

INDOOR PACKAGED EQUIPMENT

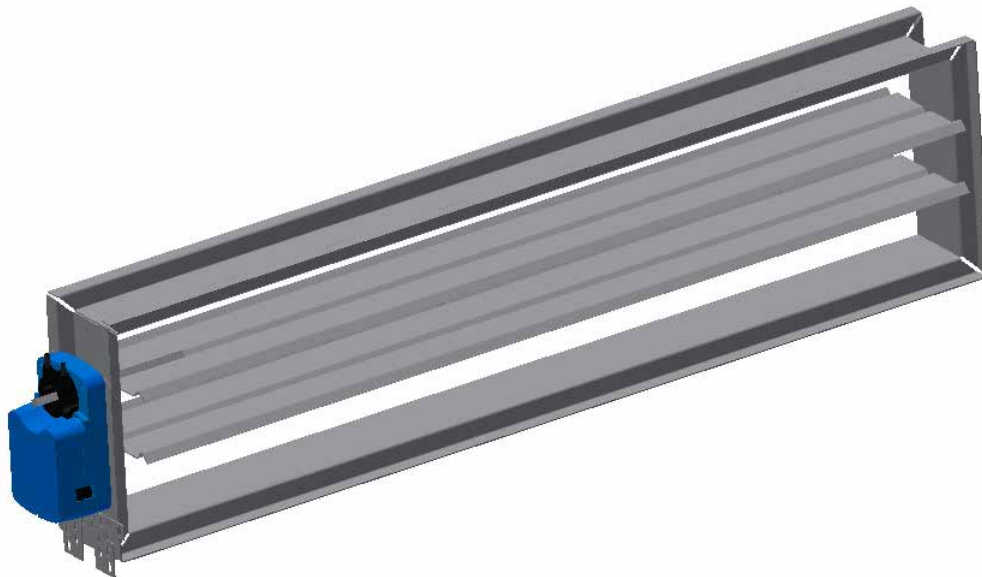
INSTALLATION AND OPERATION

Supersedes: 145.10-IOM4 (418)

Form 145.10-IOM4 (219)

LOW AMBIENT DAMPER KIT (LADK-XXXC-1 AND VADK-XXXC-1)

AIR-COOLED SELF-CONTAINED UNITS
DSH/DSV MODELS, B/C STYLES



R-410A

Issue Date:
February 27, 2019

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

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

which it is situated, as well as severe personal injury or death to themselves and people at the site.

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

SAFETY SYMBOLS

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



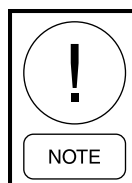
Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.



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



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



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



External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with 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.

CHANGEABILITY OF THIS DOCUMENT

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

It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating/service personnel should

verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the equipment.

CHANGE BARS

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

ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
System 450 Series Modular Control Systems with Standard Control Modules Technical Bulletin	LIT-12011459
DSV060C-300C, C Generation, Vertical Air-Cooled Self-Contained Installation, Operation, and Maintenance Manual	145.29-IOM3
DSH024C-120C, C Generation, Horizontal Air-Cooled Self-Contained Installation, Operation, and Maintenance Manual	145.32.IOM5

HORIZONTAL UNIT NOMENCLATURE

1, 2 3 4, 5, 6 7 8 9 10 11 12 13 14 15 16 17

DS | **H** | **120** | **C** | **2** | **S** | **1** | **P** | **A** | **A** | **1** | **A** | **0** | **A**

PRODUCT CATEGORY
DS = Integral Air-Cooled
Packaged A/C, R-410A

PRODUCT IDENTIFIER
H = Horizontal, Ceiling Mounted

NOMINAL CAPACITY
024 = 2 Ton
036 = 3 Ton
048 = 4 Ton
060 = 5 Ton
096 = 8 Ton
120 = 10 Ton

DESIGN SERIES
C = Current

VOLTAGE
2 = 208/230-60-3
4 = 460-60-3
5 = 575-60-3

CONTROL OPTIONS
M = Simplicity Microprocessor Controls
S = Smart Equipment (SE) Microprocessor Controls
N = SE Microprocessor Controls with BACnet®

INDOOR FAN OPTIONS
1 = Standard*
2 = High Static*
3 = Standard with VFD (VAV)**
4 = High Static with VFD (VAV)**
5 = Standard with VFD Discrete Speeds**
6 = High Static with VFD Discrete Speeds**

MISCELLANEOUS OPTIONS
A = None
D = Condensate
Overflow Switch

HEATING OPTIONS
0 = None

REFRIGERANT CIRCUIT OPTIONS
A = None
B = Hot Gas Bypass

OUTDOOR FAN OPTIONS
1 = Standard
2 = High Static
3 = Standard with Low Ambient
Control VFD***
4 = High Static with Low Ambient
Control VFD***

OUTDOOR AIRSIDE OPTIONS
A = Standard Airside Coil
C = Corrosion Protective Coating

INDOOR AIRSIDE OPTIONS
A = Standard AirsideCoil
C = Corrosion Protective Coating
D = Stainless Steel Drain Pan
F = Coated Coil with Stainless Steel Drain Pan

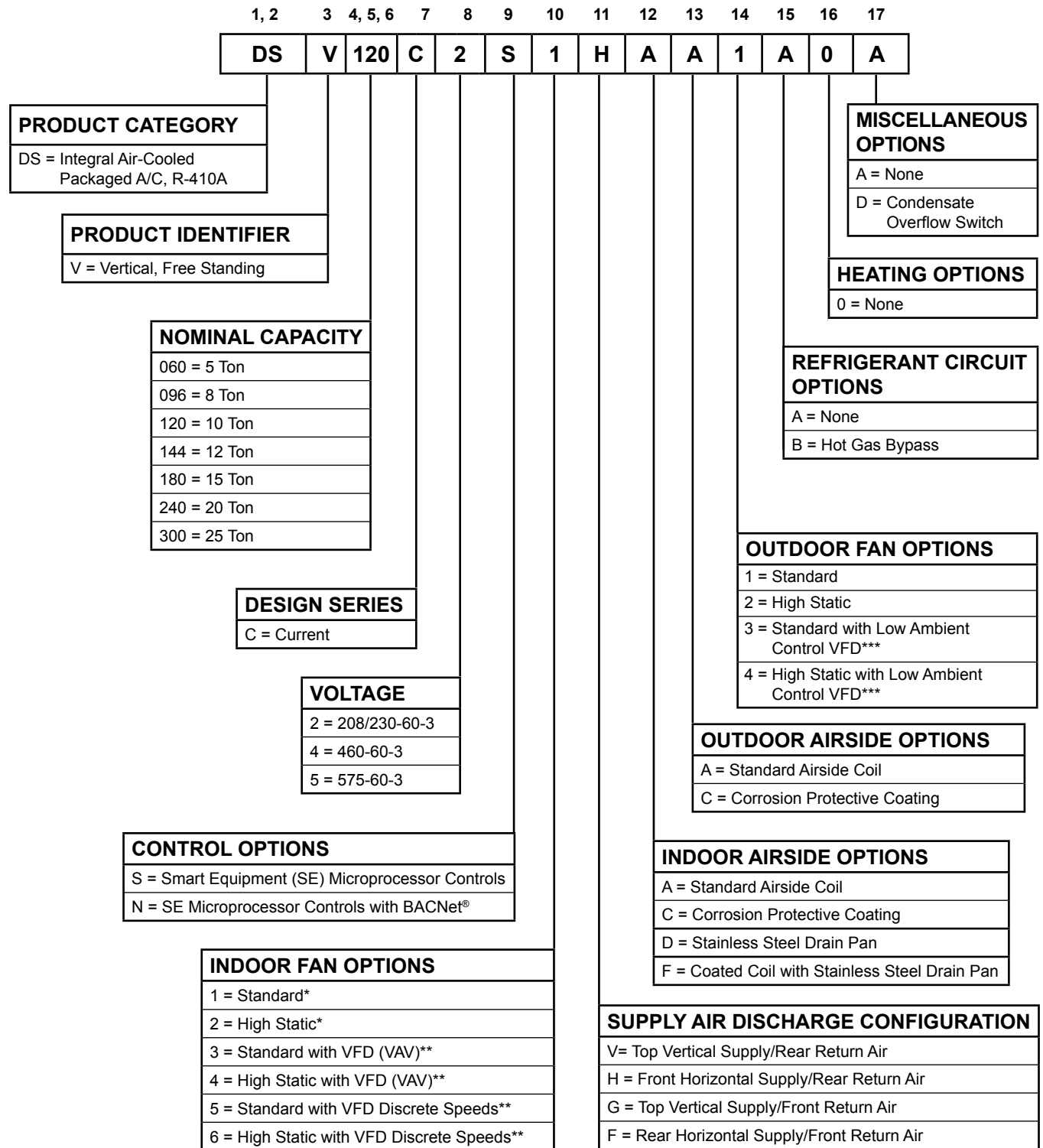
CABINET CONFIGURATION
P = Single Package (Standard)
S = Factory-Split (Charged R-410A)
N = Factory-Split (Nitrogen Charge Only)

