONTROL BOARD WITH COMMUNICATION CARD
SE-SPU1004 4 STAGE EXPAND CONTROL BOARD
HP1 HIGH PRESSURE SWITCH (COMP 1)
LP1 LOW PRESSURE SWITCH (COMP 1)
HP2 HIGH PRESSURE SWITCH (COMP 2)
LP2 LOW PRESSURE SWITCH (COMP 2)
SAT STANDARD SUPPLY AIR TEMPERATURE (FIELD INSTALLED)
RAT STANDARD RETURN AIR TEMPERATURE (FIELD INSTALLED)
OAT OPTIONAL OUTSIDE AIR TEMPERATURE (FIELD INSTALLED)
SOL COMPRESSOR SOLENOID
TBV BYPASS VFD TERMINAL BLOCK
EVFD EVAPORATOR VFD
CVFD COMPRESSOR VFD
EVFDR EVAPORATOR VFD RELAY
CVFDR COMPRESSOR VFD RELAY
M1 COND. FAN MOTOR CONTACTOR
M2 COMP1. CONTACTOR
M3 COMP2. CONTACTOR
M4 COND. VFD BYPASS CONTACTOR
SPU1004 J1,J2 SOCKET/PLUG CONNECTION,24V, 8 PIN ON 4 STAGE EXPAND CONTROL BOARD
SPU1004 J6 SOCKET/PLUG CONNECTION,24V, 4 PIN ON 4 STAGE EXPAND CONTROL BOARD
SPU1004 J7 SOCKET/PLUG CONNECTION,24V, 8 PIN ON 4 STAGE EXPAND CONTROL BOARD
SPU1004 J8 SOCKET/PLUG CONNECTION,24V, 3 PIN ON 4 STAGE EXPAND CONTROL BOARD
SPU1004 J9 SOCKET/PLUG CONNECTION,24V, 8 PIN ON 4 STAGE EXPAND CONTROL BOARD
SPU1002 P1/S1 SOCKET/PLUG CONNECTION,24V, 6 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P2/S2 SOCKET/PLUG CONNECTION,24V, 8 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P3/S3 SOCKET/PLUG CONNECTION,24V, 4 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P4/S4 SOCKET/PLUG CONNECTION,24V, 4 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P5/S5 SOCKET/PLUG CONNECTION,24V, 3 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P9/S9 SOCKET/PLUG CONNECTION,24V, 10 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P10/S10 SOCKET/PLUG CONNECTION,24V, 5 PIN ON 2 STAGE SE CONTROL BOARD
SPU1002 P22/S22 SOCKET/PLUG CONNECTION,24V, 4 PIN ON 2 STAGE SE CONTROL BOARD
NOTES:
1 UP TO 3 STAGES OF STAGED HEAT ARE AVAILBALE UPON REQUEST PROVIDED 24 VAC SIGNAL CAN BE USED TO ENERGIZE FIELD PROVIDED ON/OFF VALVE OR SWITCHING RELAY DO NOT MIX HEATIG OUTPUT SIGNAL WITH ANY FIELD PROVIDE POWER SUPPLIES (DRY CONTACT ONLY)
2 OPTIONAL CONDENSATE OVERFLOW SWITCH TO BE CONNECTED BETWEEN WIRE NO 181 & 182.
FACTORY WIRING AND DEVICES
FIELD WIRING AND DEVICES
OPTIONAL WIRING AND DEVICES
CAUTION - OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT.
STK-2012C REV 2 SHT 1 OF 1
LD28630b

