

# Downflow Economizers

## Z1ECON30 (14D94) ECONOMIZERS

### INSTALLATION INSTRUCTIONS FOR ECONOMIZERS USED WITH ZC,ZG,ZH 036,048,060,072,074 UNITS

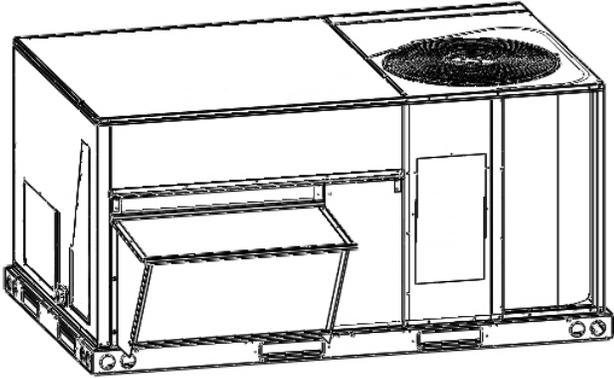


Figure 1

#### Application

The Z1ECON30 (14D94) economizer is used with ZC,ZG,ZH 036,048,060,072,074 units in downflow air discharge applications. Economizer dampers will modulate to maintain 55°F (13°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. Other outdoor and return air (OA and RA) sensor options are available to determine whether outdoor air is suitable for free cooling. See Table 1 and the instructions provided with optional sensors.

TABLE 1

Sensors	Dampers modulate to maintain 55°F mixed air (R1) when:
*Single OA Sensible	OA temperature is lower than free cooling setpoint
Single OA Enthalpy	OA temperature and humidity is suitable for free cooling
Differential Enthalpy - 1 in OA & 1 in RA	OA temperature and humidity is lower than RA temperature and humidity.

\*Single OA sensible sensor is shipped standard on economizer

#### 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 (CO<sub>2</sub>) increases.

For proper operation, the IAQ sensor must provide a 2-10VDC, 100 ohm impedance signal. Connect sensor leads to AQ and AQ1 terminals on the economizer control module located in the filter section.

#### CAUTION

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

#### 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
- 1 - Hardware bag
- 1 - Hood parts package
  - 1 - Left hood side
  - 1 - Right hood side
  - 1 - Hood divider
  - 1 - Hood filter
- 1 - Side economizer panel

##### Order Of Installation

- Economizer
- Mixed air sensor
- Optional OA and RA sensors
- Power Exhaust fans (optional)
- Side economizer panel