*Evaporator and condenser motor VFD available only on 8 tons and up. Evaporator motor without VFD available only on 2, 3, 4, and 5 tons.

**Evaporator motor VFD standard on 8 tons and up.

***Condenser and motor VFD available only on 8 tons and up.

VERTICAL UNIT NOMENCLATURE



*Evaporator motor without VFD available only on 5 ton

**Evaporator motor VFD standard on 8 tons and up. Condenser and motor VFD available only on 8 tons and up.

***Condenser VFD not available in 575V

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SECTION 1 - INSTALLATION

GENERAL INFORMATION



Before installing this accessory kit, turn off electrical power to the equipment. Failure to do so could result in electrical shock, leading to component damage, injury, or death.

If DSH/DSV unit operation is required at outdoor air temperatures (OATs) between 50.0°F and 0.0°F (minimum), install the optional low ambient damper kit to maintain acceptable condensing pressure.

From the *Commission > Standard* menu on the Smart Equipment controller (SEC), ensure the parameter CL-GOATCUTOUT-EN is set to NO. This enables the unit to operate when outdoor temperatures are below 45.0°F (factory default).

In horizontal DSH units, install the damper directly over the intake duct connection. In vertical DSV units, install the damper over the exhaust duct connection.

Determine the damper actuator position by the refrigerant pressure. Depending on the output signal from a proportional pressure control module, the 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 that is located on the liquid refrigerant line leaving the condenser. The pressure controller panel, complete with terminal connection blocks for wiring, is attached to a field-installed mounting bracket.

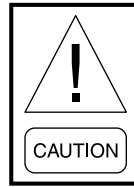
The low ambient damper kit provides all appropriate mounting hardware for the pressure control module and the damper actuator motor. The condenser corner panel contains a routing hole near the damper actuator's mounting location that enables installation of the plenum-rated cable between the motor and the C450 controller.



On dual compressor units, the transducer MUST be connected to the first stage circuit liquid line fitting. Connection to the second stage refrigerant circuit can result in system malfunction.

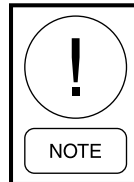


Prior to securing the damper to the unit, ensure the damper blades do not interfere with unit when fully open!



When installing the transducer, observe all regulations governing the handling and containment of hazardous or regulated materials (refrigerants or lubricants).

DAMPER INSTALLATION



FOR ALL DAMPERS: To avoid shipping damage, the damper rod is recessed inside damper and must be pulled out.

For damper information, refer to the DSV Installation, Operation, and Maintenance (IOM) manual (145.29-IOM3) or DSH IOM manual (145.32-IOM5).

1. Loosen the four nuts as shown in *Figure 1* below.
2. Slide out the damper rod approximately 3.5 inches from the damper as shown in *Figure 1*.
3. Tighten the four nuts as shown in *Figure 1*.



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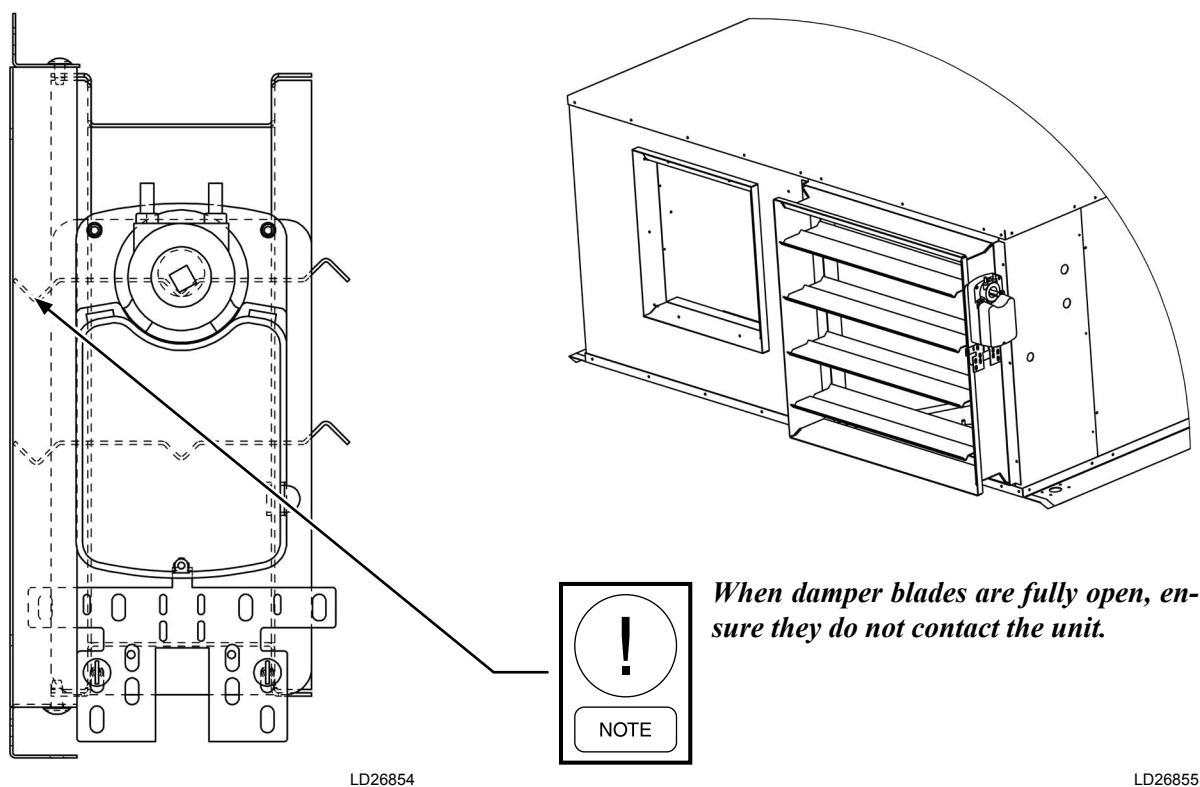


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FIGURE 1 - SLIDE OUT DAMPER ROD

DSH Horizontal Units (B/C Style)

