

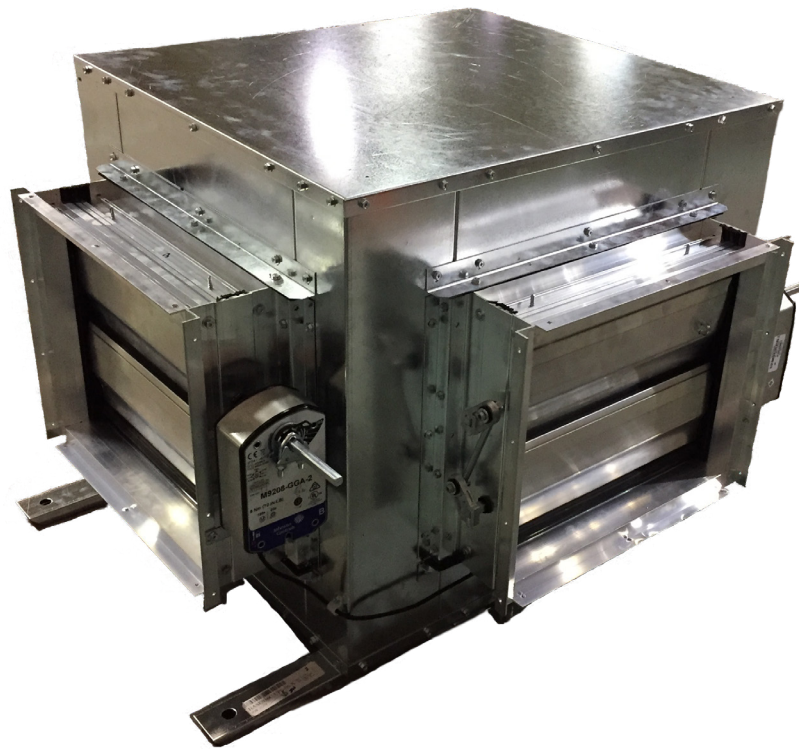
# INDOOR PACKAGED EQUIPMENT

INSTALLATION & OPERATIONS MANUAL

Supersedes: 145.10-NO2 (118)

Form 145.10-NO2 (719)

## AIRSIDE ECONOMIZER FOR DSH/DSV, C GENERATION AIR-COOLED AIR CONDITIONING UNITS WITH SMART EQUIPMENT CONTROLLER (SEC) R-410A



Issue Date:  
July 20, 2019

# IMPORTANT!

## READ BEFORE PROCEEDING!

### GENERAL SAFETY GUIDELINES

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

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

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

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### SAFETY SYMBOLS

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



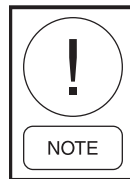
*Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.*



*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 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 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.*

## 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 sales 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.

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MANUAL DESCRIPTION	FORM NUMBER
Smart Equipment Controls (SEC) Quick Start Guide	LIT-12011938
Mobile Access Portal Gateway Product Bulletin	LIT-12011884
SMART Equipment Controls (SEC) Sequence of Operation Overview	LIT-12011950
Smart Equipment Control (SEC) Technical Bulletin	LIT-12011998-UTB-A-0714
Smart Equipment Controls (SEC) Parameters for DSH Units, Style C	145.32-IOM5 (LS01)
Smart Equipment Controls (SEC) Parameters for DSV Units, Style C	145.29-IOM3 (LS01)

### TECHNICAL SUPPORT

If Technical Support is required, please contact the Product Technical Support team at 877-329-7430 or [AppliedDXTechSupport@jci.com](mailto:AppliedDXTechSupport@jci.com).

### REPLACEMENT PARTS

For replacement parts, please contact your local Source1 Dealer.

Source1 Parts Phone Number: 800-536-6112

Source 1 Parts Website: <http://www.source1parts.com>

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## SECTION 1 - INSTALLATION

The airside economizer (ASE) detailed in this manual is only compatible with DSV/DSH units featuring the Smart Equipment controller (SEC). Check the DSV/DSH model number and confirm that the nomenclature pin #9 (Control Option) is either “S” or “N” (for example, DSV180C2Sxx or DSV180C2Nxx). Ensure that the correct ASE model is selected before ordering and installing the ASE.

The B-gen DSV/DSH units use a Simplicity microcontroller and require a B-gen ASE with a Honeywell JADE® economizer module.

The C-gen DSV/DSH unit uses a SEC requiring a C-gen ASE with a Johnson Controls economizer module.

ASEs have an integrated mixing box and a control assembly designed for easy mating to DSV/DSH, C-gen air handlers with an SEC. A factory-supplied wiring harness simplifies the field wiring. Complete installation does not require additional controls or transformers.

The mixing box is made of heavy gauge steel and insulated with a 1/2 inch of insulation. The mixing box comes complete with fully modulating opposed blade dampers and linkage (where applicable). The dampers have an air leakage rate no greater than 4 CFM/ft<sup>2</sup> (20.3 l/s/m<sup>2</sup>) of the damper surface area at 1.0 iwg (249 Pa). Dampers are leakage tested to AMCA Standard 500-D.

The digital economizer control module is a multi-functional controller that can analyze dry bulb, enthalpy, and air quality inputs. The economizer module output positions the mixing box dampers to provide energy saving through the introduction of outside air for free cooling. The economizer module communicates with the SEC using an SA bus protocol.

For both types of ASE, follow these installation steps:

1. Attach the mixing box to the unit evaporator return. Use the provided metal securing strip. For additional security, use fasteners around the perimeter of the mixing box at the filter frame. This connects the units, but it does not support the full weight of the economizer mixing box.



**Additional field support of the mixing box is required. Failure to provide adequate support for the unit may result in injury or even death.**

2. Determine which inlet is for outside air and which is for return air. If the normal open/closed

position of the dampers must be reversed, remove the actuator, reset the damper positions (so that the outside air damper closes), and check that the return air damper is fully open.

3. Adjust the linkage rod to these normal positions and secure it.
4. Reattach the actuator so that it rotates in the appropriate direction.

DSV ASEs are universal for rear and front return units. One universal model of ASE works for both return air options. The unit has side wiring holes for the harness to enter the condenser section. These holes are punched for both options on each side of the condenser section.

The module is connected to the unit wiring using a special wiring harness. The harness connects an SA bus between the economizer and the SEC. The SA bus harness provides communication and common (C) from the SEC to Economizer. There is no power connection through the SA bus harness. The economizer harness is enclosed in a plenum rated wire jacket. The unit sensors only require minimal field wiring to accommodate the ASE option (outside air temperature (OAT) and outside air humidity (OAH)). The economizer wiring harnesses come factory-wired to the ASE module. See *Wiring Harness and Sensors Installation on page 10* for detailed instructions on installing the economizer.

When the module is powered, the actuator springs wind and lock. The enthalpy changeover setting can be altered and the outside air damper minimum position adjusted. For details, refer to the *Smart Equipment Controls (SEC) Sequence of Operation Overview (Form LIT-12011950)*.