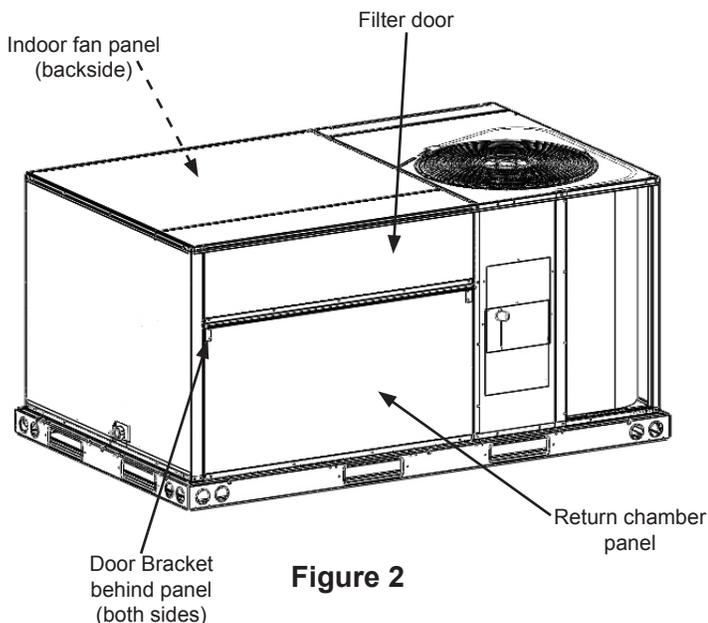
#### WARNING

**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**

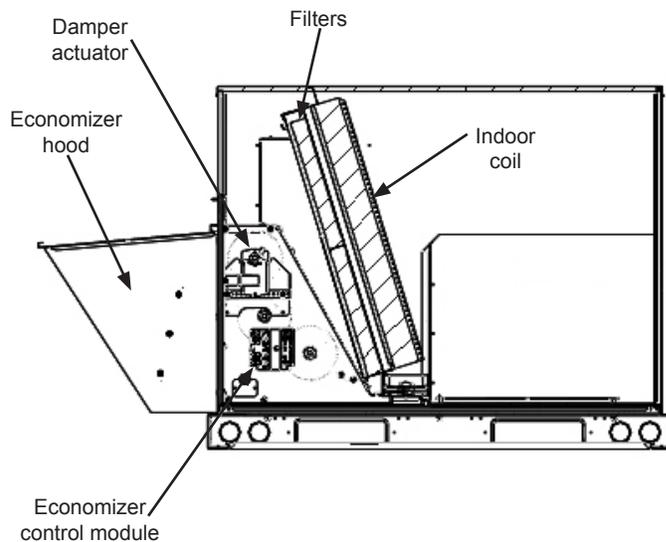
## Install Economizer

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

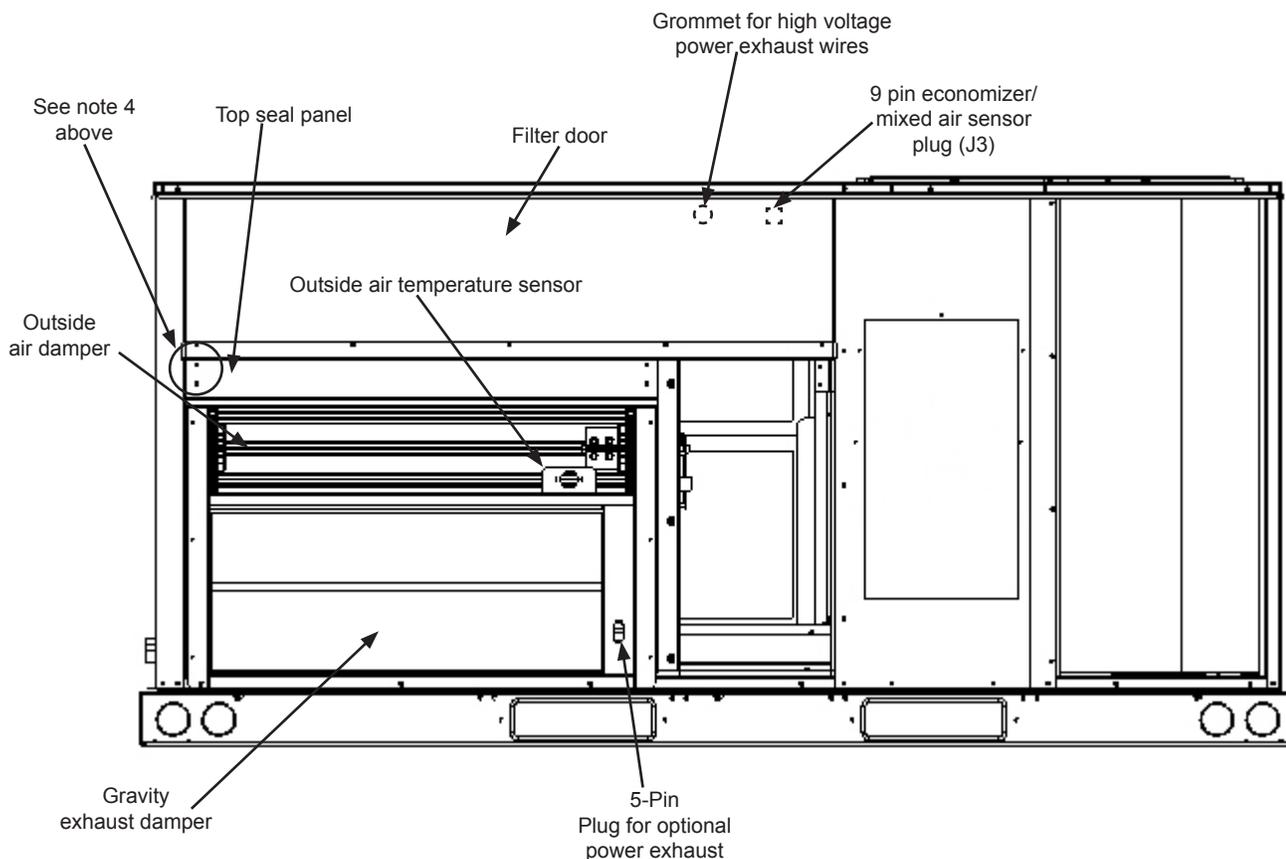
3. Install damper assembly into unit. Fit opening in bottom of damper assembly over the return air opening. See Fig. 3.
4. Partially back-out the 2 screws on the left side of the economizer top seal. Insert these 2 screws into the door bracket (see figures 2 and 4) holes and tighten. Place screws in bottom flange as shown in figure 4.