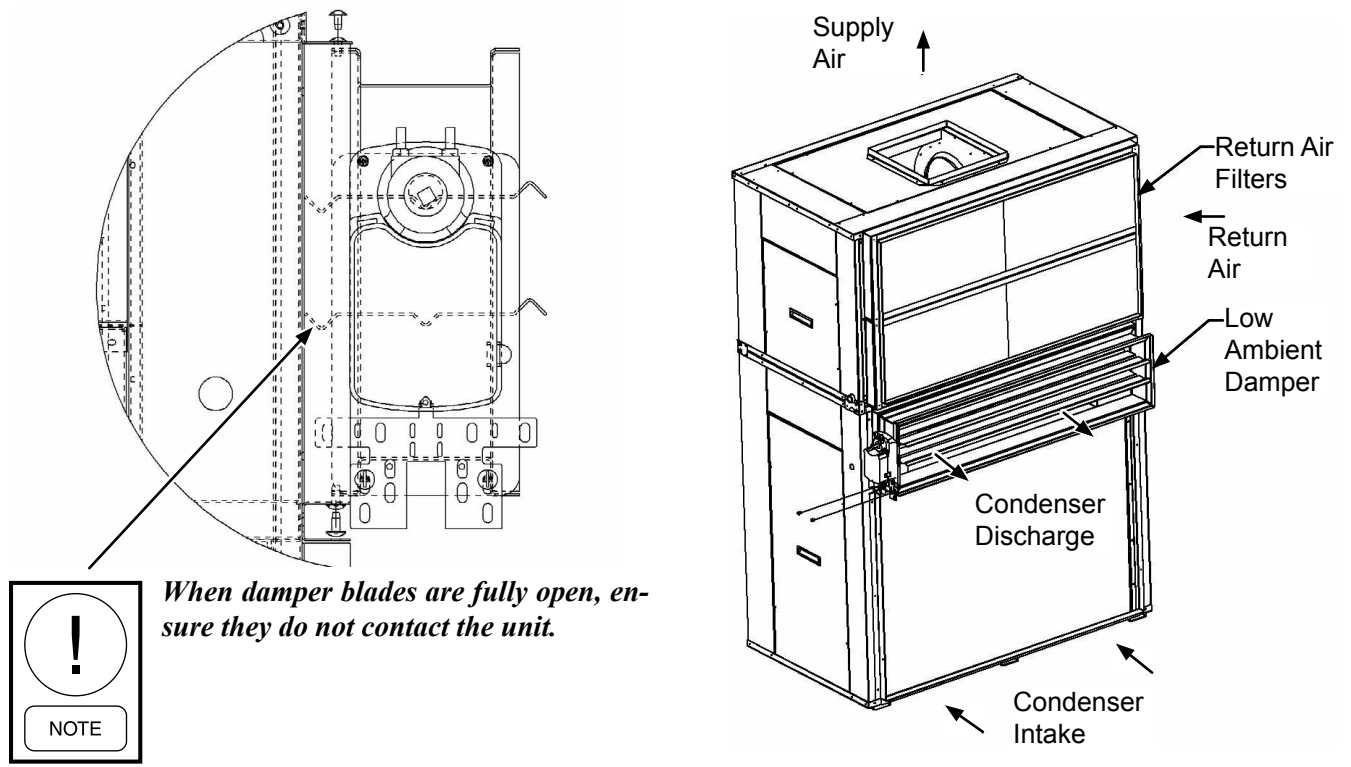
1. Attach the two long, horizontal flanges from the LADK low ambient damper kit using the original holes and screws. These flanges reduce the intake opening height to match the damper dimensions.
2. Re-attach one of the original vertical flanges as close as possible to the edge of the corner post (approximately 1/8 inch from corner post's edge).

**FIGURE 2 - HORIZONTAL UNIT DAMPER**

3. Position the damper casing between the two horizontal flange surfaces, and butt the damper's drive end against the vertical flange at the unit's corner. Ensure that the damper is orientated with the drive shaft at the top of unit (see *Figure 2 on page 8*).
4. Position the damper blades to fully open and check that there is no interference with unit. If the damper blades contact the unit, adjust the damper slightly away from the unit.
5. Secure the damper using the self-drilling screws provided. Drive the screws through the holes in the flanges and into the metal damper casing.
6. Attach the remaining vertical flange opposite the drive end of the casing.
7. Ensure that the damper assembly rotates freely, with little or no resistance, by rotating the drive shaft by hand.

DSV Vertical Units (B/C Style)

1. Locate the pilot holes at the condenser exhaust, and line up the two vertical and two horizontal duct flanges accordingly. The VADK low ambient damper kit includes the factory-supplied duct flanges.
2. Secure the flanges using self-drilling sheet metal screws. Ensure the horizontal flanges are flush with the condenser exhaust opening.
3. Position the damper casing inside the flanges and secure with screws (see *Figure 3 on page 9*).
4. Position the damper blades to fully open and check that there is no interference with the unit. If the damper blades contact the unit, adjust the damper slightly away from the unit.
5. Secure the damper using the self-drilling screws provided. Drive the screws through the holes in the flanges and into the metal damper casing.
6. Attach the remaining vertical flange opposite the drive end of the casing.
7. Ensure that the damper assembly rotates freely, with little or no resistance, by rotating the drive shaft by hand.



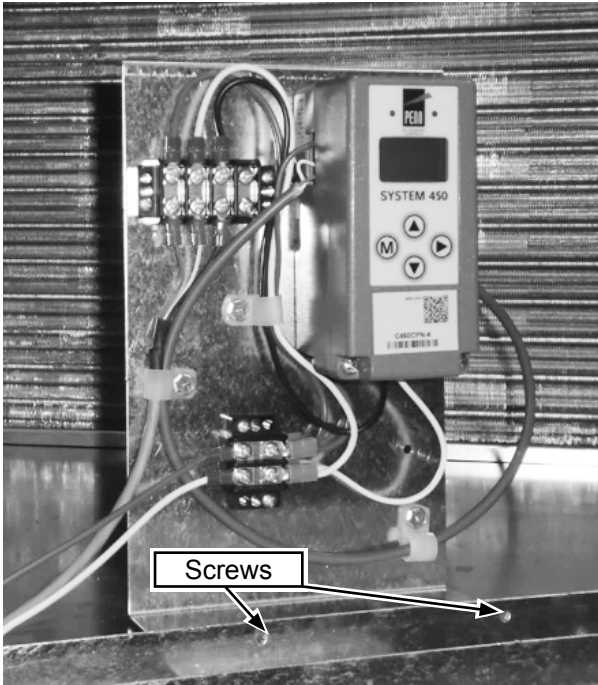
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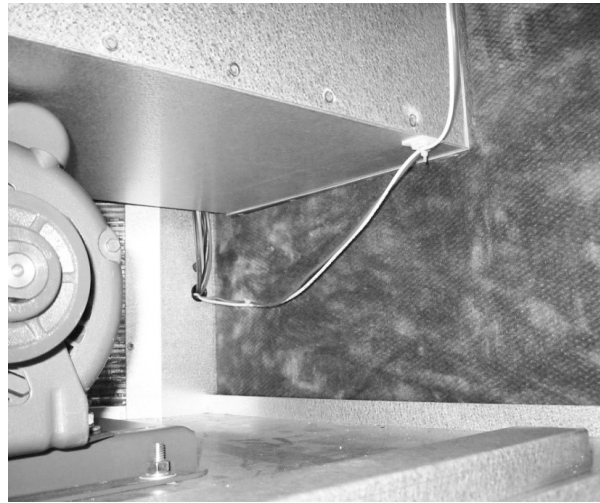
FIGURE 3 - VERTICAL UNIT DAMPER

