

DOWNFLOW ECONOMIZERS

24F99 HIGH PERFORMANCE ECONOMIZER

INSTALLATION INSTRUCTIONS FOR ECONOMIZERS USED WITH ZC,ZG 092-150 and ZH 092-120 UNITS

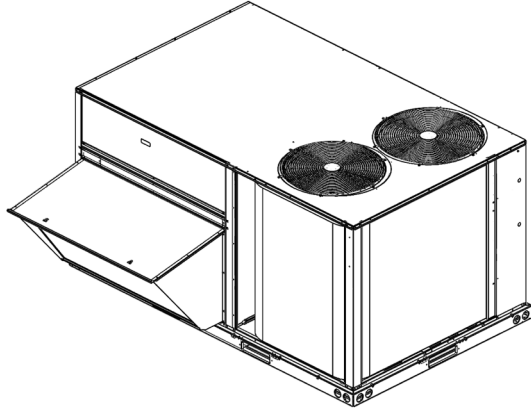


Figure 1

Application

The 24F99 high performance economizer is used with ZC, ZG 092-150 and ZH 092-120 units in vertical air discharge applications. Economizer dampers will modulate to maintain 55°F (31°C) supply air when outdoor air is suitable. The mixed air temperature sensor measures the supply air sensible temperature.

An outdoor air sensor is used to determine whether outdoor air is suitable for free cooling. The outdoor air sensor is factory-installed in all economizers. The high performance economizer is equipped with POL224.00 control module A6. The default OA temperature sensor or high limit sensor (RT26) is a CEC approved, California Title 24 fixed dry bulb device.

See Table 1 for outdoor and return air (OA and RA) sensor options. Refer to manufacturer's instructions provided for more detail.

TABLE 1

Sensors	Dampers modulate to maintain 55°F mixed air (R1) when:
Single OA Sensible DEFAULT - approved for CA Title 24	OA temperature (RT26) is lower than free cooling setpoint
Single OA Enthalpy Not approved for CA Title 24	OA temperature and humidity (A7) is lower than free cooling setpoint
Differential Enthalpy - 1 in OA & 1 in RA Not approved for CA Title 24	OA temperature and humidity (A7) is lower than RA temperature and humidity (A62).
IAQ Sensor	CO ₂ sensed (A63) is higher than CO ₂ setpoint

INDOOR AIR QUALITY SENSOR

An IAQ sensor is used when demand control ventilation (DCV) is specified. Damper minimum position can be set lower than traditional minimum air requirements resulting in cost savings. The IAQ sensor allows the economizer control module to open dampers to traditional ventilation requirements as room occupancy (CO₂) increases.

For proper operation, the IAQ sensor must provide a 2-10VDC, 100 ohm impedance signal. Connect sensors to the green IAQ leads provided on the economizer control module in the filter section as shown in Figure 9.

Shipping and Packing List

Package 1 of 1 contains:

- 1 - Economizer damper assembly
 - 1 - Outdoor air damper
 - 1 - Return air damper
 - 1 - Gravity exhaust damper
 - 1 - Economizer actuator
 - 1 - Economizer control module
 - 1 - Outdoor air temperature sensor
 - 1 - Top seal panel
 - 1 - Lower panel (hood top)
- 1 - Mixed air sensor and adaptor harness
- 1 - Hardware bag
- 1 - Hood parts package
 - 1 - Left hood side
 - 1 - Right hood side
 - 1 - Hood divider
 - 1 - Hood filter
- 1 - Wiring Diagram Label

Order Of Installation

- Economizer
- Mixed air sensor
- Optional OA, RA and CO₂ (IAQ) sensors
- Optional Power Exhaust Fans



WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer, service agency or the gas supplier



CAUTION

Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

Install Economizer

1. Disconnect all power sources to the unit
2. Remove the following panels from the unit;
 - Filter door panel
 - Return chamber panel
 - Blower access panel
 - Control panel

When filter door and return chamber panels are removed there will be a cross support still in the unit stretching from side to side of the return chamber.

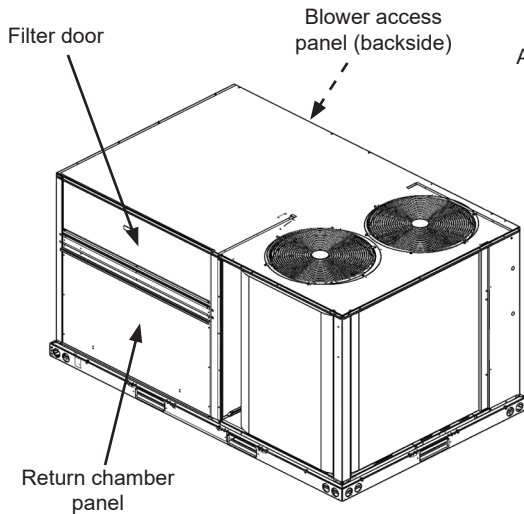


Figure 2

3. Remove hood parts package.
4. Install damper assembly into unit under the cross support. Fit opening in bottom of damper assembly over the return air opening. See Figure 3.
5. The upper panel of the economizer will screw into the cross support through pre-punched holes.
6. Secure the economizer to unit base pan with five screws.