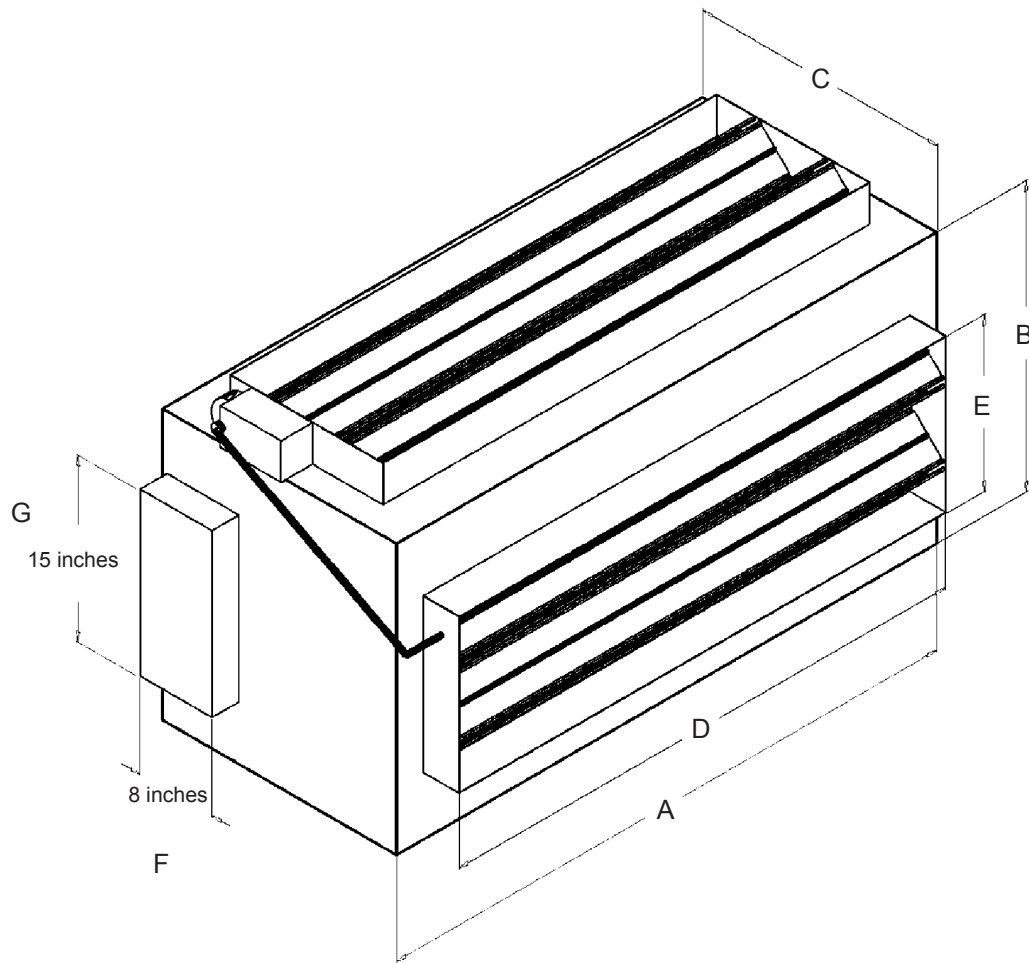
**Configure the SEC and economizer board and wire all the sensors before starting the economizer. If the sensors for OAT, supply air temperature (SAT), and return air temperature (RAT) disconnect during the setup mode, the SEC alarms that failure.**



**Before installing or servicing the unit, lock all electrical power supply switches in the OFF position. Failure to disconnect the power supply can result in electrical shock or even death.**



**Exercise care when working around the sharp metal edges of door panels or flanges. These edges can cause injury.**



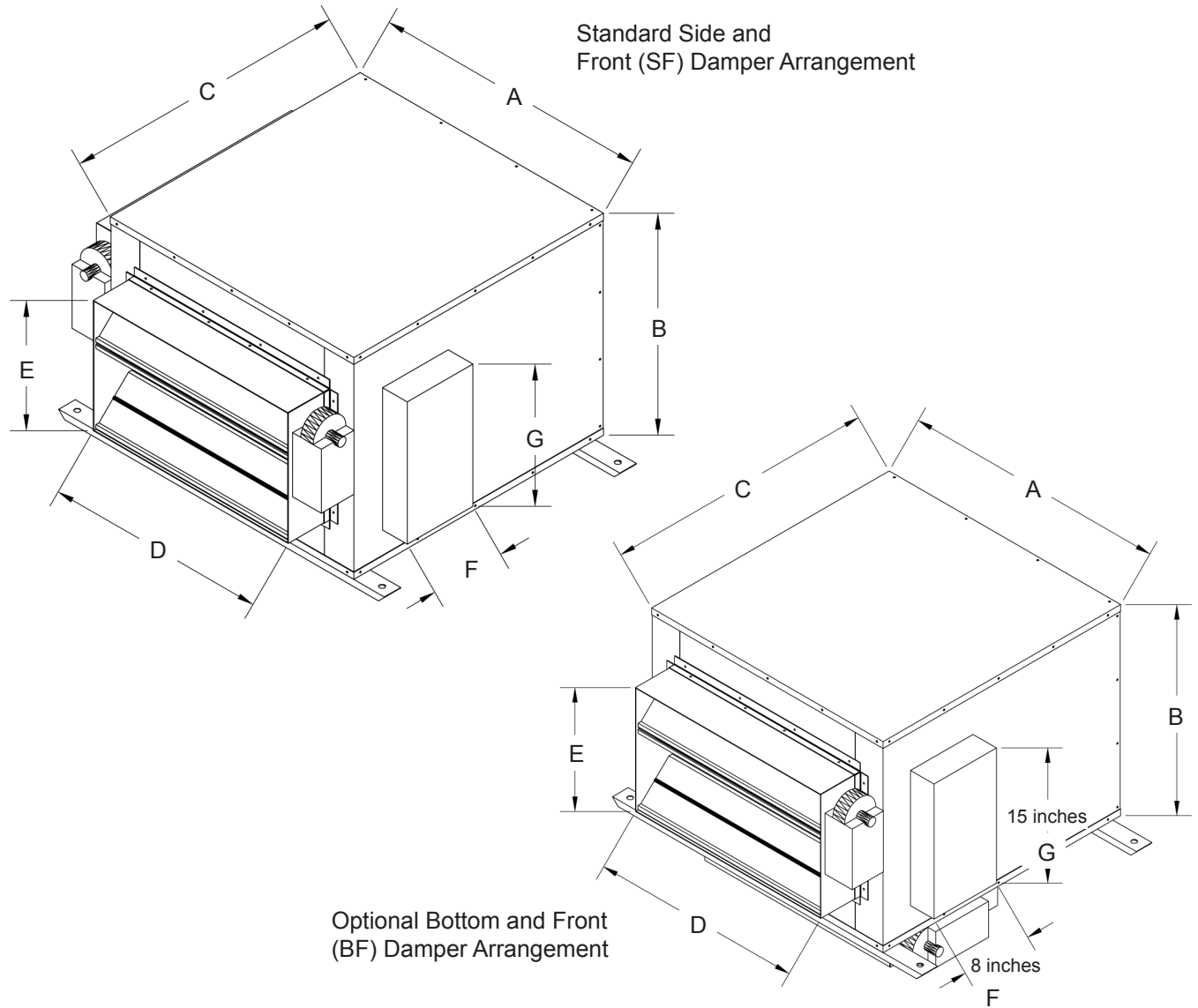
VERTICAL UNIT MODEL NUMBER	ECONOMIZER MODEL NUMBER	MIXING BOX DIMENSION			DAMPER DIMENSION		CONTROL MODULE	
		A	B	C	D	E	F	G
DSV060C	VASE-060C-1	49.00	27.75	24.00	40.00	14.00	11.00	12.75
DSV096C/120C	VASE-120C-1	66.50	36.25	26.50	58.00	19.50	11.00	12.75
DSV144C	VASE-144C-1	78.00	35.75	28.50	70.00	19.50	11.00	12.75
DSV180C	VASE-180C-1	82.00	37.75	28.50	74.00	21.50	11.00	12.75
DSV240C	VASE-240C-1	86.00	41.00	34.00	78.00	25.00	11.00	12.75
DSV300C	VASE-300C-1	104.00	45.00	34.00	90.00	25.00	11.00	12.75

**NOTES**

1. All listed part numbers only work with SEC equipped units.
2. The DSV unit model number's pin #9 (Control Option) must be "S" or "N".