PRESSURE CONTROL PANEL INSTALLATION AND WIRING

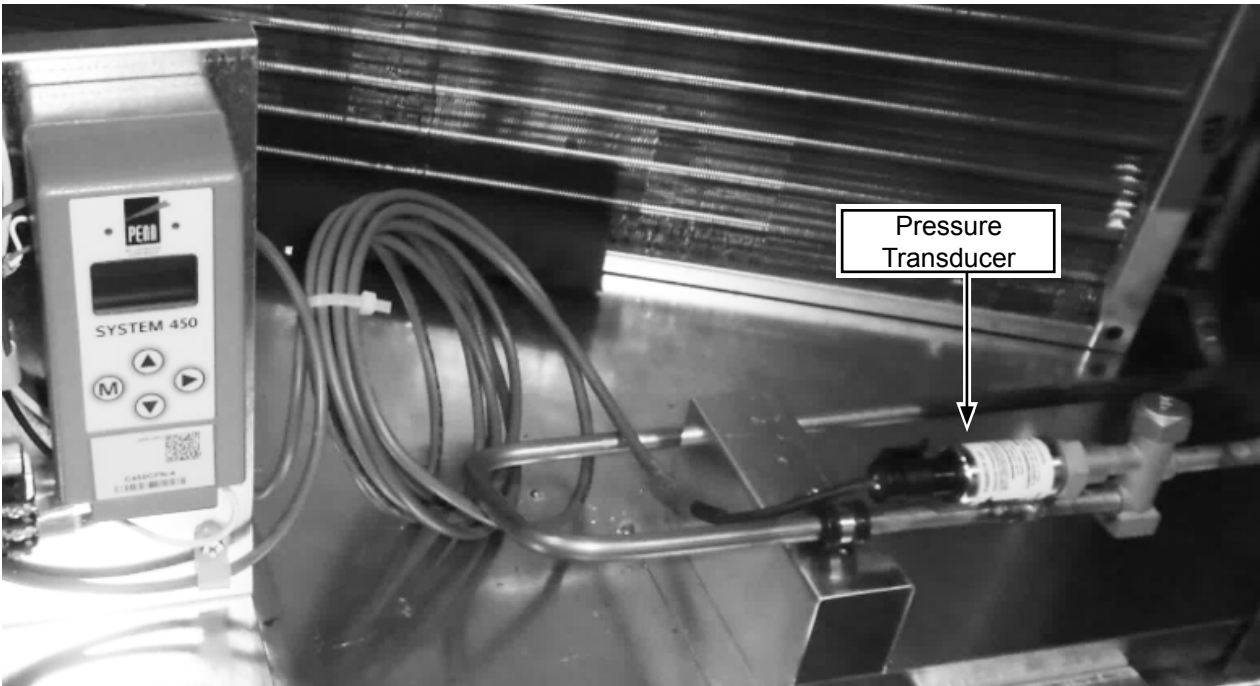
1. Mount the pressure control panel in the compressor/condenser section immediately behind the compressor side access panel (see *Figure 4 on page 10* and *Figure 5 on page 11*). In horizontal DSH units, mount the pressure control panel to the interior base pan. In vertical DSV units, mount the panel to the base rails. Fasten the panel bracket to the vertical flange of the interior base pan (recommended) or to the horizontal surface of the pan using the provided self-drilling screws.
2. Using the pre-terminated two-wire harness (red and white) from the kit, connect the pressure control panel to the microprocessor board's R and C terminals that are located in the main electrical panel of the condensing unit. The harness must be fed through the electrical routing hole.
 - On horizontal DSH units, the hole is located at the intake end of the condenser coil (see *Figure 4 on page 10*).
 - On vertical DSV units, the hole is located at the low voltage end of the electrical panel (see *Figure 5 on page 11*).
3. Route the harness across the blower section of the unit. For horizontal DSH units, route the harness into the back of the electrical panel via the low voltage entrance hole.
4. Using the self-adhesive mounts provided, secure the harness. This ensures that the wiring is kept well clear of the belt-driven blower and motor assembly.
5. On the microprocessor board, connect the red harness lead to the R terminal and the white harness lead to the C terminal (see *Figure 12 on page 15* and *Figure 13 on page 16*).
6. Within the compressor compartment, secure the harness to the existing compressor wiring. Route the terminated ends to the 2-pole terminal block on the pressure control panel. Attach the terminated harness ends to the appropriate terminals (red-to-red and white-to-white).



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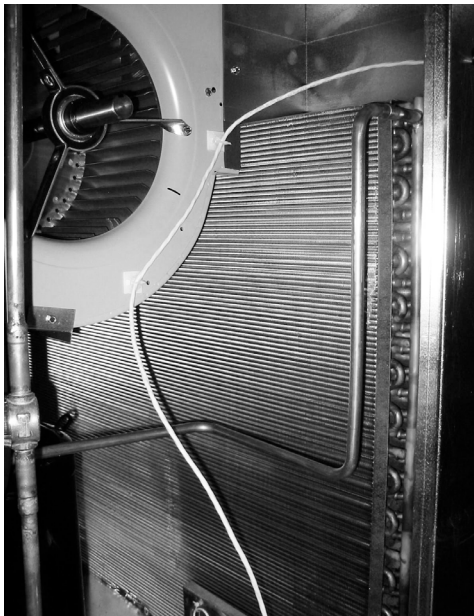


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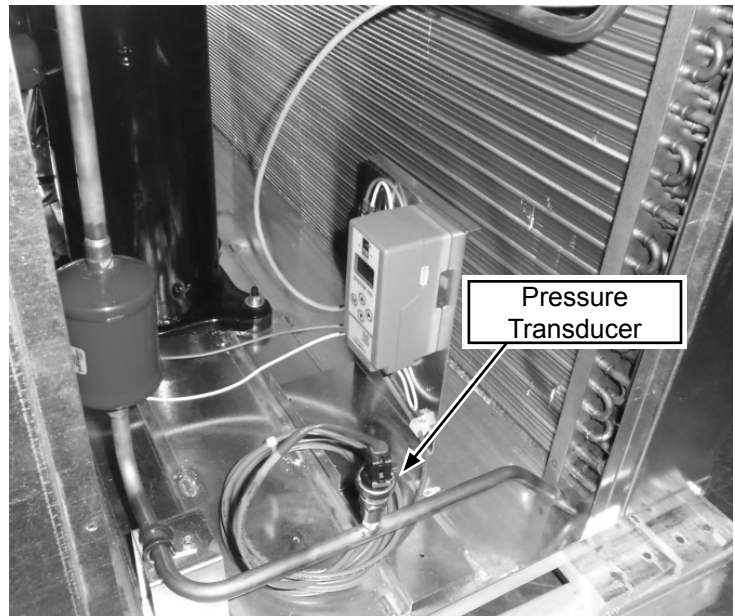


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FIGURE 4 - DSH UNIT: PRESSURE CONTROL PANEL MOUNTING AND WIRING



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FIGURE 5 - DSV UNIT: PRESSURE CONTROL PANEL MOUNTING AND WIRING

PRESSURE TRANSDUCER INSTALLATION

For transducer information, refer to the DSV IOM manual (145.29-IOM3) or DSH IOM manual (145.32-IOM5).

1. Mount the compact P499 or P599 transducer directly to the liquid refrigerant pressure port. This port is incorporated into the refrigerant shutoff valve (as illustrated with DSH single stage units in Figure 4 on page 10).



On dual compressor units, the transducer *MUST* be connected to the first stage circuit liquid line fitting. Connection to the second stage refrigerant circuit can result in system malfunction.

2. Hand thread the transducer onto the pressure port.



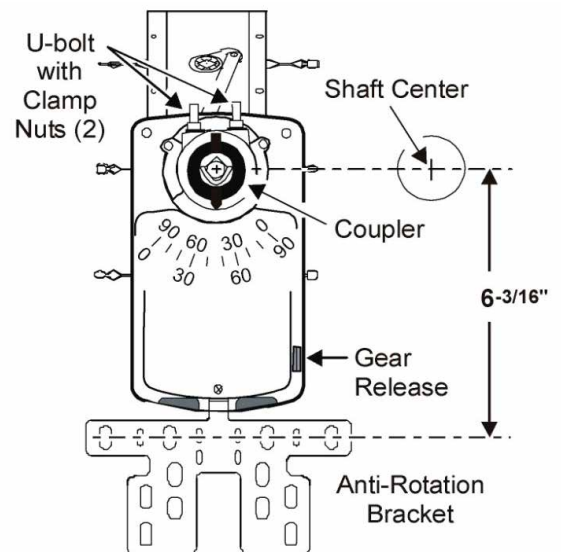
Wear gloves for protection. Seat the transducer as quickly as possible to minimize release of liquid refrigerant.

3. To avoid damaging the transducer, tighten the connection using the wrench flats provided
4. The connecting harness for the pressure transducer is pre-wired to the pressure control panel. The sensor end of the harness is equipped with a polarized plug connection. Insert the plug into the end of the transducer and ensure that the locking tab on the plug is engaged.

5. Perform a leak test on the refrigerant port connection before putting the system into operation.

DAMPER ACTUATOR INSTALLATION AND WIRING

1. Press and hold the gear release lever, and rotate the drive coupler according to the steps below. Release the gear lever.
 - a. For horizontal LADK kits, rotate fully counterclockwise (CCW).
 - b. For vertical VADK kits, rotate fully clockwise (CW).