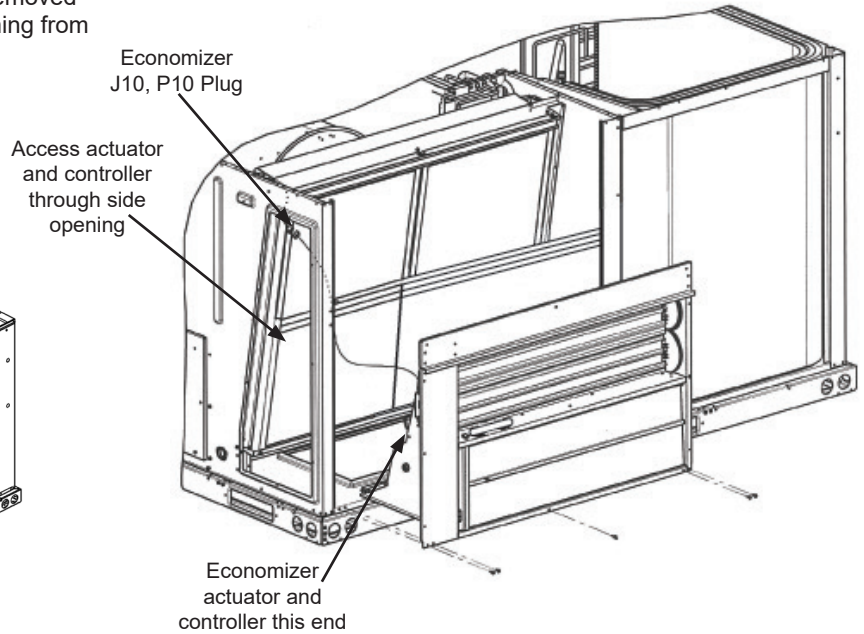


Figure 3 - Economizer Installation

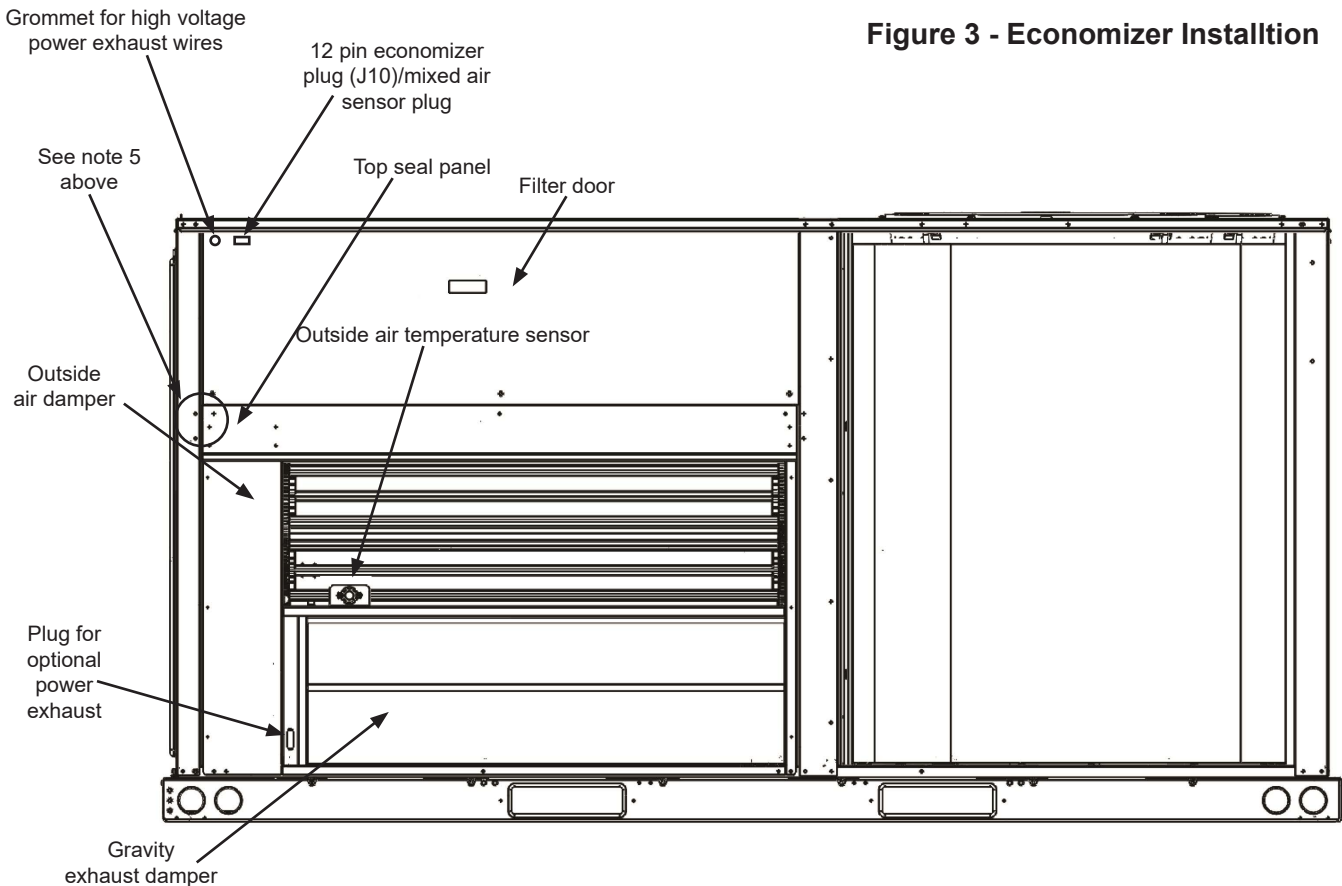


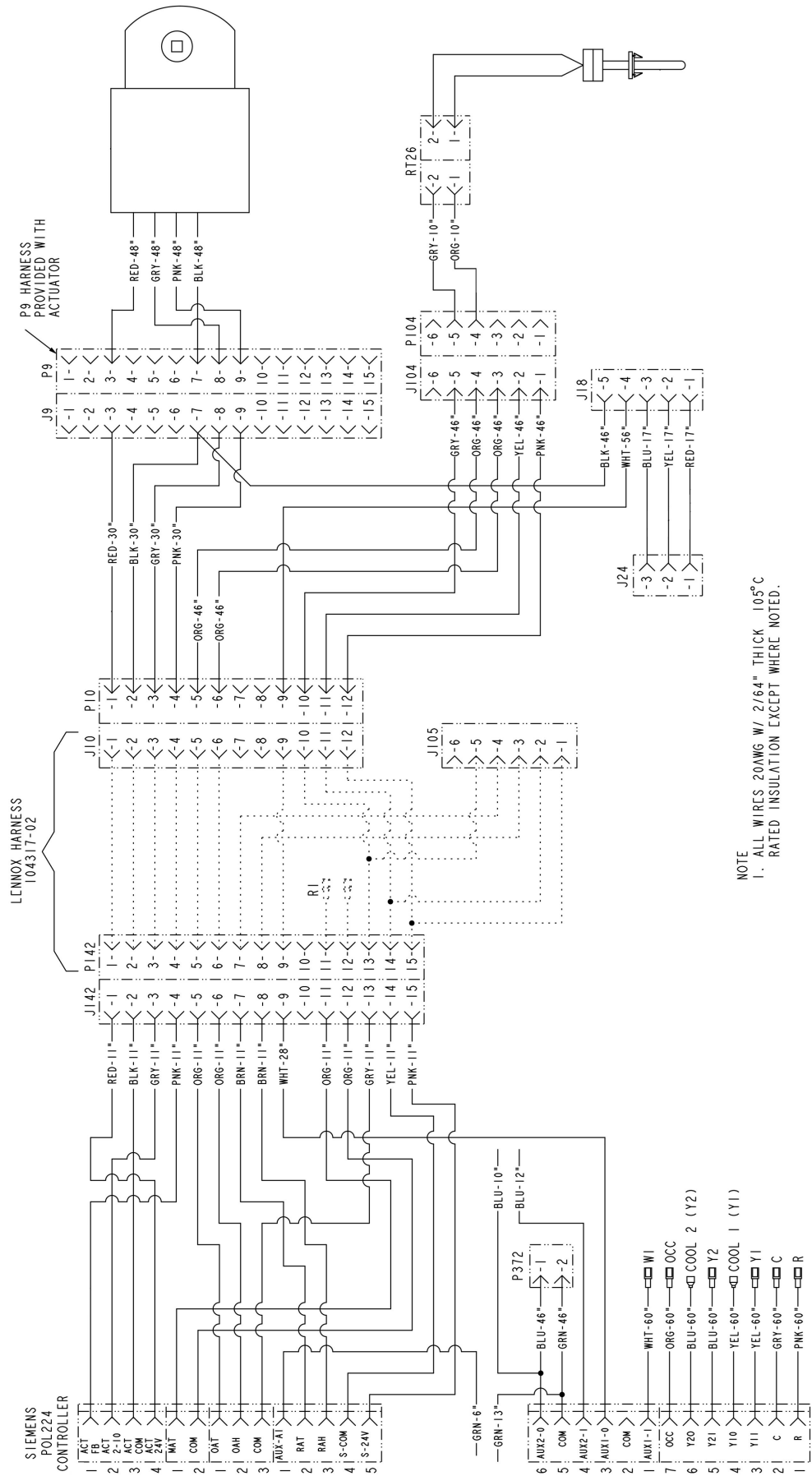
Figure 4

Economizer Wiring

1. The economizer control module and harness are located below the actuator for shipping. Relocate the control to the unit control box, see Fig. 6.
2. Route the control wires to unit terminal block (TB1) and connect these wires to TB1 as follows (see Fig. 6):
 - Connect all female terminals to TB1.
 - Disconnect the factory installed terminals Y1 and Y2 at TB1. Connect these terminals to the control wire male terminals Y1 and Y2.
3. Attach the control harness jack (J142) to the prewired harness plug (P142).
4. At economizer/ filter compartment, attach economizer plug P10 to prewired jack (J10). See Fig. 3.
5. Connect any optional sensors as shown in Fig. 9.
6. If optional power exhaust is used, wire according to instructions provided with power exhaust. See Fig. 5.
7. Apply wiring diagram to the control panel. See Fig. 7.

Install Mixed Air Sensor

1. Remove mixed air sensor, mixed air sensor harness, wire tie and screw from the economizer parts bag.
2. Locate the 2 mixed air sensor wire connectors in the unit blower compartment. They are in the harness routed over the blower housing. Attach these 2 wires to the mixed air sensor harness.
3. Mount the wire tie to the blower housing as shown in Fig. 8.
4. Secure wires in place so they don't interfere with unit operation.
5. Replace all panels.



NOTE
 1. ALL WIRES 20AWG W/ 2/64" THICK 105°C
 RATED INSULATION EXCEPT WHERE NOTED.