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**FIGURE 1 - VERTICAL MIXING BOX DIMENSIONS**



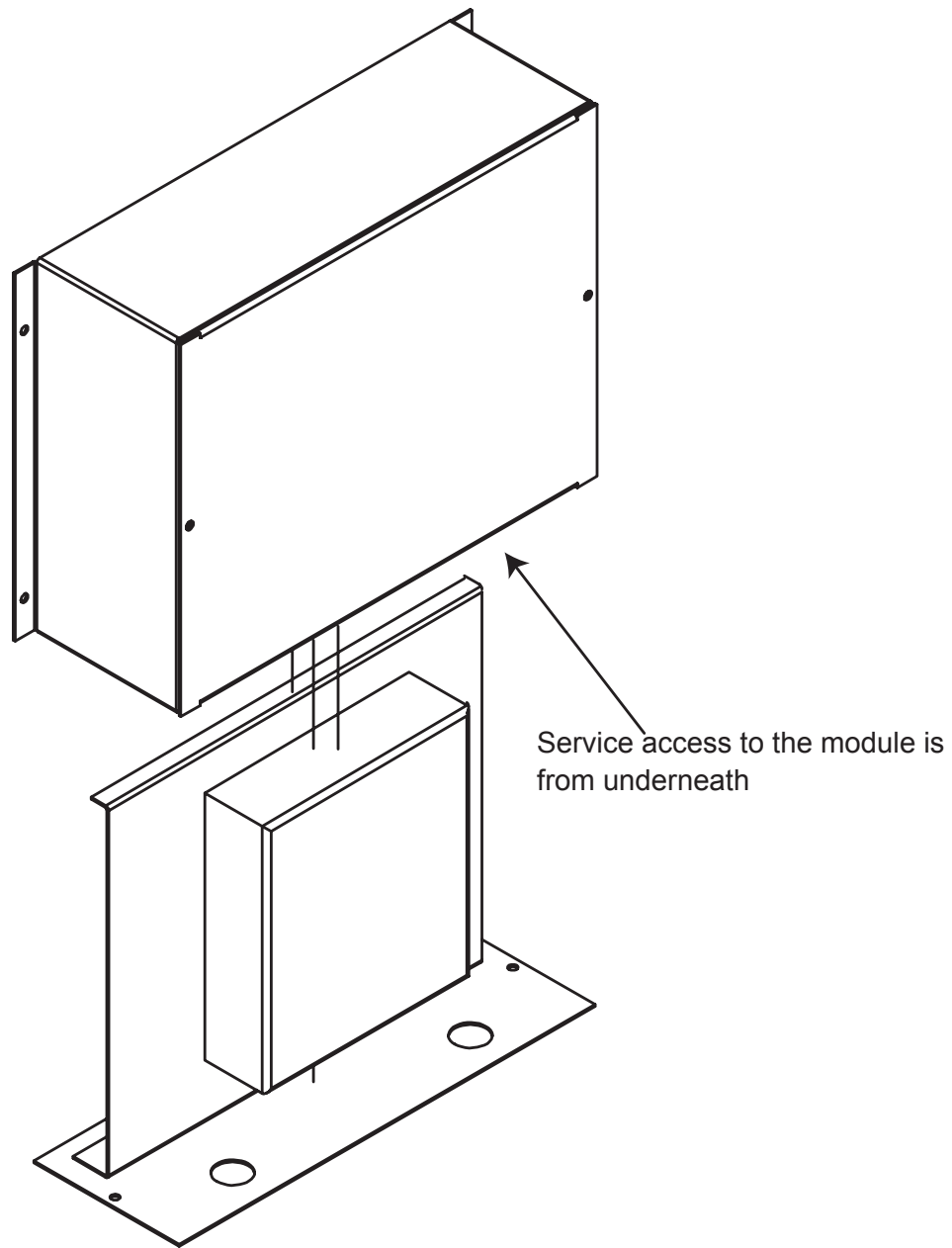
HORIZONTAL UNIT MODEL NUMBER	ECONOMIZER MODEL NUMBER	MIXING BOX DIMENSION			DAMPER DIMENSION		CONTROL MODULE	
		A	B	C	D	E	F	G
DSH024C/036C	HASE-036C-1 SF/ HASE-036C-1 BF	26.00	23.31	23.38	17.00	14.00	11.00	12.75
DSH048C/060C	HASE-060C-1 SF/ HASE-060C-1 BF	29.62	23.44	30.38	24.00	14.00	11.00	12.75
DSH096C/120C	HASE-100C-1 SF/ HASE-100C-1 BF	38.38	30.38	39.38	32.00	25.00	11.00	12.75

**NOTES**

1. All listed part numbers only work with SEC equipped units.
2. The DSH unit model number's pin #9 (Control Option) must be "S" or "N".

**FIGURE 2 - HORIZONTAL MIXING BOX DIMENSIONS**

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**FIGURE 3 - SERVICE ACCESS FOR HASE ECONOMIZER MODULE**

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## WIRING HARNESS AND SENSORS INSTALLATION

Each ASE ships complete with a control wiring harness, OAT sensor, and enthalpy sensor. DSH and DSV units ship with standard SAT and RAT sensors. SAT and RAT sensors require field installation for ASE to operate. The economizer harness connects the economizer module to the unit control board (UCB). The economizer module end of the wiring harness is factory-wired and already connected to the economizer board.

The unit end of the harness assembly is field connected to the SEC board (or terminal block for DSH unit); see the wiring diagrams in *Section 3 – Wiring Schematics*.

The actuator is factory-wired to the economizer board. Other than installing linkages, setting the rotation (for DSV), and setting the rotation direction (for DSH units), no field wiring is needed for the actuator to function.

For split unit applications (DSH units), extend the unit harness in the field using an 18-gauge wire and a shielded 4-wire cable. The unit harness is the harness between the condenser and evaporator section, not the economizer harness.

Extension harnesses for split unit applications (DSH units) are available through special quote (SQ) from the factory.

### Installing the Supply Air Temperature (SAT) Sensor

1. Install the SAT sensor inside the supply discharge duct.
2. Drill a 5/16-inch hole in the supply duct and push the sensor through. Check that the SAT sensor is secure and located in the air stream. Install the SAT sensor at least 6 feet away from the unit discharge. Center the SAT sensor along the width of the duct.
3. Connect one end of the factory-supplied wiring extension to the SAT.
4. For DSV units, connect the other end to the SAT quick connects inside of the electrical box (attached to the SEC).
5. For DSH units, field wire the SAT sensor to the appropriate terminal block (as per the unit schematic).

### Installing the Return Air Temperature (RAT) Sensor

1. If the unit is installed with a return air duct, locate the RAT sensor inside the return air duct.
2. Check that the RAT sensor has adequate airflow when in operation.

Follow step 2 from *Installing the Supply Air Temperature (SAT) Sensor* for the return air duct and sensor.

3. If the unit is installed without a return air duct, mount the RAT sensor on the unit filter frame. Two 5/16-inch holes are punched on the filter frame flange. Use either of these holes to install the RAT sensor.
4. Check that the RAT sensor is in the air stream with no obstructions.
5. Connect one end of the factory-supplied wiring extension to the RAT.
6. For DSV units, connect the other end to the RAT quick connects inside of the electrical box that is attached to the SEC.
7. For DSH units, field wire the RAT sensor to the appropriate terminal blocks (as per the unit schematic).

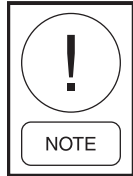
### Installing the Outside Air Temperature (OAT) Sensor

1. Install the OAT sensor in the duct supplying outside air to the economizer.
2. Connect one end of the factory-supplied wiring extension to the OAT.
3. For DSV units, connect the other end to the OAT quick connects inside of the electrical box (attached to the SEC).
4. For DSH units, field wire the OAT sensor to the appropriate terminal blocks (as per the unit schematic).

### Installing the Outside Air Humidity (OAH) Sensor

Install the outside air humidity (OAH) sensor (HE-6863-0N00WS) in the outside air duct. Field wire this sensor into the OAH terminals of economizer module (SE-EC01001).