**Figure 2**



**Figure 3**



**Figure 4**

## Economizer Wiring

1. Locate 9-pin J3 economizer jack harness seated in upper right panel inside filter compartment. Disconnect P3 jumper plug from J3 and retain jumper plug for future troubleshooting. Connect 9-pin P4 economizer plug from economizer control module harness to J3 economizer jack. Secure P4 harness with push in wire tie from parts bag and inset it into the 1/4" hole on top of filter rack. Refer to figure 4 and 5.
2. Connect any optional sensors as shown in figure 5.
3. If optional power exhaust is installed, wire according to instructions provided with power exhaust. See figure 5.

## Install Mixed Air Sensor

1. Remove the mixed air sensor from the economizer parts bag. The sensor has a small ring terminal. See Fig. 6.
2. Remove the panel covering the indoor fan. Locate the 2 mixed air sensors wires in the unit from plug J3. The mixed air sensor wire colors are green and violet. Attach these 2 wires to the mixed air sensor wires.
3. Mount the mixed air sensor to the indoor fan through the existing bottom screw on the blower. See Fig. 6A.
4. Secure wires in place so they don't interfere with unit operation.
5. Replace the panel covering the indoor fan.

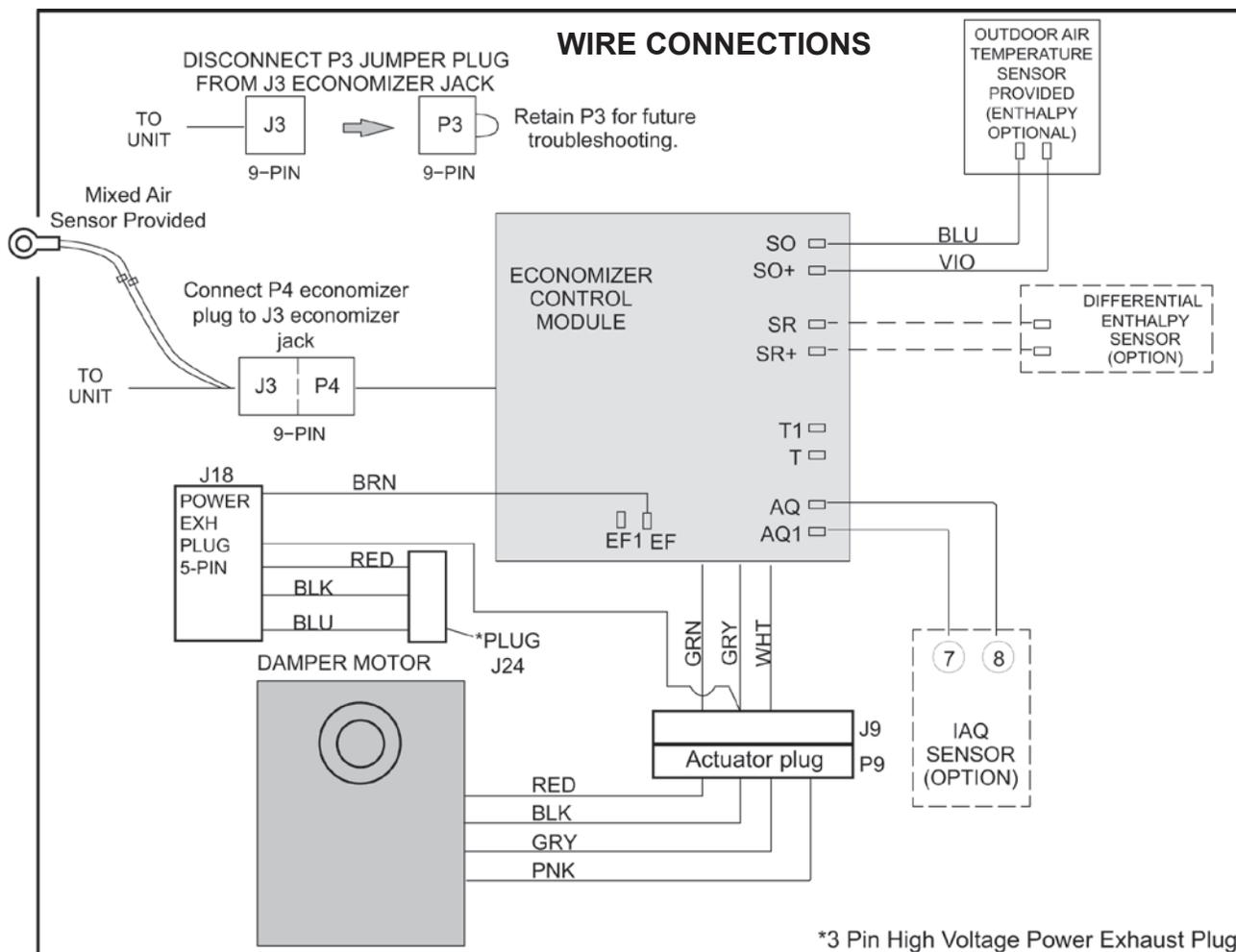


Figure 5 - Wiring Detail



Figure 6 - Mixed Air Sensor

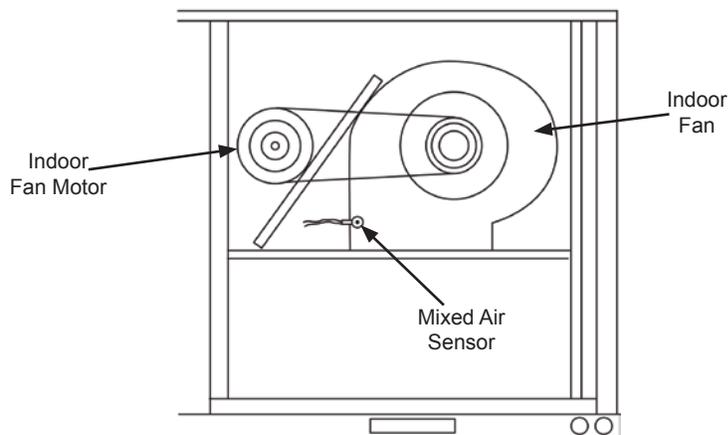
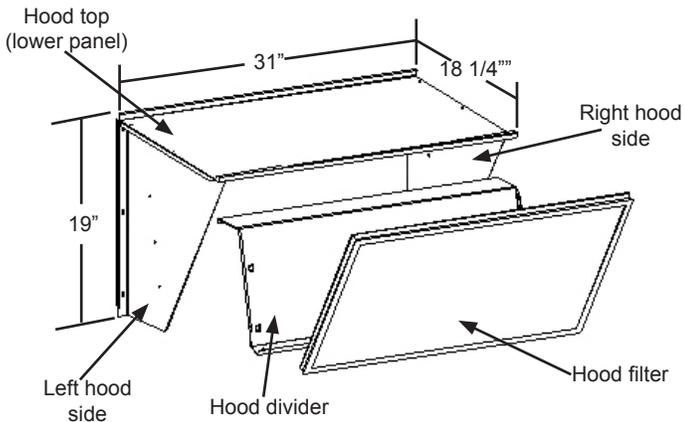
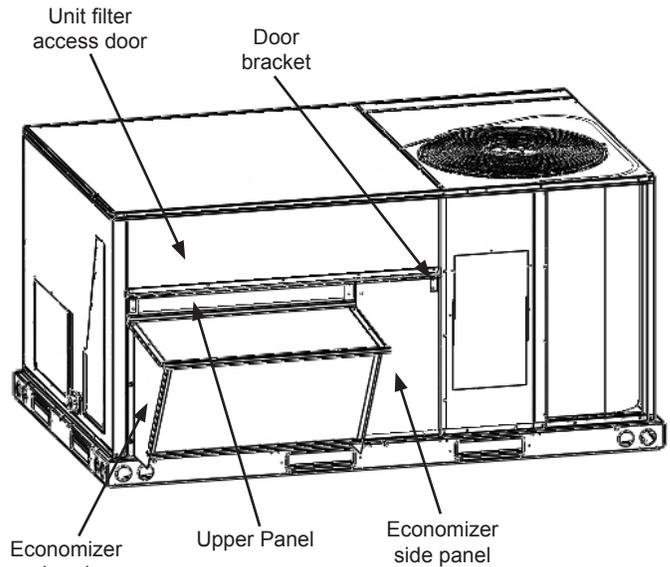