Figure 5 - Wiring Detail

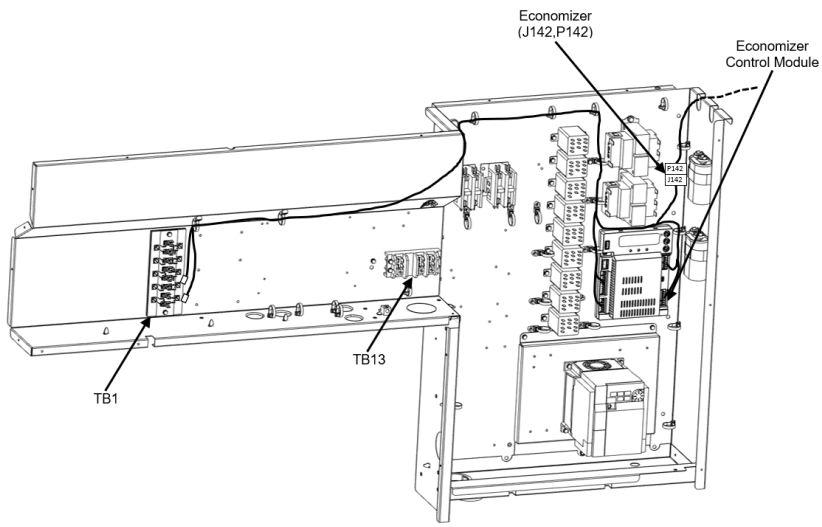


Figure 6 - HVAC Control Box

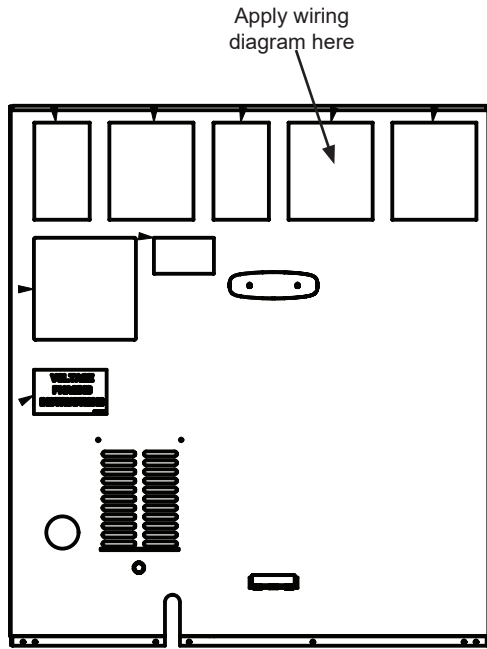


Figure 7

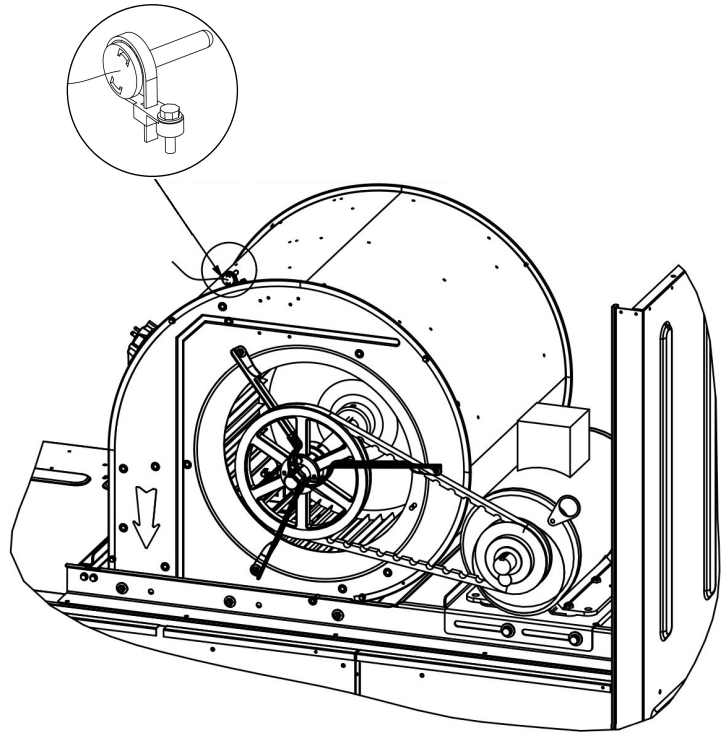


Figure 8 - Mixed Air Sensor

High Performance Economizer - Electrical

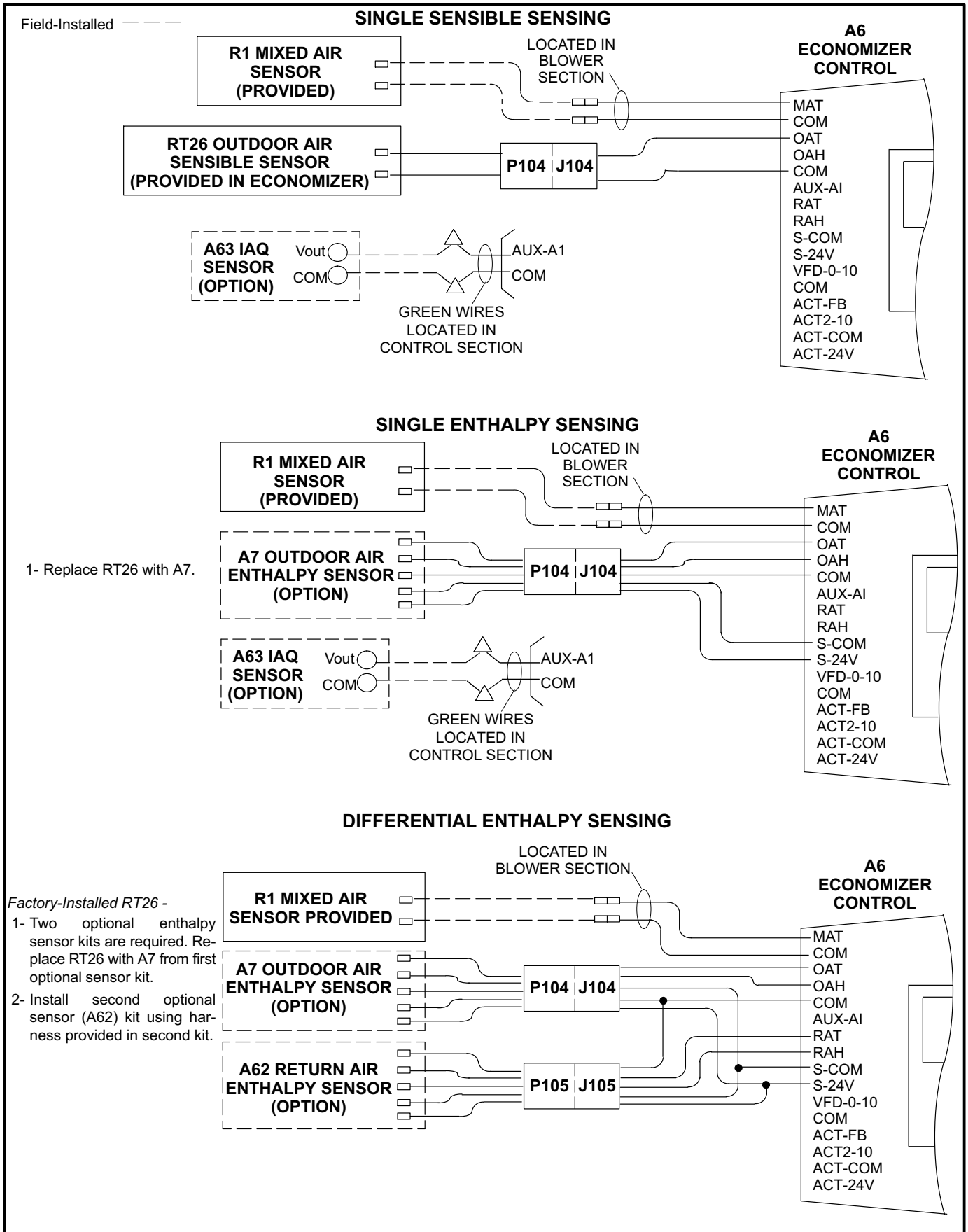


Figure 9

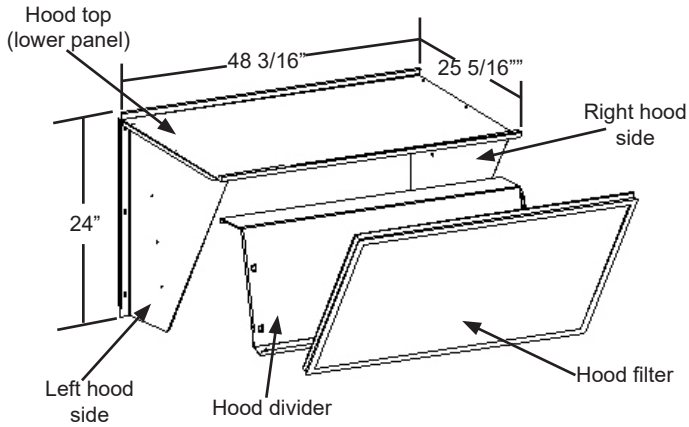


Figure 10

Outdoor Air Hood

If using a power exhaust accessory skip this step. The hood parts shipped with the economizer will not be used.

1. Remove the hood top from the economizer assembly.
2. Install the hood sides to the hood top, see Figure 10.