ALL MODELS		
4-WIRE, PLENUM RATED HARNESS		
PIN #	COLOR	CONNECTION ID
1	Red	24V
2	Orange	+
3	Black	-
4	White	COMMON



*Refer to documents included with the OAH sensor for more details.*

### Installing the Harness – DSV Vertical Units

Follow these steps to install the harness for DSV vertical units:

1. Open the ASE control module and pull out the unit end of the wiring harness.
2. Working from the left or right unit side (depending if the unit is rear or front return), open the 7/8-inch knockout access hole and install a 7/8-inch hole protector. Through the bushed hole, feed the loose, pre-terminated ends of the harness through the condenser section and into the electrical box.
3. Connect the harness terminations to the SEC board economizer harness terminations. The shielded cable plug connects to +, - and the common terminals marked SA bus.

See *Section 3 – Wiring Schematics*. The single red wire connects to the 24V for outputs terminal on the SEC board.

4. In the condenser section, secure the harness to the side of the blower housing using the supplied cable clips.
5. Ensure that:
  - The harness is routed clear of moving parts and sharp edges
  - There are no loose wires that can be pulled into the blower inlet
6. Coil the excess wire length and secure it with wire ties and cable clips.
7. For a rear return air configuration, route the harness through the knockout hole into the condenser unit through the rear-right corner post.

For a front return air configuration, route the harness through the knockout hole into the condenser unit through the front-left corner post.

8. Check that the harness is secured on the outside of the unit using the provided cable clips.

### Installing the Harness – DSH Horizontal Units

Follow these steps to install the harness for DSH horizontal units:

1. Open the ASE control module and pull the unit end of the wiring harness out. Feed the loose pre-terminated ends of the harness along the base of the unit towards the knockout hole on the evaporator blower corner post.
2. Open the 7/8-inch knockout access hole and install a 7/8-inch hole protector. Through the bushed hole, feed the loose, pre-terminated ends of the harness through the evaporator section and into the evaporator electrical box.
3. Check that the cable is protected from damage and the wiring meets all local code requirements.
4. Inside of the evaporator electrical box, connect the unit end harness terminations to the terminal block marked TBE (see *Section 3 – Wiring Schematics*).
5. Inside the blower section of the evaporator unit, secure the harness along the base towards the left corner post using the supplied cable clips.
6. Ensure that:
  - The harness is routed clear of moving parts and sharp edges
  - There are no loose wires that can be pulled into the blower inlet
7. Coil the excess wire length and secure it with wire ties and cable clips.

For split unit applications, extend the harness between condenser and evaporator sections in the field using a 3 wire shielded communication cable and an 18 gauge wire.

Extension harnesses for split unit applications (DSH units) are available through special quote (SQ) from the factory.

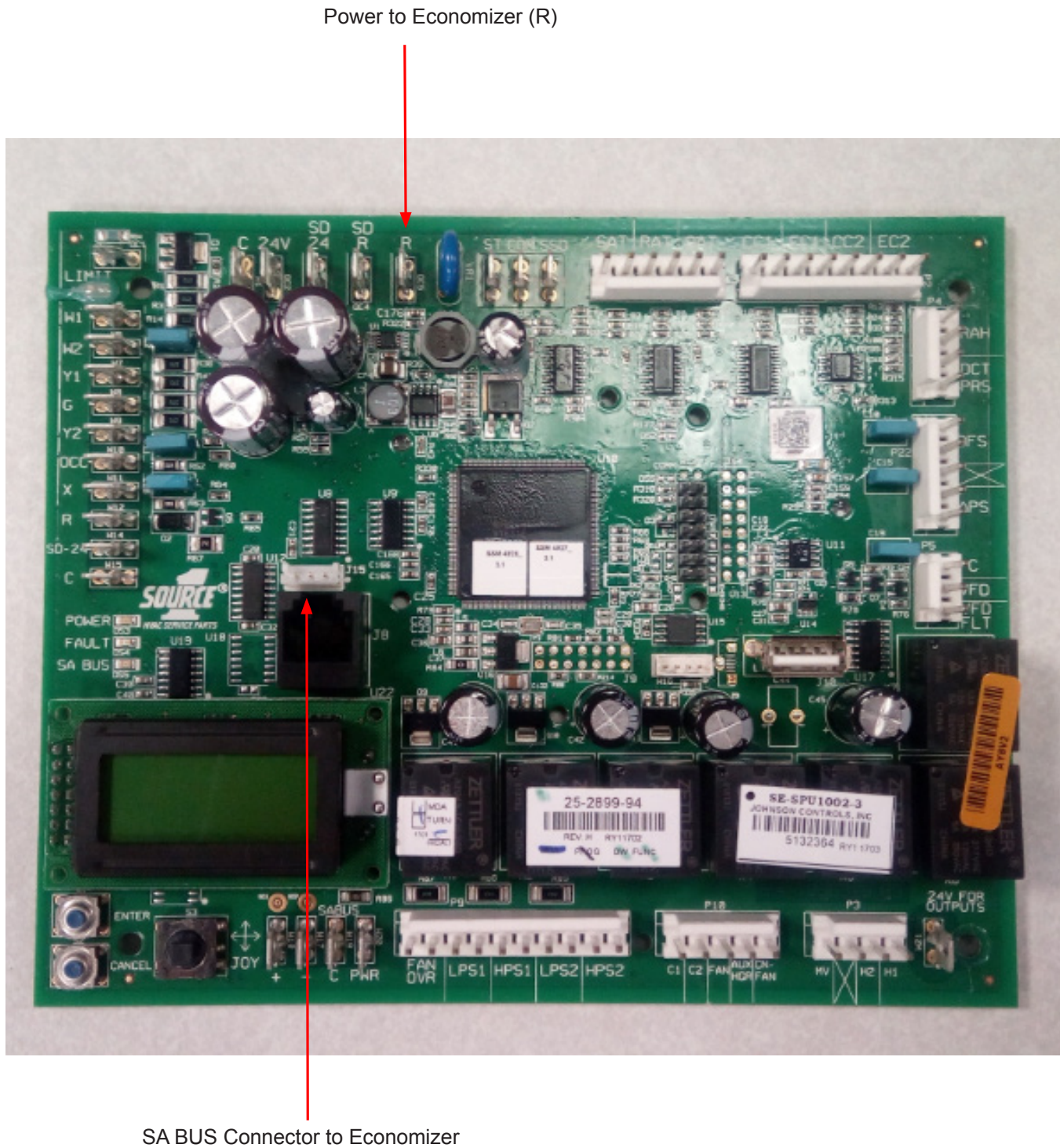
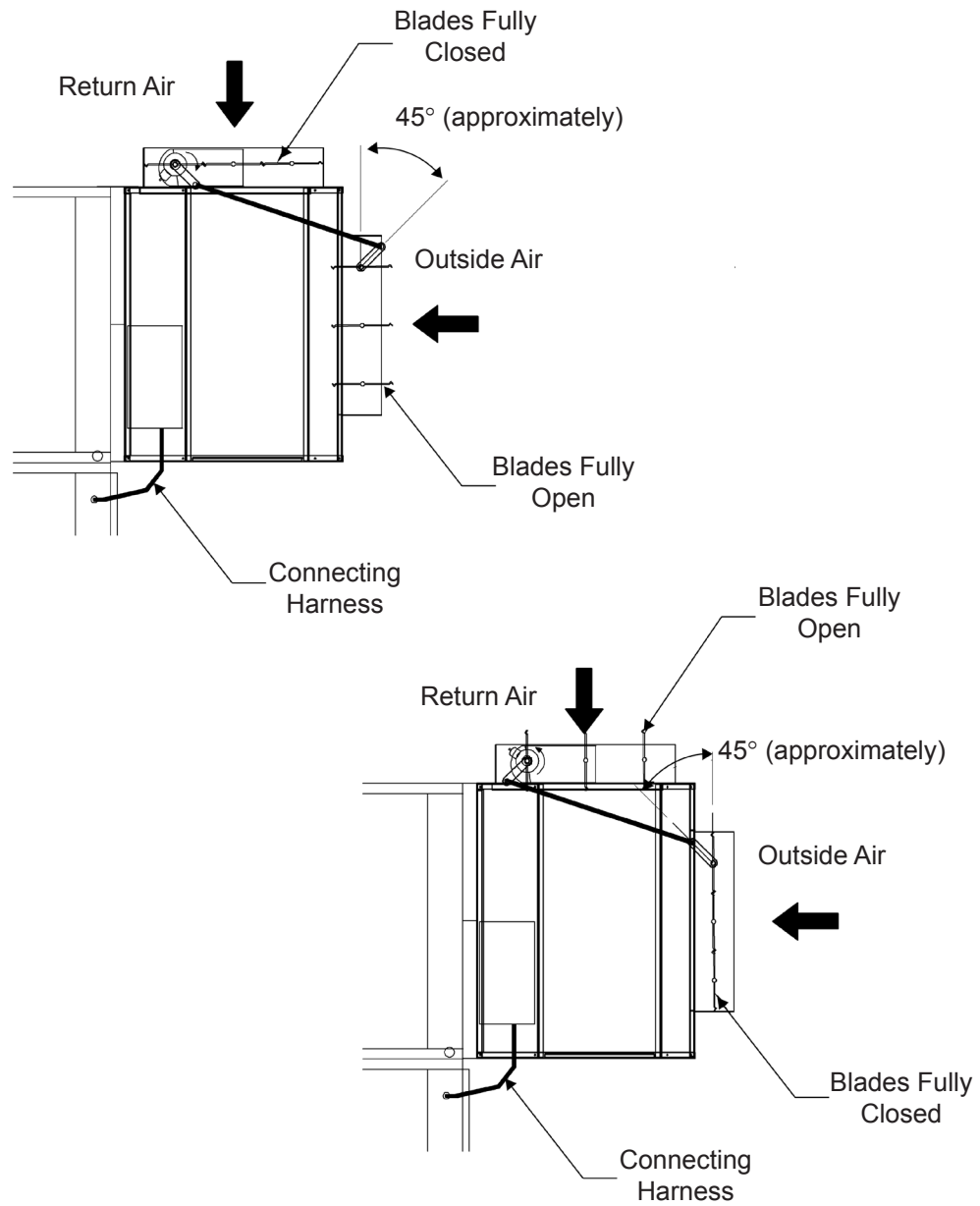