**Figure 47: DSV180/240/300C vertical A/C unit – control wiring**



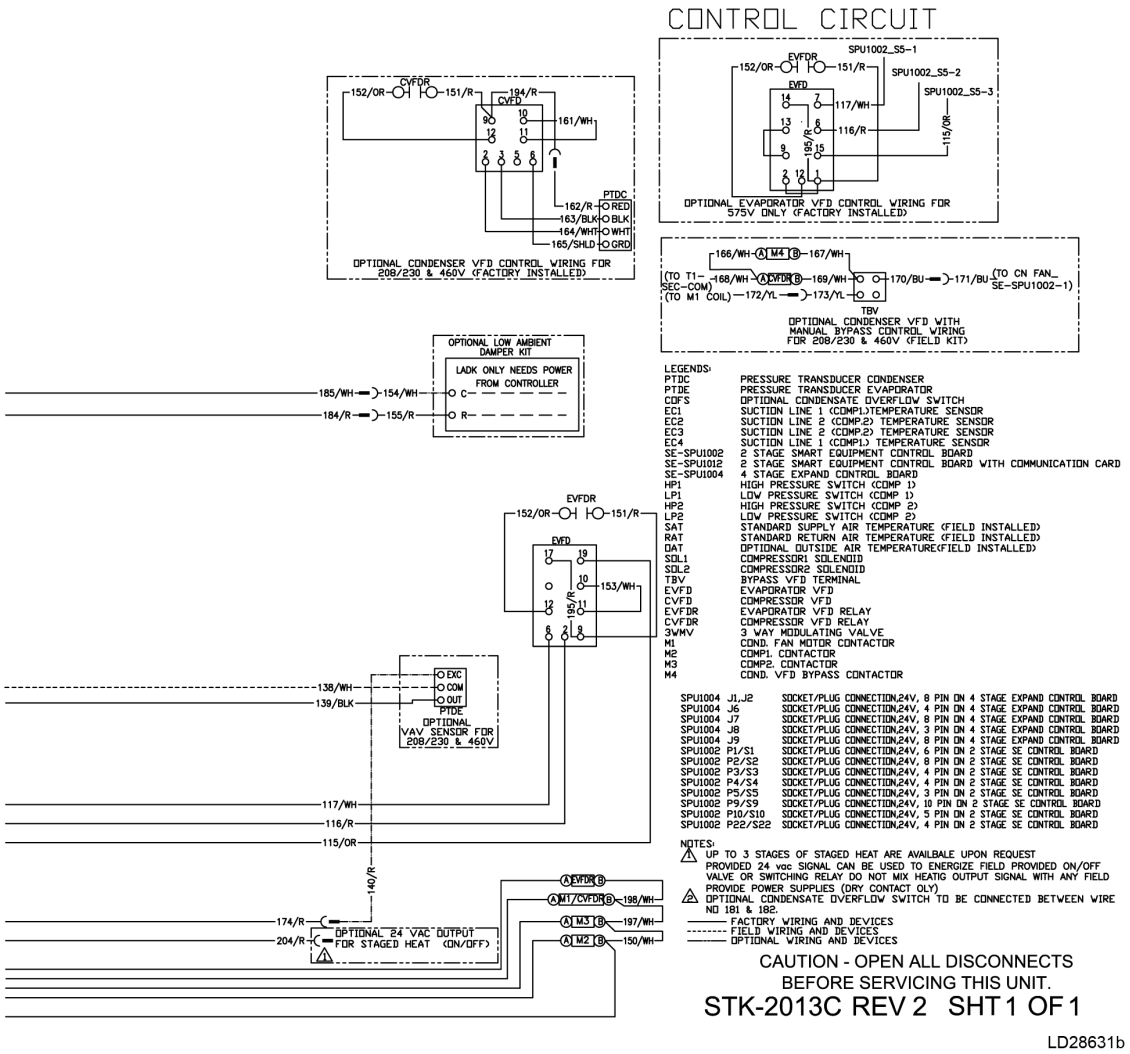
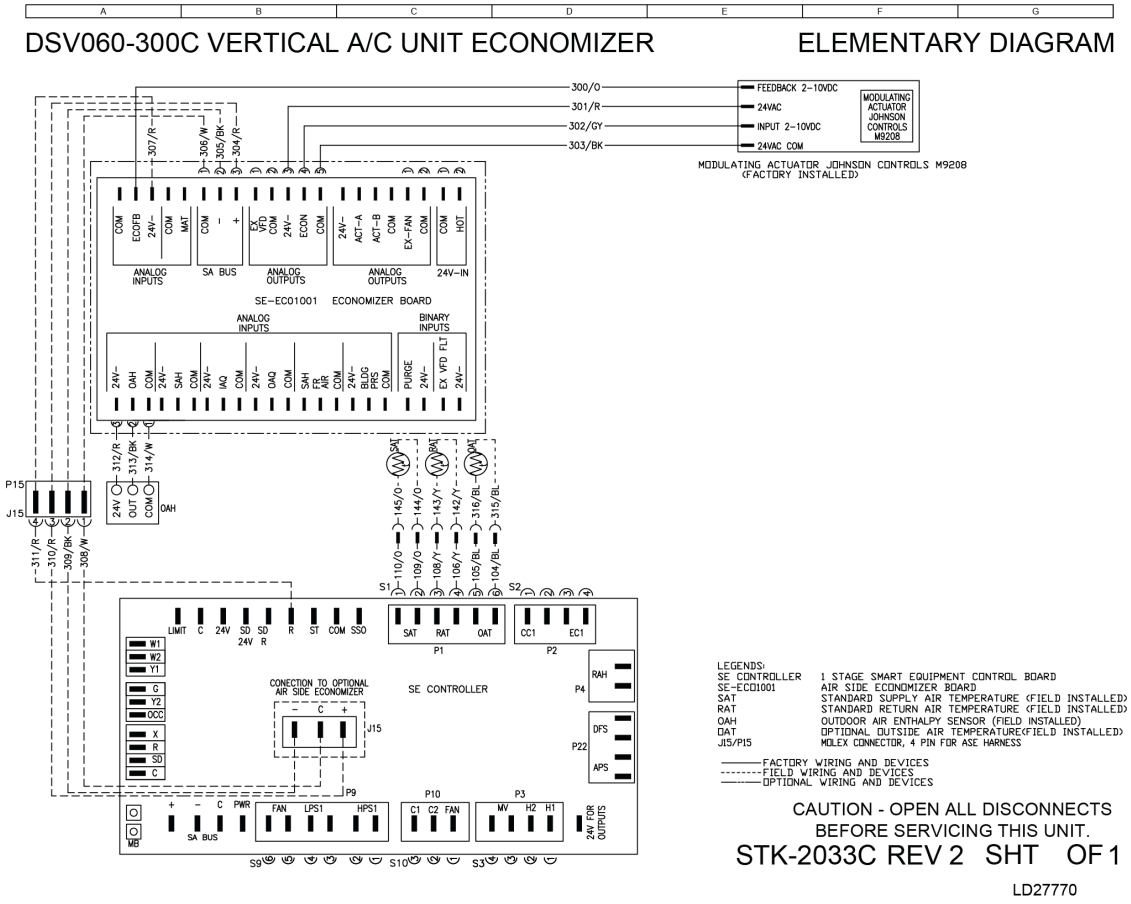