3. Screw the hood divider to the hood sides. Divider sits between the left and right hood side. Bottom angle of divider is used for the filter rack.
4. Open the filter clips on the underneath side of the hood top and insert filter. See Figure 11.
5. With hood assembled, fit the mating flange on hood top underneath the "knuckle" on the top seal panel. Install the hood over economizer as shown in Figure 4, 10 and 12.
6. Screw hood to unit as shown in figure 12.

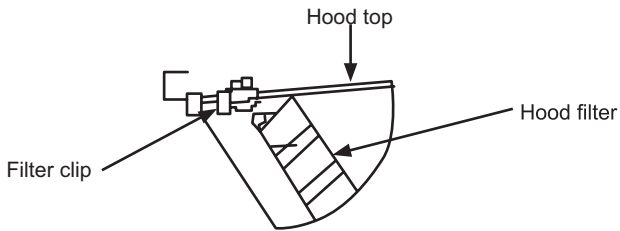


Figure 11

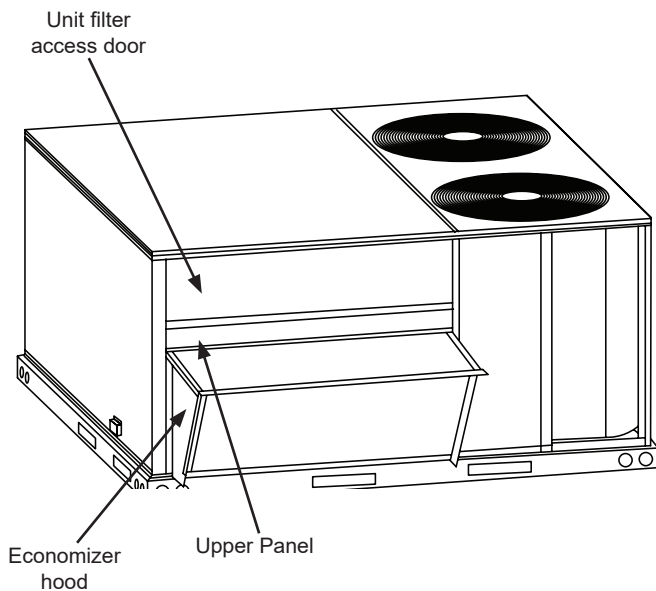


Figure 12

High Performance Economizer - A6 Control

USER INTERFACE