FIGURE 4 - DSV024C-300C UNIT ECONOMIZER WIRE HARNESS CONNECTIONS TO SEC BOARD

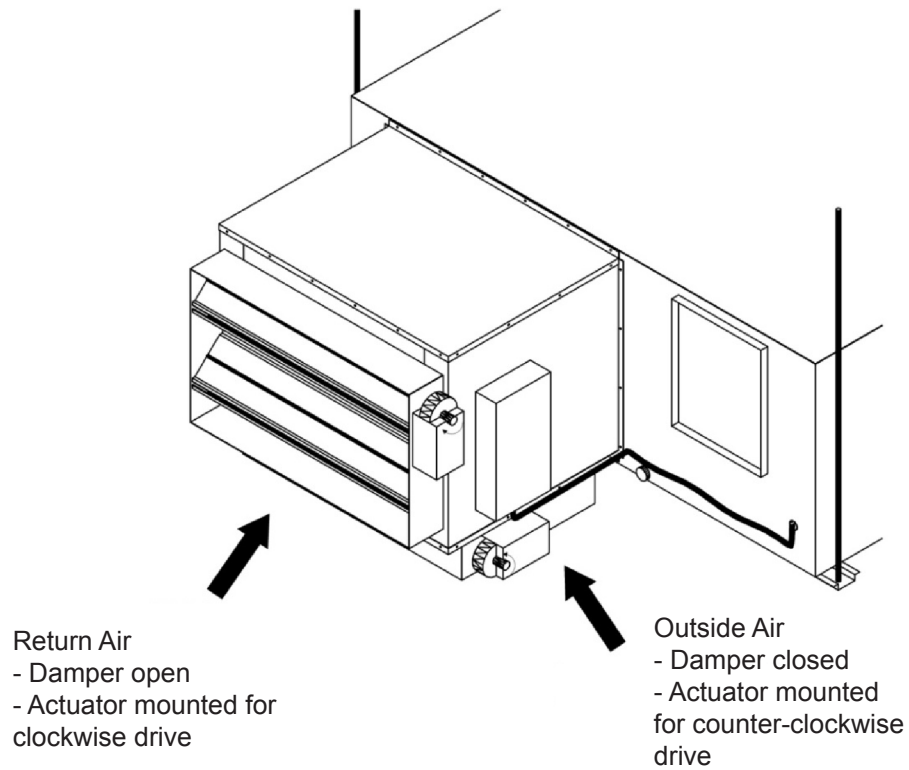
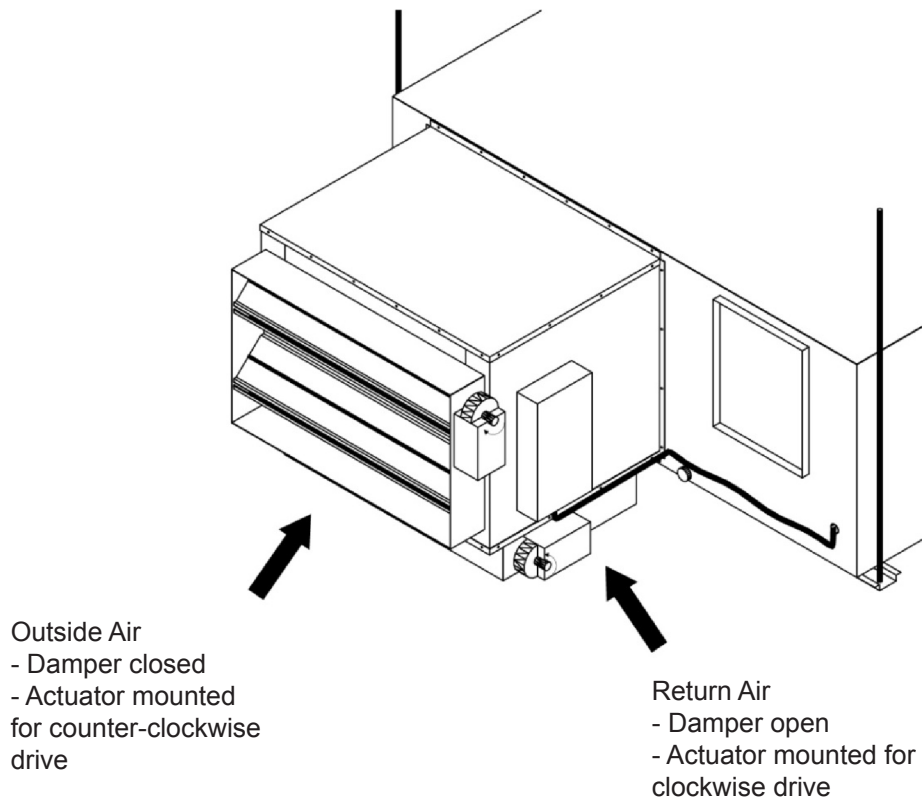
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### DAMPER AND ACTUATOR SETUP FOR ECONOMIZERS



**FIGURE 5 - ACTUATOR ORIENTATION WITH MOTOR DE-ENERGIZED (VERTICAL ECONOMIZER)**

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**FIGURE 6 - ACTUATOR ORIENTATION WITH MOTOR DE-ENERGIZED (HORIZONTAL ECONOMIZER)**

## SECTION 2 - OPERATION

The Smart Equipment controller (SEC) automatically recognizes the airside economizer (ASE) board when connected through the SA bus. However, the specific ASE mode of operations and setpoints must be field set up based on customer requirements and the specifics of field application. Adjust the SEC using either the mobile access portal (MAP) gateway device with Wi-Fi (refer to *Smart Equipment Controls (SEC) Sequence of Operation Overview (Form LIT-12011950)*) or through an easy-to-use web page.