CONTROL CIRCUIT
OPTIONAL CONDENSER VFD CONTROL WIRING FOR 208/230 & 460V (FACTORY INSTALLED)
OPTIONAL EVAPORATOR VFD CONTROL WIRING FOR 575V ONLY (FACTORY INSTALLED)
TBV
OPTIONAL CONDENSER VFD WITH MANUAL BYPASS CONTROL WIRING FOR 208/230 & 460V (FIELD KIT)
OPTIONAL LOW AMBIENT DAMPER KIT
LADK ONLY NEEDS POWER FROM CONTROLLER
OPTIONAL VAV SENSOR FOR 208/230 & 460V
OPTIONAL 24 VAC OUTPUT FOR STAGED HEAT (ON/OFF)
LEGENDS:
PTDC PRESSURE TRANSDUCER CONDENSER
PTDE PRESSURE TRANSDUCER EVAPORATOR
COFS OPTIONAL CONDENSATE OVERFLOW SWITCH
EC1 SUCTION LINE 1 (COMP1)TEMPERATURE SENSOR
EC2 SUCTION LINE 2 (COMP.2) TEMPERATURE SENSOR
EC3 SUCTION LINE 2 (COMP.2) TEMPERATURE SENSOR
EC4 SUCTION LINE 1 (COMP1.) TEMPERATURE SENSOR
SE-SPU1002 2 STAGE SMART EQUIPMENT CONTROL BOARD
SE-SPU1012 2 STAGE SMART EQUIPMENT CONTROL BOARD WITH COMMUNICATION CARD
SE-SPU1004 4 STAGE EXPAND CONTROL BOARD
HP1 HIGH PRESSURE SWITCH (COMP 1)
LP1 LOW PRESSURE SWITCH (COMP 1)
HP2 HIGH PRESSURE SWITCH (COMP 2)
LP2 LOW PRESSURE SWITCH (COMP 2)
SAT STANDARD SUPPLY AIR TEMPERATURE (FIELD INSTALLED)
RAT STANDARD RETURN AIR TEMPERATURE (FIELD INSTALLED)
OAT OPTIONAL OUTSIDE AIR TEMPERATURE(FIELD INSTALLED)
SOL1 COMPRESSOR1 SOLENOID
SOL2 COMPRESSOR2 SOLENOID
TBV BYPASS VFD TERMINAL
EVFD EVAPORATOR VFD
CVFD COMPRESSOR VFD
EVFDR EVAPORATOR VFD RELAY
CVFDR COMPRESSOR VFD RELAY
3WMV 3 WAY MODULATING VALVE
M1 COND. FAN MOTOR CONTACTOR
M2 COMP1. CONTACTOR
M3 COMP2. CONTACTOR
M4 COND. VFD BYPASS CONTACTOR
SPU1004 J1,J2 SOCKET/PLUG CONNECTION,24V, 8 PIN DN 4 STAGE EXPAND CONTROL BOARD
SPU1004 J6 SOCKET/PLUG CONNECTION,24V, 4 PIN DN 4 STAGE EXPAND CONTROL BOARD
SPU1004 J7 SOCKET/PLUG CONNECTION,24V, 8 PIN DN 4 STAGE EXPAND CONTROL BOARD
SPU1004 J8 SOCKET/PLUG CONNECTION,24V, 3 PIN DN 4 STAGE EXPAND CONTROL BOARD
SPU1004 J9 SOCKET/PLUG CONNECTION,24V, 8 PIN DN 4 STAGE EXPAND CONTROL BOARD
SPU1002 P1/S1 SOCKET/PLUG CONNECTION,24V, 6 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P2/S2 SOCKET/PLUG CONNECTION,24V, 8 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P3/S3 SOCKET/PLUG CONNECTION,24V, 4 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P4/S4 SOCKET/PLUG CONNECTION,24V, 4 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P5/S5 SOCKET/PLUG CONNECTION,24V, 3 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P9/S9 SOCKET/PLUG CONNECTION,24V, 10 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P10/S10 SOCKET/PLUG CONNECTION,24V, 5 PIN DN 2 STAGE SE CONTROL BOARD
SPU1002 P22/S22 SOCKET/PLUG CONNECTION,24V, 4 PIN DN 2 STAGE SE CONTROL BOARD
NOTES:
1. UP TO 3 STAGES OF STAGED HEAT ARE AVAILBALE UPON REQUEST PROVIDED 24 vac SIGNAL CAN BE USED TO ENERGIZE FIELD PROVIDED ON/OFF VALVE OR SWITCHING RELAY DO NOT MIX HEATIG OUTPUT SIGNAL WITH ANY FIELD PROVIDE POWER SUPPLIES (DRY CONTACT ONLY)
2. OPTIONAL CONDENSATE OVERFLOW SWITCH TO BE CONNECTED BETWEEN WIRE NO 181 & 182.
FACTORY WIRING AND DEVICES
FIELD WIRING AND DEVICES
OPTIONAL WIRING AND DEVICES
CAUTION - OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT.
STK-2013C REV 2 SHT 1 OF 1
LD28631b