See figure 13.

- 1- One-line LCD. After a period of inactivity, the controller displays the default HMI screen (free cooling status: "1FREECOOL YES" or "1FREECOOL NO").
- 2- Operation button (Up button) - Move to the previous value, step or category.
- 3- Operation button (Down button)- Move to the next value, step or category.

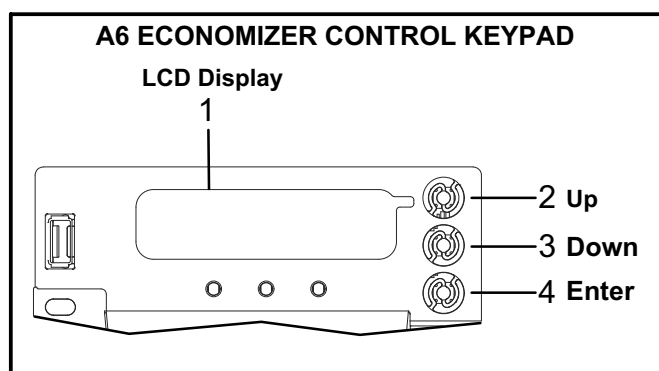


Figure 13

Operation button (Enter button):

- Press to edit the current value or option.
- Press to confirm a newly selected value or option.
- Press Enter + Up to jump up one entire category.
- Press Enter + Down to jump down one entire category.