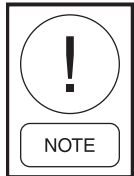
The MAP gateway is an optional device that you can purchase from the factory (catalog ID: TL-MAP1810-0P). Refer to *Mobile Access Portal Gateway Product Bulletin (Form LIT-12011884)* for details.

You can also use the SEC joystick. Refer to *Smart Equipment Controls (SEC) Quick Start Guide (Form LIT-12011938)* for more details on using the SEC joystick. The *Smart Equipment Control (SEC) Technical Bulletin (Form LIT-12011998-UTB-A-0714)* is also useful for setting up the operation of SEC and ASE boards.

### AIRSIDE ECONOMIZER (ASE) SEQUENCES OF OPERATION

There are several functions for operating an economizer, including minimum position, free cooling, economizer loading, and minimum outdoor air supply.

#### Economizer Minimum Position



*The economizer is not used for ventilation, only for cooling.*

The economizer minimum position is set during occupied mode when outside air is not suitable for free cooling. In relation to the variable frequency drive (VFD) output percentage, the position of the damper is set proportionally between the economizer minimum position and the economizer minimum position low speed fan setpoints. 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 return air temperature (RAT).

Free cooling is no longer available if the OAT rises above either the economizer OAT enable setpoint or the RAT.

#### Single Enthalpy Changeover

For single enthalpy economizer operation, the outside air is suitable for free cooling if the outside air enthalpy is at least 1 Btu/lb below the economizer outside air enthalpy setpoint and the OAT is no greater than 9.0°F above the RAT.

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 9.0°F above the RAT to enter free cooling again.

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

#### Auto

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

- Dry bulb changeover = return and outside air dry bulb
- Single enthalpy = return and outside air dry bulb and outside air humidity (OAH)
- Dual enthalpy = return and outside air dry bulb and return air humidity (RAH) and OAH
- If either the return or outside air dry bulb sensors are unreliable, free cooling is not available

## Free Cooling Operation

When the control determines that the outside air is suitable, the first stage of cooling is always free cooling.

## Thermostat Controlled Operation

In free cooling, with a thermostat input to Y1, the dampers modulate to control the supply air temperature (SAT) to the economizer setpoint  $\pm 1.0^{\circ}\text{F}$  (default  $55.0^{\circ}\text{F}$ ).

If the thermostat provides an input to Y2 and the parameter Compressors Off in Free Cooling is turned OFF, a compressor output energizes.

The economizer dampers continue to modulate to control the SAT to the economizer setpoint.

If the SAT cannot be maintained within  $50.0^{\circ}\text{F}$  of the economizer setpoint, the first stage compressor (C1) turns on.

Second stage compressor (C2) is added as needed to keep the SAT within  $50.0^{\circ}\text{F}$  of the economizer setpoint. Units with additional C3 and C4 stages of capacity follow the same capacity steps.

## Sensor Controlled Operation

In free cooling, with a demand from the zone/RAT sensor for the first stage of cooling, the dampers modulate to control the SAT to the economizer setpoint  $\pm 1.0^{\circ}\text{F}$ .

If the economizer output is at 100% and the SAT is greater than the economizer setpoint  $+ 1.0^{\circ}\text{F}$ , the control starts a 12-minute timer to energize a compressor output. If at any time the economizer output drops below 100%, the timer stops and resets when the economizer output returns to 100%.

When a compressor output is turned ON, the economizer dampers continue to modulate to control the SAT to the economizer setpoint.

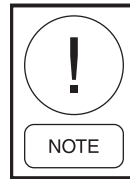
Do not turn on a compressor output if the economizer output is less than 100%, even if the differential between zone (or return air) temperature and the current cooling setpoint is great enough to demand more than one stage of cooling.

If the economizer output goes to the minimum position and the SAT is less than the economizer setpoint  $-1.0^{\circ}\text{F}$ , the control starts a 12-minute timer to de-energize a compressor output.

If at any time the economizer output goes above the minimum position, the timer stops and resets when the economizer output returns to the minimum position.

If the demand for cooling from the space/return is satisfied, the economizer output modulates to the minimum position and the compressor outputs are de-energized as long as their minimum run timers have expired.

## Indoor Air Quality (IAQ)



*The IAQ function is not used. IAQ sensors are not sold by Johnson Controls.*

The terminal AQ accepts a 2–10 VDC signal with respect to the (AQ1) terminal. When the signal is below its setpoint, the actuator can modulate normally in accordance with the enthalpy and mixed air sensor inputs.

When the AQ signal exceeds its setpoint setting and there is no call for free cooling, the actuator is proportionately modulated from the 2–10 VDC signal, with 2 VDC corresponding to fully closed and 10 VDC corresponding to fully open.

When free cooling is not required, the damper position is limited by the IAQ max damper position setting. When the signal exceeds its setpoint setting (demand control ventilation setpoint) and there is a call for free cooling, the actuator modulates from the minimum position to the fully open position. This modulation is based on the highest call from either the mixed air sensor input or the AQ voltage input.

The economizer is only used for cooling, not ventilation. Any exhaust functions should be handled by the building air exhaust system.



**AIRSIDE ECONOMIZER CONTROLLER**



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**FIGURE 7 - SE-ECO1001-0 ECONOMIZER CONTROLLER**

**TABLE 1 - SIMPLICITY SMART EQUIPMENT (SE) ECONOMIZER BOARD DETAILS**

BOARD LABEL	COVER LABEL	DESCRIPTION	FUNCTION AND COMMENTS
<b>DIRECTIONAL ORIENTATION: VIEWED WITH THE CENTER TEXT OF THE COVER LABEL UPRIGHT</b>			
<b>ANALOG INPUTS TERMINAL AT LEFT ON UPPER EDGE OF ECONOMIZER BOARD</b>			
<b>C</b>	<b>COM</b>	24 VAC common/0–10 VDC negative for economizer actuator position feedback	Connects through circuit trace to 24V~ IN pin COM
<b>IN2</b>	<b>ECOFB</b>	0–10 VDC positive input from economizer actuator position feedback	EconDampPos parameter reports input status (0–100%). Used to meet California Title 24 requirements for economizer actuator position feedback
<b>R</b>	<b>24V~</b>	24 VAC hot supplied for economizer actuator position feedback	Connects through circuit trace to 24V~ IN pin HOT
<b>C</b>	<b>COM</b>	Mixed air temperature (MAT) sensor input from 10KΩ at 77.0°F, Type III negative temperature coefficient thermistor	MAT parameter reports input status (°F/°C), 3.65 VDC reading MAT (+) to COM (–) with open circuit. Read-only use in current control revision
<b>IN1</b>	<b>MAT</b>		

**TABLE 1 - SIMPLICITY SE ECONOMIZER BOARD DETAILS (CONTINUED)**

BOARD LABEL	COVER LABEL	DESCRIPTION	FUNCTION AND COMMENTS
<b>LEDS AT LEFT ON UPPER EDGE OF ECONOMIZER BOARD</b>			
<b>POWER</b>	<b>POWER</b>	Green unit control board (UCB) power indicator	Lit indicates 24 VAC is present at 24V~ IN COM and HOT pins
<b>FAULT</b>	<b>FAULT</b>	Red networking error and firmware error indicator	1/10th-second ON/OFF flashing indicates a networking error (for example, polarity or addressing) or a firmware error (likely correctable by re-loading from the USB flash drive)
<b>SA BUS</b>	<b>SA BUS</b>	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB-to-economizer board SA bus communication is currently active. OFF indicates the economizer board is awaiting SA bus communication
<b>SA BUS PIN CONNECTIONS AT LEFT ON UPPER EDGE OF ECONOMIZER BOARD</b>			
<b>C</b>	<b>COM</b>	Common for SA bus power and communication circuits	EconCtrlr parameter reports UCB-to-economizer board SA bus communication status. Negative of the SA bus communication circuit to the UCB. Through the unit wiring harness, it can continue on to the 4-stage board or the fault detection and diagnostics (FDD) board
<b>-</b>	<b>-</b>	Communication for SA bus devices	EconCtrlr parameter reports UCB-to-economizer board SA bus communication status. Positive of the VDC (typically, a fluctuating 1.5–3.5 volts reading to C; at least 0.25 volts lower than +) SA bus communication circuit to the UCB. Through the unit wiring harness, it can continue on to the 4-stage board or FDD board
<b>+</b>	<b>+</b>	Communication for SA bus devices	EconCtrlr parameter reports UCB-to-economizer board SA bus communication status. Positive of the VDC (typically, a fluctuating 1.5–3.5 volts reading to C; at least 0.25 volts higher than –) SA bus communication circuit to the UCB. Through the unit wiring harness, it can continue on to the 4-stage board or FDD board