Figure 6A - Mixed Air Sensor Location



**Figure 7**



**Figure 9**

**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. Screw the hood sides to the hood top, See Figure 7.
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 8.
5. With hood assembled, fit the mating flange on hood top underneath the “knuckle” on the top seal panel. Attach hood over economizer as shown in figure 3, 4 and 9.
6. Screw hood to unit as shown in figure 9.

**Economizer Control Module**

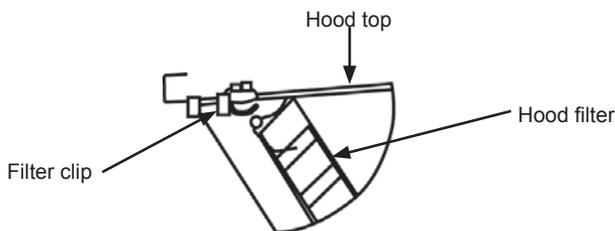
**TABLE 2**

**ECONOMIZER CONTROL MODULE LEDs**

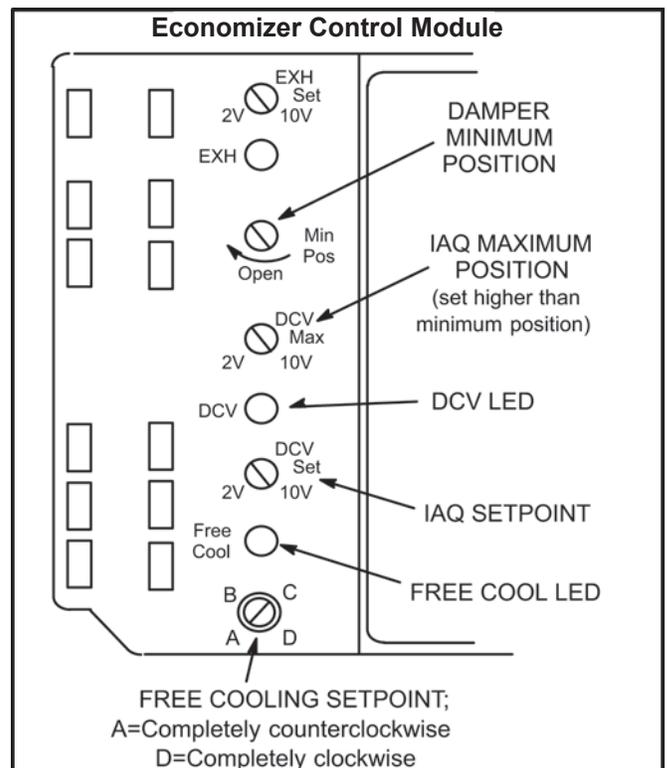
LED	When Lighted Indicates
Free Cool	Outdoor air is suitable for free cooling
Demand Control Ventilation (DCV)	Indoor IAQ is above set point requirement more fresh air

**Economizer Side Panel**

1. Before installing economizer side panel make all necessary job specific settings to the economizer control module, including minimum position setting.
2. Install side panel to the right side of hood, see figure 9. Screw panel to economizer on left side, and into door bracket on right side of panel.
3. Reinstall unit’s filter access door.
4. Caulk all seams and gaps along sides and bottom of economizer and economizer side panel sheet metal. Allow time for caulk to cure prior to placing unit into operation.



**Figure 8**



**Figure 10**

## FREE COOLING CHANGEOVER

Note - The following conditions assume unit is operating during occupied period.

### Single Outdoor Air Temperature Sensing:

The temperature sensor shipped with the economizer is used to determine outdoor air suitability for free-cooling. The sensor has a fixed changeover and cannot be adjusted. Set the A,B,C,D setting on economizer control module to the "D" setting.

The sensor will allow economizer to go to free-cooling mode when the temperature falls below 55°F, and will then disable free-cooling when temperatures rise above 70°F.

### Single Enthalpy Sensing:

Note - The following conditions assume unit is operating during occupied period.