MENU STRUCTURE

See figure 14.

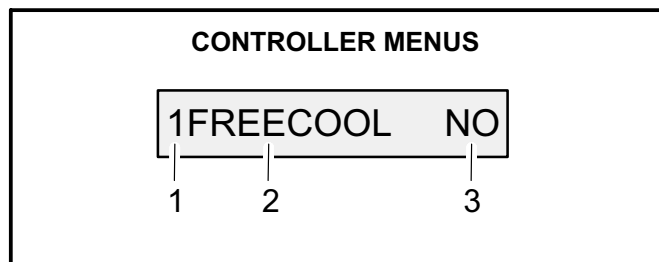


Figure 14

- 1- Menus are displayed in the Economizer Controller as per categories. There are eight first-level menus. Each menu is represented by a number at the beginning of the line on the LCD. Press Enter + Up or Down to toggle between different first-level menus.

- 1: Status Display
- 2: Basic Settings
- 3: Advanced Settings
- 4: Alarms
- 5: Enter Configuration State and Reset
- 6: I/O Config.
- 7: Testing
- 8: Enter Running State

2- Sub-menus follow the numbered first-level menus closely. Pressing Up or Down can toggle between different sub-menus.

3- At the end of the line, the LCD displays the value of the current sub-menu (if any). Enter the Edit mode by pressing Enter (if the value is editable). Press Up or Down to change the highlighted value. Press Enter to confirm the change and exit the Edit mode.

For a complete list of parameters refer to the Siemens installation manual provided in this kit.

FREE COOLING SETPOINT

Single OA Sensible Sensing (Default) -

The default free cooling setpoint or high limit setpoint is 63°F. This means that the outdoor air is suitable for free cooling at 62°F and below and not suitable at 64°F and above. This setpoint is adjustable.

For California Title 24 compliance, adjust the free cooling setpoint based on:

- The climate zone where the unit is installed. See table 7.
- The setpoint requirement published by the California Energy Commission. See Section 140.4 - Prescriptive Requirements for Space Conditioning Systems of the 2013 Building Energy Efficiency Standards.

NOTE - Values in the referenced standard will supersede values listed in table 7.

TABLE 7

FREE COOLING SETPOINT - SINGLE SENSIBLE

Climate Zone	Setpoint
1, 3, 5, 11-16	75°F
2, 4, 10	73°F
6, 8, 9	71°F
7	69°F

To adjust the setpoint, navigate to the "BASIC SETTINGS" menu and change the "2TEMP OFF" parameter accordingly.

Single OA Enthalpy Sensing (Optional) -

To adjust the enthalpy setpoint, navigate to the "BASIC SETTINGS" menu and change the "2ENTH OFF" parameter accordingly.

Differential Sensing (Optional) -

Two sensors can be used to compare outdoor air to return air. When outdoor air is cooler than return air, outdoor air is suitable for free cooling. When return air is cooler than outdoor air, the damper will modulate to the minimum position.

SETUP AND CONFIGURATION - FACTORY-INSTALLED ECONOMIZER

Program the following parameters into the controller. Navigate to the specific menus to make the changes required.

1INS	(MM/DD/YY) enter installation date
2FAN L ACT*	() adjust VDC value until desired fresh air setpoint is reached when fan runs at low speed. *Appears only if unit is configured as 2SPEED.
2FAN H ACT	() adjust VDC value until desired fresh air setpoint is reached

SETUP AND CONFIGURATION - FIELD-INSTALLED ECONOMIZER

Program the following parameters into the controller. Navigate to the specific menus to make the changes required.

IMPORTANT - Before setup and configuration, it is recommended to obtain some location-based values such as shutoff points or utilize the location services in the Climatix mobile application.

Menus are displayed in the Economizer Controller as per categories. There are eight first-level menus. Each of them is represented by a number at the beginning of the line on the LCD. Press Enter + Up or Down to toggle between different first-level menus.

Navigate to the applicable menus and set the following parameters based on the unit configuration:

1INS	(MM/DD/YY) enter installation date
2FAN L ACT	() adjust VDC value until desired fresh air set point is reached when fan runs at low speed (*Appears only if unit is configured as 2SPEED)
2FAN H ACT	() adjust VCD value until desired fresh air set point is reached
3DIF T LOC	(LAT)
3STG3 DLY	(120)
6Y2O	(NONE) For single-stage units (COOL 2) For 2-stage units
6FAN	(1 SPEED) For CAV units (2 SPEED) For MSAV units

ALARM MONITORING

The controller is equipped with a 24V output signal that can be configured for remote alarm monitoring. Field-wire to provided blue wire marked "Aux2-O" near the controller for remote alarm monitoring.