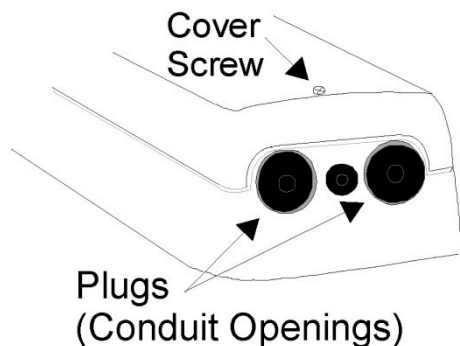
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FIGURE 6 - DAMPER ACTUATOR

2. Fully close the damper actuator by turning the drive shaft CCW (LADK kit) or CW (VADK kit).
3. Insert the tab on the anti-rotation bracket into the slot located on the bottom of the damper actuator. Slide the damper actuator onto the damper drive shaft.
4. Position the anti-rotation bracket 6-3/16 inches below the drive shaft center (see *Figure 6 on page 11*).
5. Use the holes in the anti-rotation bracket as a guide, and secure the bracket to the damper actuator casing using the self-drilling screws provided. (Do not drive screws near the center of the damper actuator casing. Use the outermost holes in the anti-rotation bracket.)
6. Adjust the anti-rotation bracket as necessary to position the tab midway into the slot at the bottom of the damper actuator.



The tab on the anti-rotation bracket must fit midway into the actuator slot to prevent damper actuator binding and premature wear.



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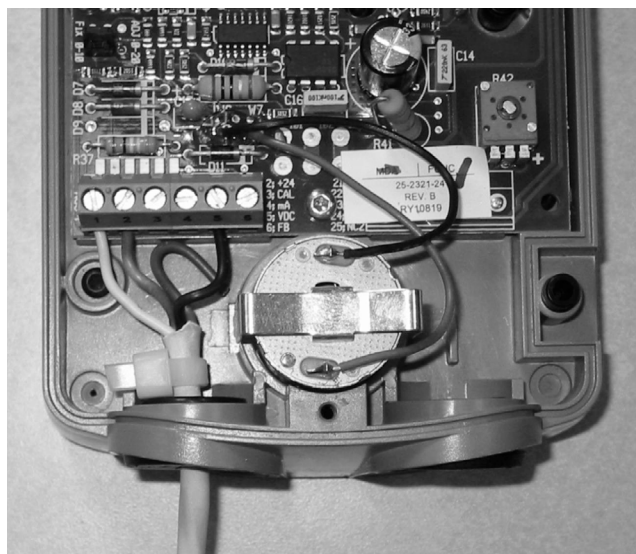
FIGURE 7 - REMOVING THE ACTUATOR COVER

7. Hold the damper actuator in place, and evenly hand tighten both clamp nuts onto the U-bolt. Ensure the damper drive shaft remains in the fully closed position while tightening the clamp nuts. Secure the U-bolt to the damper drive shaft.
8. Press and hold the gear release. To verify that the damper actuator rotates freely throughout the range, rotate the drive coupler and drive shaft from fully closed to fully open according to the steps below.
 - a. For horizontal LADK kits, rotate fully CW.
 - b. For vertical VADK kits, rotate fully CCW.

9. Loosen the damper actuator cover screw using a #1 Phillips screwdriver, and remove the damper actuator cover. Push the plastic plug, adjacent to the actuator terminal block, out of the conduit opening.
10. Use the #1 Phillips screwdriver to punch a center hole through the plug, and reinsert the plug into the opening.

A plenum-rated connection cable is provided, pre-wired to the pressure control panel, for supply of 24 VAC power and 0–10 VDC signal voltage. The cable is routed to the damper actuator through a 7/8-inch knock-out in the unit corner post.

11. Remove the knock-out, and insert the plastic bushing provided in the low ambient damper kit. Pull a sufficient length of cable through the bushing to reach the connection terminal block at the bottom of the actuator.
12. Push the cable through the hole in the plastic conduit plug (enlarge if necessary), strip approximately 1 inch of the outer cable sheath, and connect the wires to the following terminals:
 - White = Terminal 1
 - Red = Terminal 2
 - Black = Terminal 5
 - Green (if applicable) = not used
13. Secure the cable with a large nylon wire tie (provided) to prevent the cable from being accidentally pulled from the damper actuator housing (see *Figure 8 on page 12*).



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FIGURE 8 - CONNECTING CABLE TO TERMINALS

- Verify the M9108 damper actuator is configured correctly for either CW or CCW rotation. See *Table 1 on page 13* for jumper location and configuration table.

NOTE *Jumper W1 is factory set for CW rotation.*

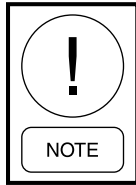


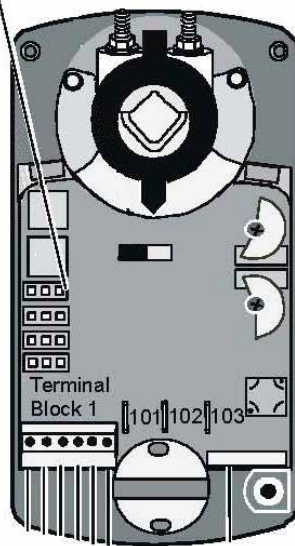
TABLE 1 - ACTUATOR ROTATION FOR JUMPER W1 SETPOINT

LOW AMBIENT KIT #	UNIT MODEL	JUMPER W1 SETTING
LADK-XXXC-1	DSH024-120B/C	RA (CCW)
VADK-XXXC-1	DSV060-300B/C	DA (CW)

CCW = Counterclockwise

CW = Clockwise

Jumper W1	
Direct Acting (DA) Reverse Acting (RA) Rotation Direction with Increasing Signal	
Factory Set (CW) DA	(CCW) RA



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FIGURE 9 - ACTUATOR ROTATION FOR JUMPER W1 SETPOINT

- Re-attach the damper actuator cover and tighten the cover screw.
- To avoid accidental damage or contact with moving components, secure the cable with the provided cable routing hardware.



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FIGURE 10 - SECURE CABLE WITH ROUTING HARDWARE

- Check that damper blades can fully open without contacting unit. If the damper blades are unable to fully open, reposition the damper slightly away from the unit.