### Single Outdoor Air Enthalpy Sensing:

The enthalpy sensor is an optional accessory. The temperature sensor shipped with the economizer will be removed and discarded, and the enthalpy sensor field installed. The enthalpy sensor is used to determine outdoor air suitability for free-cooling, see Table 3.

Free cooling will be enabled when the outdoor air enthalpy is lower than the free cooling setpoint. Table 3 shows the free cooling setpoints which are adjustable on the economizer control module.

For example: At setting A (Table 3), free cooling will be enabled when outdoor air enthalpy is lower than 73°F and 50% RH. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be enabled at 70°F and 50% RH.

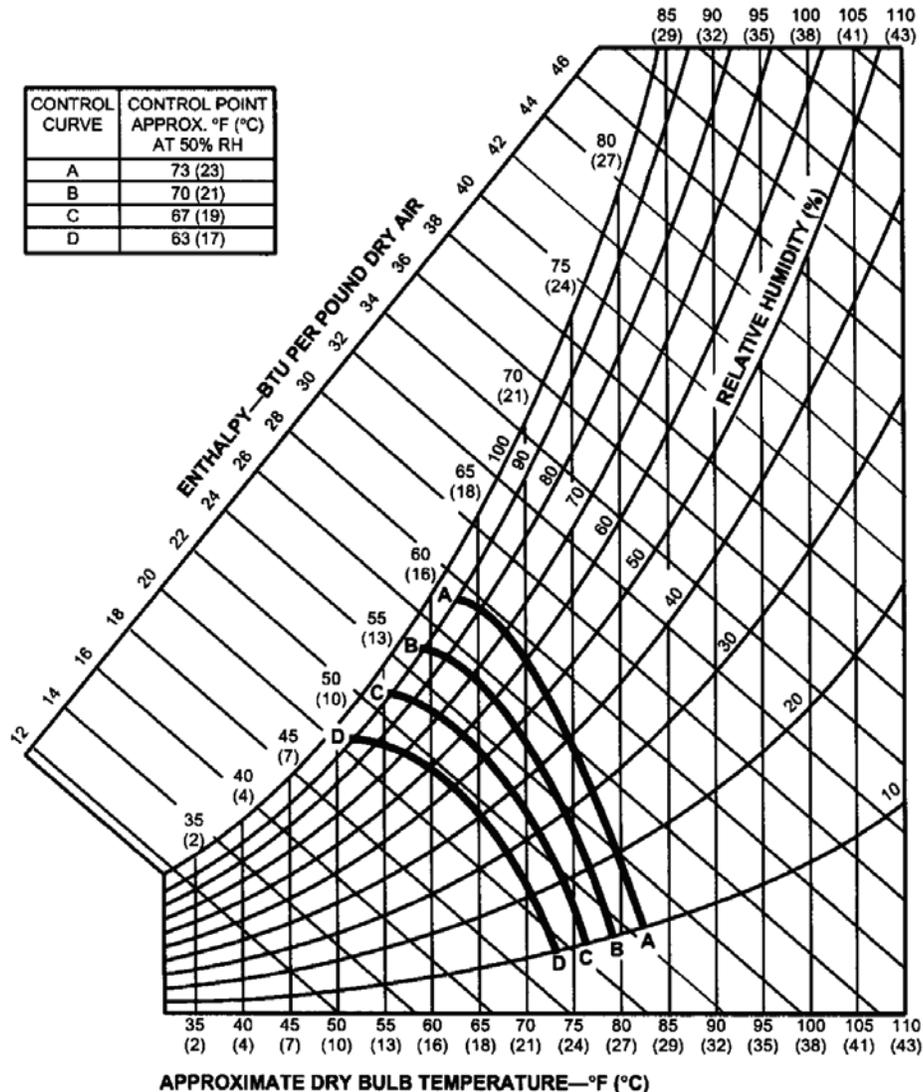
### Differential Enthalpy Sensing:

Outdoor air and differential enthalpy sensors are optional accessories. Two enthalpy sensors can be used to compare outdoor air to return air. When outdoor air is cooler than return air and free cooling setpoint, outdoor air is suitable for free cooling. Adjust the free cooling setpoint to "D" in this application. Table 3 shows the free cooling setpoints for enthalpy sensors.

For example: At setting D (Table 3), free cooling will be enable when outdoor air enthalpy is lower than return air enthalpy AND free cooling setpoint 63°F / 50% RH. If indoor air is too cool or dry, increase the setpoint to C.