**TABLE 1 - SIMPLICITY SE ECONOMIZER BOARD DETAILS (CONTINUED)**

BOARD LABEL	COVER LABEL	DESCRIPTION	FUNCTION AND COMMENTS
<b>ANALOG OUTPUTS PIN AT CENTER ON UPPER EDGE OF ECONOMIZER BOARD</b>			
<b>J4</b>	<b>EX VFD</b>	2–10 VDC positive output for the modulating power exhaust fan VFD/ discharge damper modulating power exhaust actuator	Unused in current control revision
	<b>COM</b>	24 VAC common/0–10 VDC negative for the power exhaust variable frequency drive/ discharge damper modulating power exhaust actuator	Connects through the circuit trace to 24V~ IN pin COM
	<b>24V~</b>	24 VAC hot supplied for the discharge damper modulating power exhaust actuator and economizer actuator	Connects through the circuit trace to 24V~ IN pin HOT
	<b>ECON</b>	2–10 VDC output for the economizer actuator	Econ parameter reports the output status (0–100%). Used to position the economizer actuator for minimum position, free cooling, demand ventilation, cooling economizer loading, and purge functions
	<b>COM</b>	24 VAC common/0–10 VDC negative for economizer actuator	Connects through circuit trace to 24V~ IN pin COM
<b>BINARY OUTPUTS PIN AT RIGHT ON UPPER EDGE OF ECONOMIZER BOARD</b>			
<b>J3</b>	<b>24V~</b>	24 VAC hot supplied for an incremental (floating control) economizer actuator	Connects through circuit trace to 24V~ IN pin HOT
	<b>ACT-A</b>	24 VAC hot outputs to position an incremental (floating control) economizer actuator	Unused in current control revision
	<b>ACT-B</b>	24 VAC return	Unused in current control revision
	<b>COM</b>	24 VAC common for an incremental (floating control) economizer actuator	Connects through circuit trace to 24V~ IN pin COM
	<b>EX-FAN</b>	24 VAC hot output to energize power exhaust fan contactor coil/VFD enable relay coil	Unused in current control revision
	<b>COM</b>	24 VAC common/0–10 VDC negative for economizer actuator	Connects through circuit trace to 24V~ IN pin COM

**TABLE 1 - SIMPLICITY SE ECONOMIZER BOARD DETAILS (CONTINUED)**

BOARD LABEL	COVER LABEL	DESCRIPTION	FUNCTION AND COMMENTS
<b>24V~ IN PIN CONNECTIONS AT RIGHT ON UPPER EDGE OF ECONOMIZER BOARD</b>			
<b>C</b>	<b>COM</b>	24 VAC transformer common referenced to cabinet ground	24 VAC common connection to power the economizer board. Connects through circuit traces to C/COM terminals and pins distributed on the economizer board
<b>R</b>	<b>HOT</b>	24 VAC transformer HOT	24 VAC hot connection to power the economizer board. Connects through circuit traces to R/24V~ terminals and pins distributed on the economizer board
<b>ANALOG INPUTS TERMINAL ON LOWER EDGE OF ECONOMIZER BOARD</b>			
<b>R</b>	<b>24V~</b>	24 VAC hot supplied for the OAH sensor	Connects through circuit trace to 24V~ IN pin HOT
<b>IN3</b>	<b>OAH</b>	0–10 VDC positive input from the OAH sensor	OAH parameter reports input status (0–100%H). Used in outdoor air enthalpy calculation for dual enthalpy economizer free cooling changeover
<b>C</b>	<b>COM</b>	24 VAC common/0–10 VDC negative for the OAH sensor	Connects through circuit trace to 24V~ IN pin COM
<b>R</b>	<b>24V~</b>	24 VAC hot supplied for the supply air humidity (SAH) sensor	Connects through circuit trace to 24V~ IN pin HOT
<b>IN4</b>	<b>SAH</b>	0–10 VDC positive input from the SAH sensor	SAH parameter reports input status (0–100%H). Unused in current control revision
<b>C</b>	<b>COM</b>	24 VAC common/0–10 VDC negative for the SAH sensor	Connects through circuit trace to 24V~ IN pin COM
<b>R</b>	<b>24V~</b>	24 VAC hot supplied for the indoor air quality sensor	Connects through circuit trace to 24V~ IN pin HOT
<b>IN5</b>	<b>IAQ</b>	0–10 VDC positive input from the Indoor Air Quality sensor	IAQRange parameter sets the CO <sub>2</sub> parts per million measured by the IAQ sensor when it outputs 10 VDC; IAQ parameter reports input status (0–5,000ppm). Used for demand ventilation functions if the NetIAQ parameter indicates ?Unrel
<b>C</b>	<b>COM</b>	24 VAC common/0–10 VDC negative for the IAQ sensor	Connects through circuit trace to 24V~ IN pin COM
<b>R</b>	<b>24V~</b>	24 VAC hot supplied for the outdoor air quality (OAQ) sensor	Connects through circuit trace to 24V~ IN pin HOT
<b>IN6</b>	<b>OAQ</b>	0–10 VDC positive input from the OAQ sensor	OAQRange parameter sets the CO <sub>2</sub> parts per million measured by the OAQ sensor when it outputs 10 VDC; OAQ parameter reports input status (0–5,000ppm). Used for demand ventilation function when DVent-Mode selection is Diff between IAQ and OAQ and the NetOAQ parameter indicates ?Unrel

**TABLE 1 - SIMPLICITY SE ECONOMIZER BOARD DETAILS (CONTINUED)**

BOARD LABEL	COVER LABEL	DESCRIPTION	FUNCTION AND COMMENTS
C	COM	24 VAC common/0–10 VDC negative for the OAQ sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the air monitoring station sensor	Connects through circuit trace to 24V~ IN pin HOT
IN7	FR AIR	0–10 VDC positive input from the air monitoring station sensor	MOA-Range parameter sets the CFM/ft <sup>2</sup> (l/s) measured by the air monitoring station sensor when it outputs 10 VDC; Fr Air parameter reports input status (0–5,0000 CFM (23,595 l/s)). Used for economizer minimum position reset in speed-controlled indoor blower applications
C	COM	24 VAC common/0–10 VDC negative for the air monitoring station sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the building pressure sensor	Connects through circuit trace to 24V~ IN pin HOT
IN8	BLDG PRES	0–5 VDC positive input from the Building Pressure sensor	Unused in current control revision
C	COM	24 VAC common/0–5 VDC negative for the building pressure sensor	Connects through circuit trace to 24V~ IN pin COM
<b>BINARY INPUTS AT RIGHT ON LOWER EDGE OF ECONOMIZER BOARD</b>			
IN9	PURGE	24 VAC hot input from the purge dry contact	Unused in current control revision
	24V~	24 VAC hot supplied for the purge dry contact	Connects through circuit trace to 24V~ IN pin HOT
IN10	EX VFD FLT	24 VAC hot input from the power exhaust VFD fault contact	Unused in current control revision
	24V~	24 VAC hot supplied for the power exhaust VFD fault contact	Connects through circuit trace to 24V~ IN pin HOT