REPLACING P352P CONTROLLER WITH C450 CONTROLLER

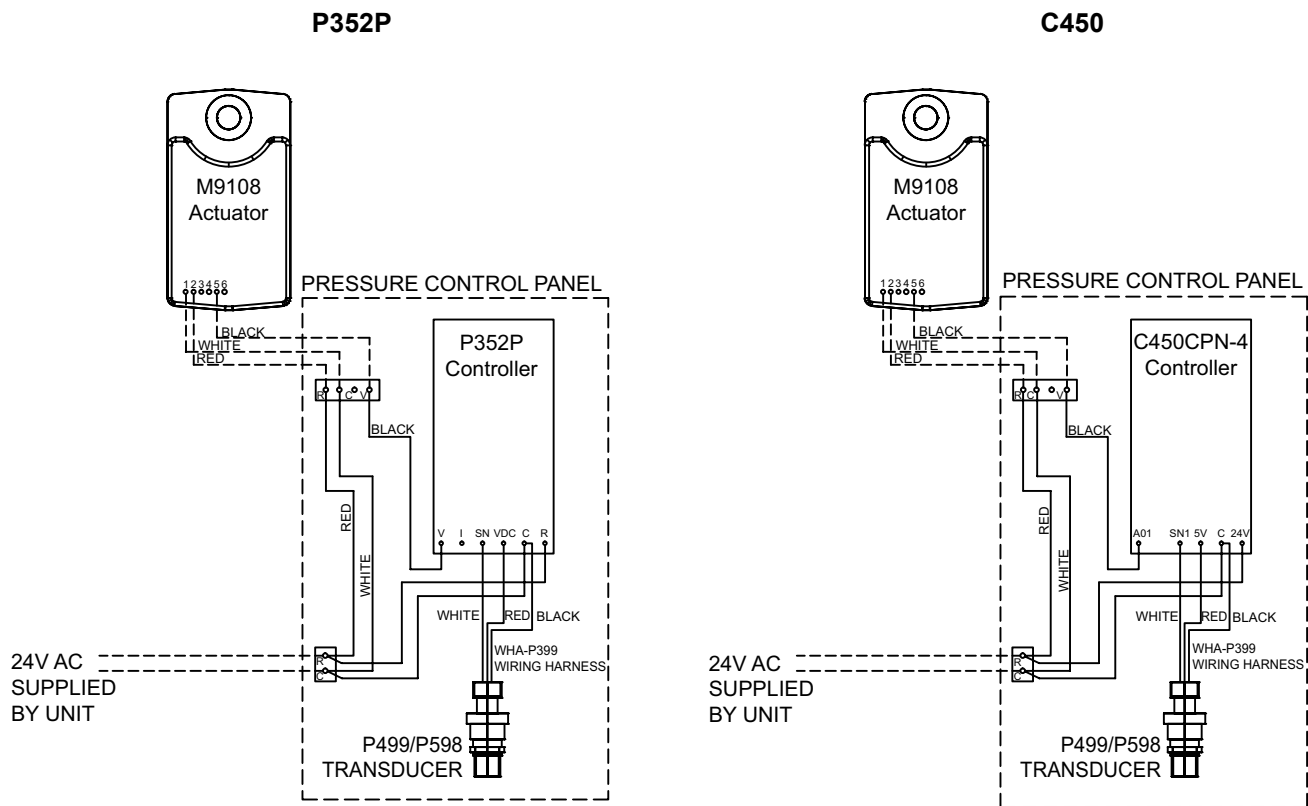
Replace the P352P controller (p/n P352PN-4C) used with previous generation low ambient damper kits (LADK-XXXB-1 and VADK-XXXB-1) with the C450 controller (p/n C450CPN-4) by taking the following steps:

1. Wire the new controller to the proper terminals.
2. Set the parameters as indicated in *Table 2 on page 14*.

TABLE 2 - C450 CONTROLLER SETTINGS FOR LOW AMBIENT DAMPER KITS

PARAMETER	SETTING
Sn-1	P750
SP1	360
EP1	260
OSP1	0
OEP1	100
I-C1	0
UP-R1	1
bNb1	0
SNF	OFF

NOTE: For details on how to set the parameters, see the System 450 Series Modular Control Systems with Standard Control Modules Technical Bulletin (LIT-12011459 via [QuickLIT's](#) LIT Number Search)



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FIGURE 11 - OLD/NEW CONTROLLER COMPARISON

SECTION 2 - OPERATION

SINGLE STAGE WIRING INTERCONNECTION

This applies to DSH024-060B/C and DSV060B/C models.

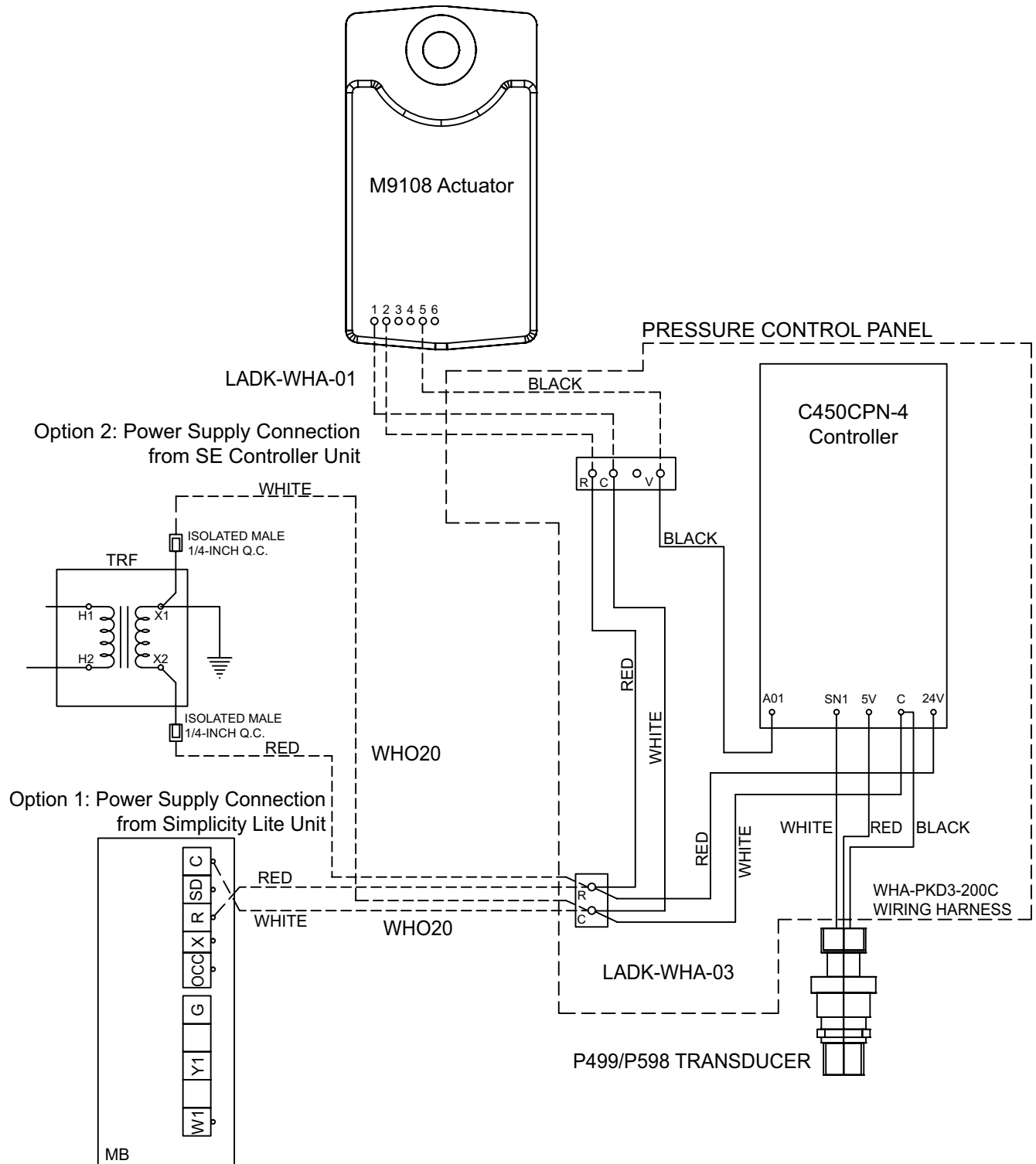


FIGURE 12 - SINGLE COMPRESSOR APPLICATION

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DUAL STAGE WIRING INTERCONNECTION

This applies to DSH096-120B/C and DSV096-300B/C models.