Note - Newer units are factory-wired to facilitate feedback wiring connections when a BACnet™ option is installed. Newer units can be identified by a P372 plug located near TB1 in the control box. One white and one gray wire are connected to P372. On older units, call 1-800-453-6669 for wiring assistance.

DEMAND CONTROL VENTILATION (DCV)

When a 0-10VDC CO₂ sensor is wired to the POL224.00 economizer control A6 (leads provided), the 2DCV, 2VENTMAX L, 2VENTMAX H, 2 VENTMIN L and 2VENTMIN H parameters will appear under "BASIC SETTINGS" menu. Navigate to the "BASIC SETTINGS" menu to adjust setpoints as desired. Refer to the Siemens manual provided for more details.

For proper operation, the IAQ sensor must provide a 0-10VDC signal. Connect sensor leads to the provided white wire marked "AUX-AI" located near the A6 economizer control located in the filter section.

CO₂ Sensor Used With High Performance Economizers-

When using any 0-10VDC sensor, set the ppm range using the POL224.00 economizer control A6 menu. Set the 6CO2 Rng L to 400 ppm and the 6CO2 Rng H to 1600 ppm.

High Performance Economizer - Sequence of Operation

Refer to tables 8, 9, 10 or 11.

When the outdoor air is suitable and a thermostat demand calls for 1st stage cooling (Y1), the economizer will modulate the dampers between the minimum and fully open positions to maintain a 55°F (12.8°C) mixed air temperature. When there is an increased thermostat demand for second stage cooling (Y2), the economizer damper opens 100% and the economizer controller (A6) will bring on the compressor. The damper will stay open 100% with the compressor running simultaneously until Y2 demand is met.

NOTE – If a two-speed fan is installed, the economizer controller (A6) will delay the compressor start for 5 minutes (default). To adjust the delay from 1 to 20 minutes, adjust the “2FAN DLY” setting.

NOTE – When there is a Y1 cooling demand, the economizer controller (A6) will display the mixed air temperature (R1). When there is a Y2 cooling demand and compressors are operating, the economizer controller (A6) will display the outdoor air temperature (RT26 or A7). In either case, the economizer controller (A6) will use the mixed air sensor for low temperature lock-out.

TROUBLESHOOTING, ALARMS AND CHECKOUT TESTS

Refer to the Siemens manual provided for details.

**TABLE 8
ECONOMIZER OPERATION - NO DCV (CO₂ SENSOR, 1-SPEED SUPPLY FAN)**

DCV	OA Good to Economize?	Y1-I	Y2-I	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	24-v/On	0-v/Off	MIN POS	Closed
		On	On	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	24-v/On	0-v/Off	Full-Open	Full-Open

**TABLE 9
ECONOMIZER OPERATION - WITH DCV (CO₂ SENSOR, 1-SPEED SUPPLY FAN)**

DCV	OA Good to Economize?	Y1-I	Y2-I	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	24-v/On	0-v/Off	Full-Open	Full-Open
Above set	No	Off	Off	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	24-v/On	0-v/Off	VENTMIN to VENTMAX	Closed
		On	On	24-v/On	24-v/On	VENTMIN to VENTMAX	Closed
	Yes	Off	Off	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	24-v/On	0-v/Off	Full-Open	Full-Open

**High Performance Economizer -
Sequence of Operation** (continued)

**TABLE 10
ECONOMIZER OPERATION - NO DCV (CO₂ SENSOR, 2-SPEED SUPPLY FAN)**

DCV	OA Good to Economize?	Y1-I	Y2-I	Fan Speed	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
None	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	Delay (b) 24-v/On	0-v/Off	Full-Open	Full-Open

(b) With 2FAN DLY (Basic Settings Menu), when in the economizing mode, there is a delay for the high speed fan to try to satisfy the call for second-stage cooling by turning on the fan to high and opening the OA dampers to 100% before the first-stage mechanical cooling is enabled.

**TABLE 11
ECONOMIZER OPERATION - WITH DCV (CO₂ SENSOR, 2-SPEED SUPPLY FAN)**

DCV	OA Good to Economize?	Y1-I	Y2-I	Fan Speed	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	Delay (b) 24-v/On	0-v/Off	Full-Open	Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX L	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	Delay (b) 24-v/On	0-v/Off	Full-Open	Full-Open

(b) With 2FAN DLY (Basic Settings Menu), when in the economizing mode, there is a delay for the high speed fan to try to satisfy the call for second-stage cooling by turning on the fan to high and opening the OA dampers to 100% before the first-stage mechanical cooling is enabled.