**Figure 48: DSV060–300C vertical A/C unit economizer**



# Appendix E: SEC parameters for DSV units, C generation

**Table 28: SEC parameters for DSV060C units with single speed evaporator fan**

| Menu/sub-menu | | | Parameter | Factory value |
|---|---|---|---|---|
| **Commission** | **Standard** | | T-Stat Only | Yes |
| | **Options** | | # Refrig Sys | 1 |
| | | | # Ht Pump Stgs | 0 |
| **Details** | **OCC** | | Occ Mode[1] | External |
| | | | Off Dur Unocc | No |
| | **Cooling** | **Setup** | Clg-En | Yes |
| | | | # Clg Stgs | 1 |
| | | | C1-En | Yes |
| | | | Low Amb-En[2] | No |
| | | | Lead Lag-En[3] | No |
| | | | Clg OAT Cutout-En | Yes |
| | | | Clg OAT Cutout | 45 |
| | | | Clg Adap Tune-En | No |
| | | | SAT Cool Limit-En | Yes |
| | | | Sat Cool Limit-SP | 45 |
| | | | Freeze-SP | 26 |
| | **Heating** | | Htg-En[4] | No |
| | | | # Htg Stgs | 0 |
| | **Fan** | | Fan Ctl-Type | Single Speed |
| | | | Fan On Dly Cool | 0 |
| | | | Fan Off Dly Cool | 45 |

**Note:**

1. Factory shipped units equipped with Occ jumper on UCB
2. Do not enable low ambient
3. Do not enable LeadLag
4. Field supplied option

**Table 29: SEC parameters for DSV096C–144C units with VAV evaporator fan**

| Menu/sub-menu | | | Parameter | Factory value |
|---|---|---|---|---|
| **Commission** | **Standard** | | T-Stat Only | Yes |
| | **Options** | | # Refrig Sys | 2 |
| | | | # Ht Pump Stgs | 0 |
| **Details** | **OCC** | | Occ Mode[1] | External |
| | | | Off Dur Unocc | No |
| | **Cooling** | **Setup** | Clg-En | Yes |
| | | | # Clg Stgs | 3 |
| | | | C1-En | Yes |
| | | | C2-En | Yes |
| | | | C3-En | Yes |
| | | | C4-En | No |
| | | | Low Amb-En[2] | No |
| | | | Lead Lag-En[3] | No |
| | | | Clg OAT Cutout-En | Yes |
| | | | Clg OAT Cutout | 45 |
| | | | SAT Cool Limit-En | Yes |
| | | | Sat Cool Limit-SP | 45 |
| | | | Freeze-SP | 26 |
| | **Heating** | | Htg-En[4] | No |
| | | | # Htg Stgs | 0 |
| | **Fan** | | Fan Ctl-Type | Variable |
| | | | Fan On Dly Cool | 0 |
| | | | Fan Off Dly Cool | 30 |
| | **Fan VFD** | | Dct Prs-SP[5] | 1.5 IWG |
| | | | Dct ShutDown SP[5] | 4.5 IWG |

**Note:**

1. Factory shipped units equipped with Occ jumper on UCB
2. Do not enable low ambient
3. Do not enable LeadLag
4. Field supplied option
5. Field set parameter

**Table 30: SEC parameters for DSV096C–144C units with discrete speeds evaporator fan**

| Menu/sub-menu | | | Parameter | Factory value |
|---|---|---|---|---|
| Commission | Standard | | T-Stat Only | Yes |
| | Options | | # Refrig Sys | 2 |
| | | | # Ht Pump Stgs | 0 |
| Details | OCC | | Occ Mode[1] | External |
| | | | Off Dur Unocc | No |
| | Cooling | Setup | Clg-En | Yes |
| | | | # Clg Stgs | 3 |
| | | | C1-En | Yes |
| | | | C2-En | Yes |
| | | | C3-En | Yes |
| | | | C4-En | No |
| | | | Low Amb-En[2] | No |
| | | | Lead Lag-En[3] | No |
| | | | Clg OAT Cutout-En | Yes |
| | | | Clg OAT Cutout | 45 |
| | | | SAT Cool Limit-En | Yes |
| | | | Sat Cool Limit-SP | 45 |
| | | | Freeze-SP | 26 |
| | Heating | | Htg-En[4] | No |
| | | | # Htg Stgs | 0 |
| | Fan | | Fan Ctl-Type | Fixed Variable |
| | | | Fan On Occ | No |
| | | | Fan On Dly Cool | 0 |
| | | | Fan Off Dly Cool | 30 |
| | | | Fan Only % Cmd | 0 |
| | | | 1 Clg Stg -% Cmd | 50 |
| | | | 2 Clg Stg -% Cmd | 60 |
| | | | 3 Clg Stg -% Cmd | 100 |
| | | | 4 Clg Stg -% Cmd | 100 |