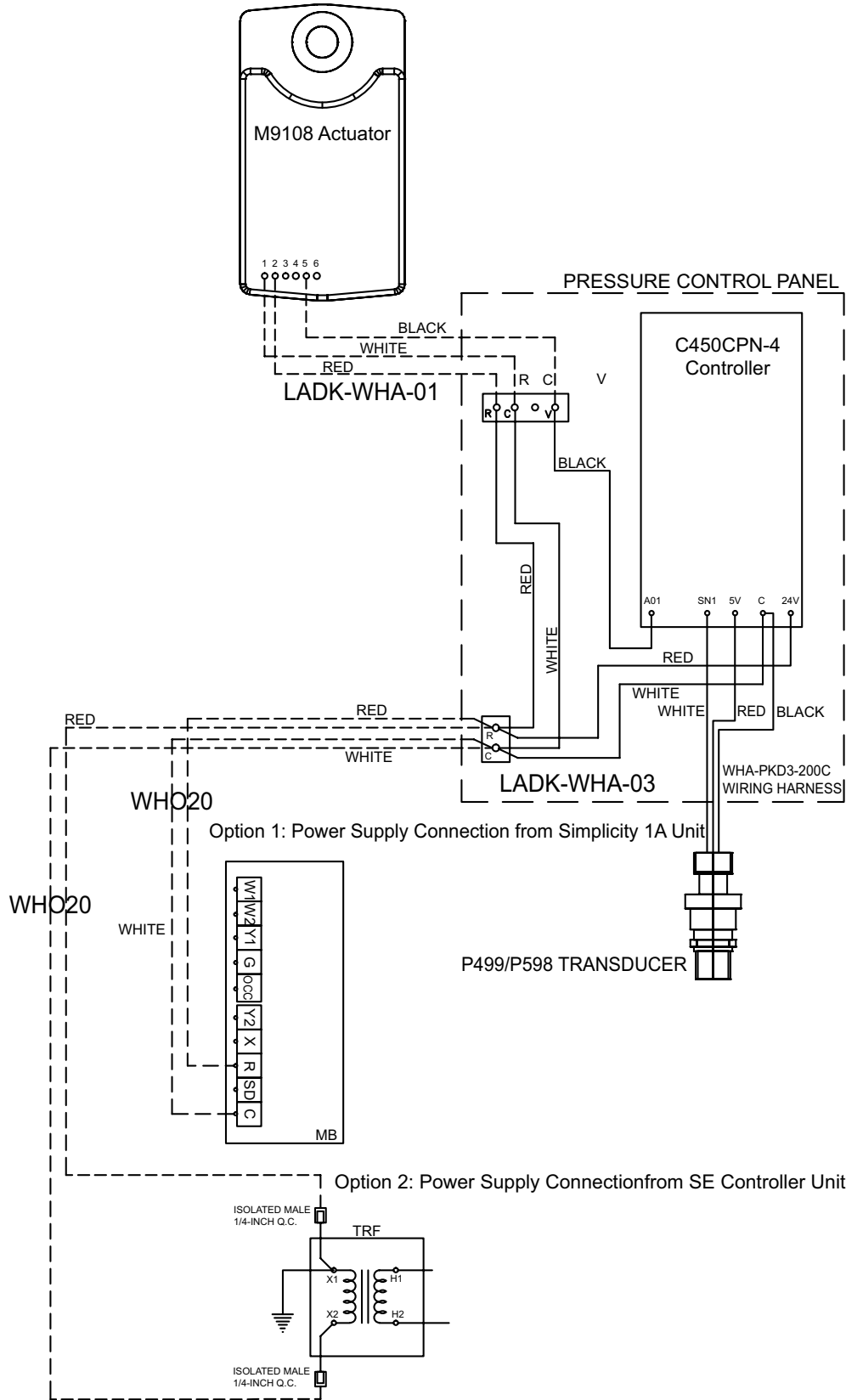


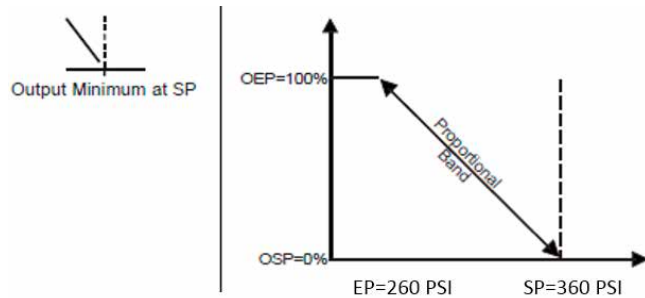
FIGURE 13 - DUAL COMPRESSOR APPLICATION

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SEQUENCE OF OPERATION: FUNCTIONAL CHECK

This condensing pressure control package is designed to maintain a minimum refrigerant liquid pressure of 260 psig, which is sufficient to ensure proper expansion valve operation under all normal conditions. The electronic proportional control module generates a 0 to 10 VDC output signal based on sensed pressure. This output signal modulates the condenser air volume, from 0–100%, via an electrically motorized intake damper.

The C450 controller is factory configured for reverse acting mode. The analog signal output increases as the sensed pressure drops. Dashed areas in *Figure 14 on page 17* show throttling range possibilities from minimum to maximum.



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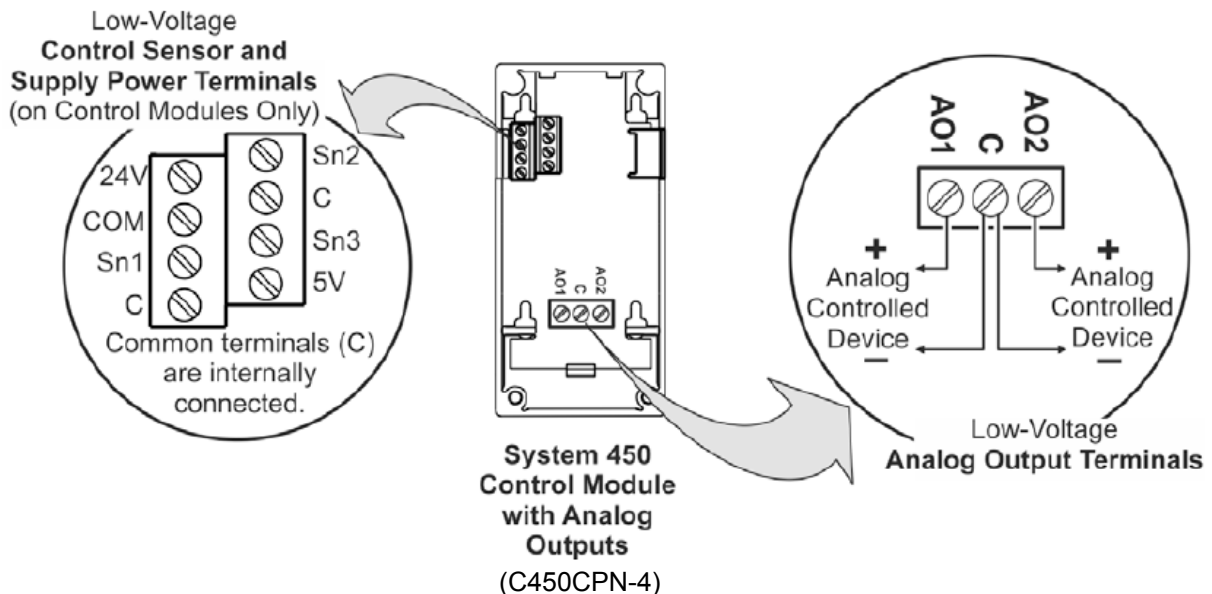
FIGURE 14 - LADK/VADK C450 CONTROLLER REVERSE ACTING

The control setpoint is factory set at 360 psig with a 100 psi throttling range.

If outdoor air temperature (OAT) and system load result in a condensing pressure above 360 psig, the output signal is 0 volts. At a signal voltage of 0, the damper actuator motor drives the damper 100% open.

At refrigerant pressures below 260 psig, the control output signal is 10 VDC, driving the damper actuator 100% closed.