### SECTION 3 – WIRING SCHEMATICS

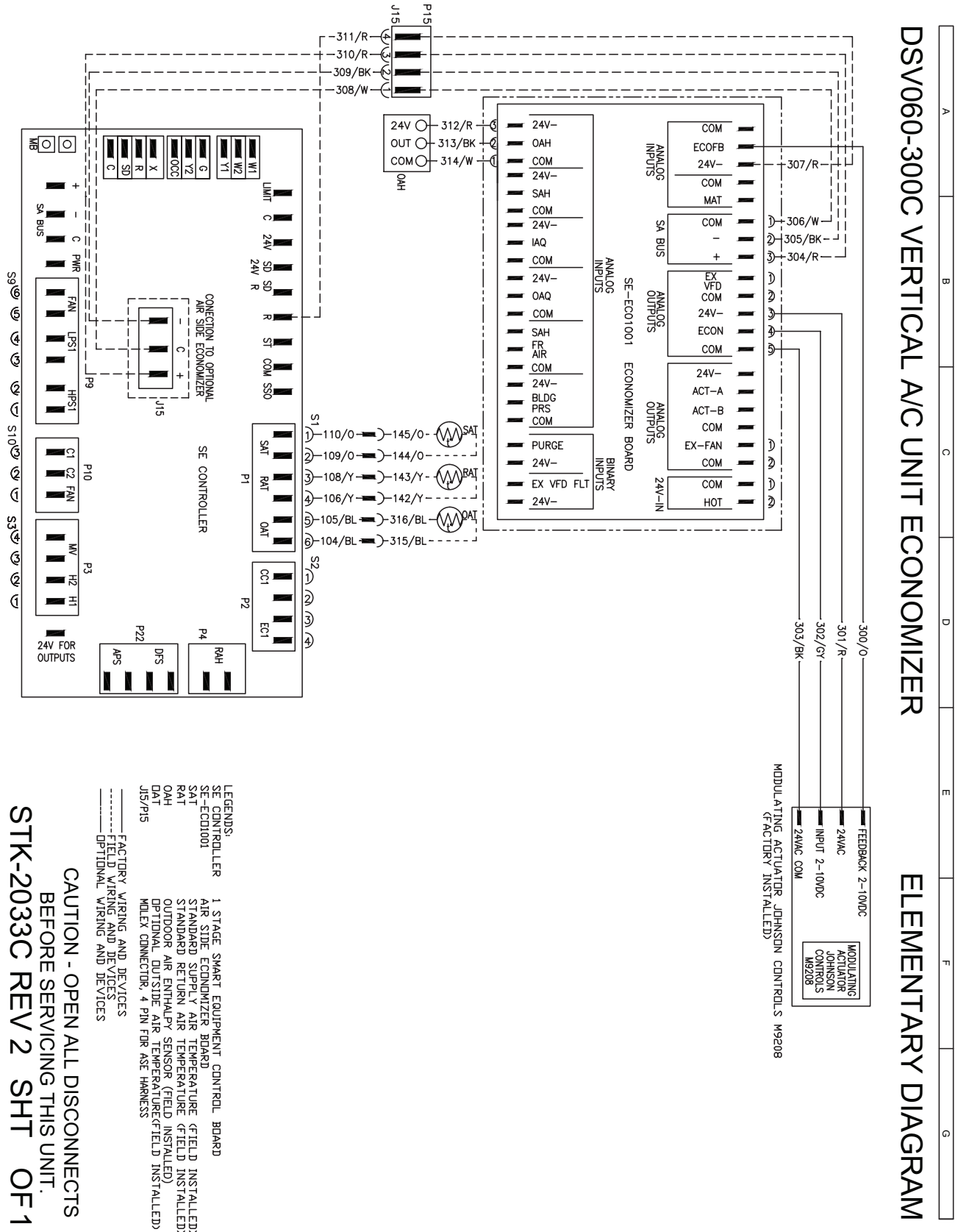
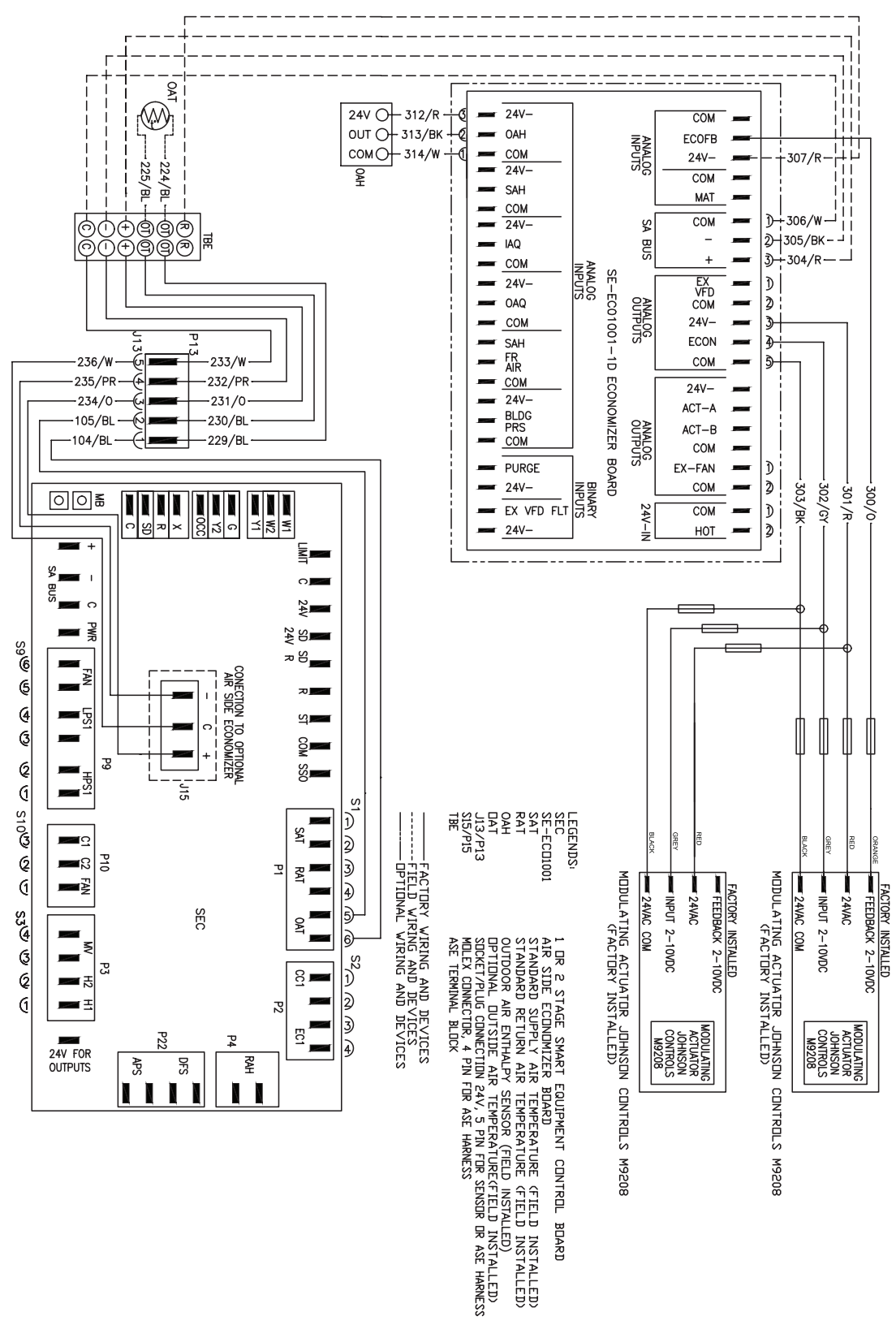


FIGURE 8 - DSV060-300C VERTICAL AIR CONDITIONING UNIT ECONOMIZER

DSH024-120C HORIZONTAL A/C UNIT ECONOMIZER  
 ELEMENTARY DIAGRAM



CAUTION - OPEN ALL DISCONNECTS  
 BEFORE SERVICING THIS UNIT.  
 STK-2032C REV 3 SHT 1 OF 1

FIGURE 9 - DSH024-120C HORIZONTAL AIR CONDITIONING UNIT ECONOMIZER



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