**Note:**

1. Factory shipped units equipped with Occ jumper on UCB
2. Do not enable low ambient
3. Do not enable LeadLag
4. Field supplied option

**Table 31: SEC parameters for DSV180C–300C units with VAV evaporator fan**

| Menu/sub-menu | | | Parameter | Factory value |
|---|---|---|---|---|
| **Commission** | **Standard** | | T-Stat Only | Yes |
| | **Options** | | # Refrig Sys | 2 |
| | | | # Ht Pump Stgs | 0 |
| **Details** | **OCC** | | Occ Mode[1] | External |
| | | | Off Dur Unocc | No |
| | **Cooling** | **Setup** | Clg-En | Yes |
| | | | # Clg Stgs | 4 |
| | | | C1-En | Yes |
| | | | C2-En | Yes |
| | | | C3-En | Yes |
| | | | C4-En | Yes |
| | | | Low Amb-En[2] | No |
| | | | Lead Lag-En[3] | No |
| | | | Clg OAT Cutout-En | Yes |
| | | | Clg OAT Cutout | 45 |
| | | | SAT Cool Limit-En | Yes |
| | | | Sat Cool Limit-SP | 45 |
| | | | Freeze-SP | 26 |
| | **Heating** | | Htg-En[4] | No |
| | | | # Htg Stgs | 0 |
| | **Fan** | | Fan Ctl-Type | Variable |
| | | | Fan On Dly Cool | 0 |
| | | | Fan Off Dly Cool | 30 |
| | **Fan VFD** | | Dct Prs-SP[5] | 1.5 IWG |
| | | | Dct ShutDown SP[5] | 4.5 IWG |

**Note:**

1. Factory shipped units equipped with Occ jumper on UCB
2. Do not enable low ambient
3. Do not enable LeadLag
4. Field supplied option
5. Field set parameter

**Table 32: SEC parameters for DSV180C–300C units with discrete speeds evaporator fan**

| Menu/sub-menu | | | Parameter | Factory value |
|---|---|---|---|---|
| **Commission** | **Standard** | | T-Stat Only | Yes |
| | **Options** | | # Refrig Sys | 2 |
| | | | # Ht Pump Stgs | 0 |
| **Details** | **OCC** | | Occ Mode[1] | External |
| | | | Off Dur Unocc | No |
| | **Cooling** | **Setup** | Clg-En | Yes |
| | | | # Clg Stgs | 4 |
| | | | C1-En | Yes |
| | | | C2-En | Yes |
| | | | C3-En | Yes |
| | | | C4-En | Yes |
| | | | Low Amb-En[2] | No |
| | | | Lead Lag-En[3] | No |
| | | | Clg OAT Cutout-En | Yes |
| | | | Clg OAT Cutout | 45 |
| | | | SAT Cool Limit-En | Yes |
| | | | Sat Cool Limit-SP | 45 |
| | | | Freeze-SP | 26 |
| | **Heating** | | Htg-En[4] | No |
| | | | # Htg Stgs | 0 |
| | **Fan** | | Fan Ctl-Type | Fixed Variable |
| | | | Fan On Occ | No |
| | | | Fan On Dly Cool | 0 |
| | | | Fan Off Dly Cool | 30 |
| | | | Fan Only % Cmd | 0 |
| | | | 1 Clg Stg -% Cmd | 50 |
| | | | 2 Clg Stg -% Cmd | 60 |
| | | | 3 Clg Stg -% Cmd | 75 |
| | | | 4 Clg Stg -% Cmd | 100 |

**Note:**

1. Factory shipped units equipped with Occ jumper on UCB
2. Do not enable low ambient
3. Do not enable LeadLag
4. Field supplied option

# R-410A Quick reference guide

Refer to the Installation specific installation requirements.

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

# Notes