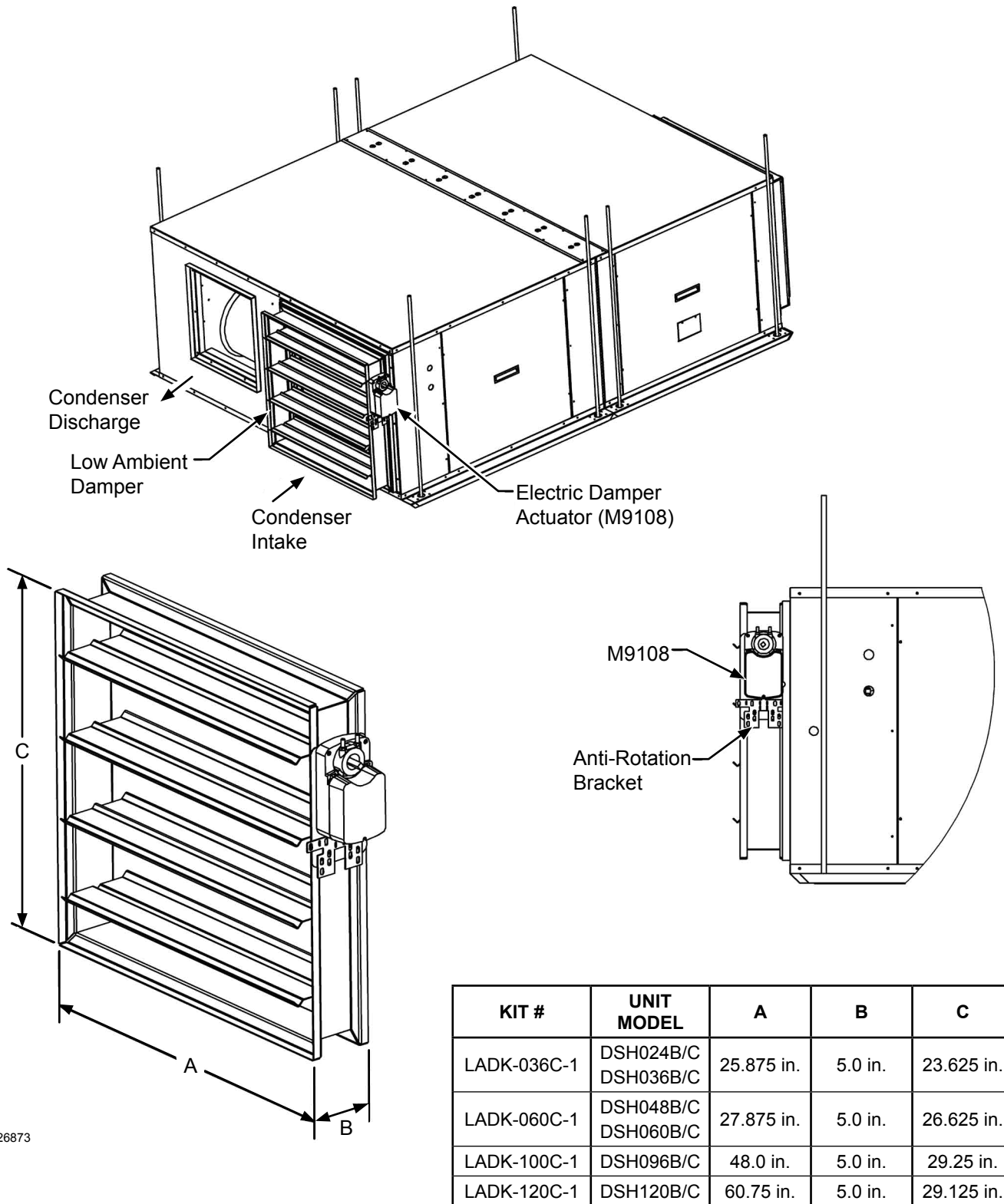
In practical operation, the condenser intake damper is fully closed whenever sensed refrigerant pressure is below 260 psig. This normally occurs during an extended system OFF interval, especially during periods of moderate to low OA temperatures. Upon compressor start, the pressure in the system increases until it reaches the 260 psig minimum throttling range. The damper only begins to modulate at pressures above 260 psig, ensuring that the actual operating condensing pressure is always greater than this minimum value.



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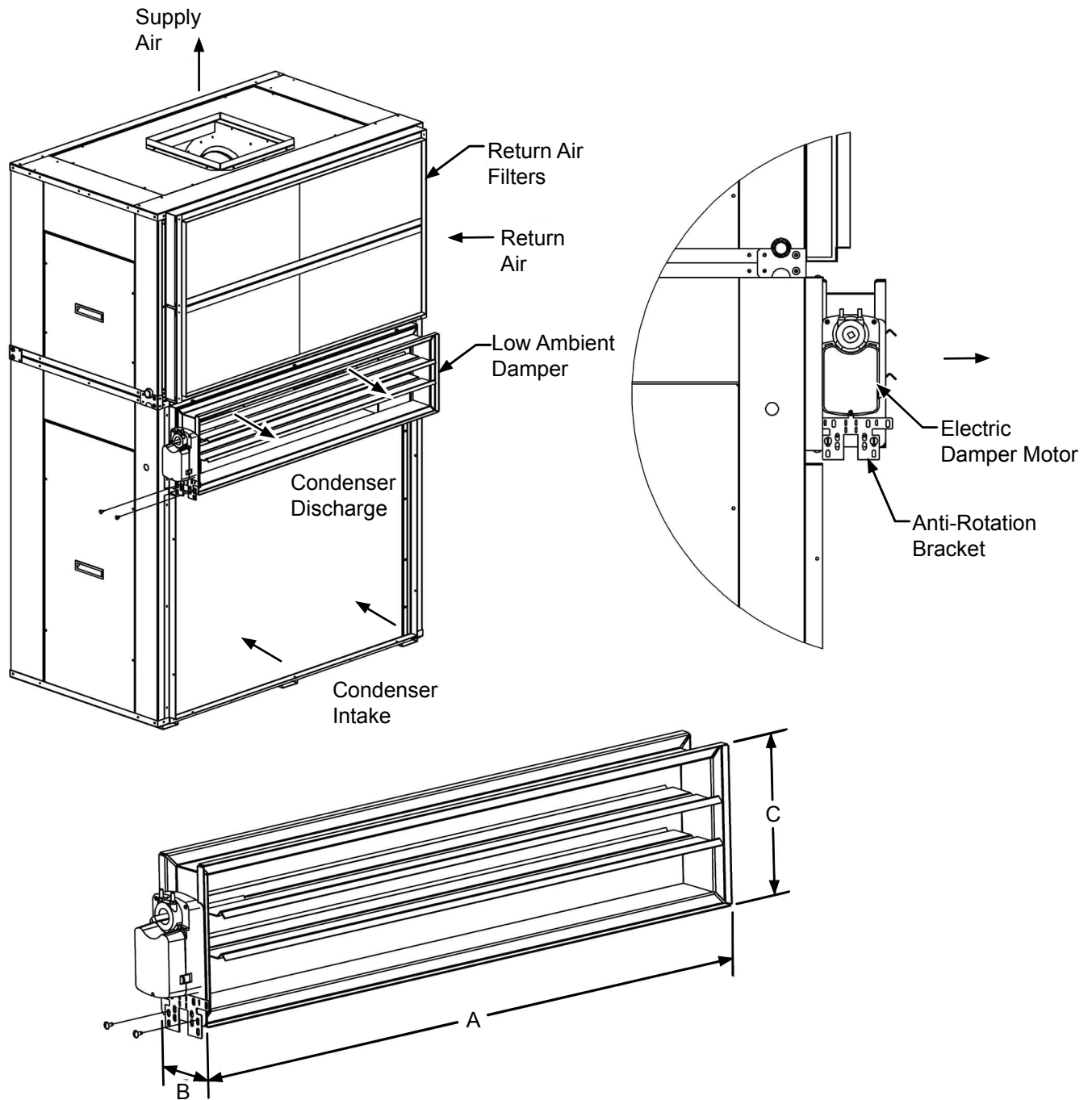
FIGURE 15 - WIRING TERMINAL DETAILS FOR C450 CONTROLLER WITH ANALOG OUTPUTS

DAMPER SCHEMATICS



LD26873

FIGURE 16 - DSH UNIT DAMPER ACTUATOR SCHEMATIC



LD26874

KIT #	UNIT MODEL	A	B	C
VADK-060C-1	DSV060B/C	47.375 in.	5.0 in.	11.875 in.
VADK-120C-1	DSV096B/C & DSV120B/C	66.375 in.	5.0 in.	14.125 in.
VADK-144C-1	DSV144B/C & DSV180B	77.5 in.	5.0 in.	14.125 in.
VADK-180C-1	DSV180C	81.5 in.	5.0 in.	12.125 in.
VADK-240C-1	DSV240B/C	85.5 in.	5.0 in.	12.875 in.
VADK-300C-1	DSV300B/C	103.5 in.	5.0 in.	12.875 in.

FIGURE 17 - DSV UNIT DAMPER ACTUATOR SCHEMATIC



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