When return air is cooler than outdoor air, the damper will modulated to the minimum position

Table 3



### DAMPER MINIMUM POSITION SETTING

*NOTE - 24 volts must be provided at unit 24 volt leads R and OC to enable economizer operation (allowing minimum fresh air).*

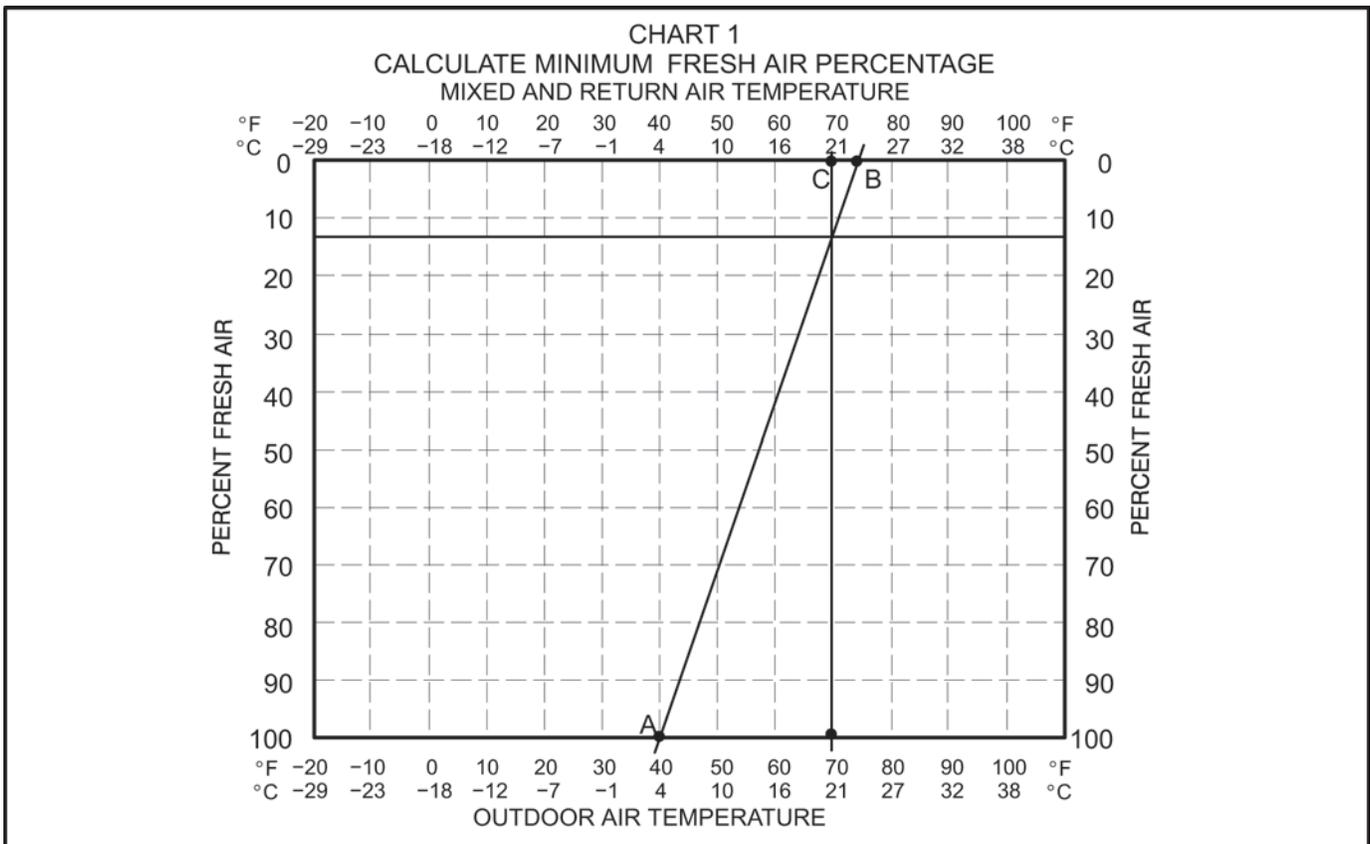
*Typically a separately ordered thermostat or energy management system with an occupied/unoccupied output is connected between R and OC leads. The thermostat will provide 24 volts to the economizer control during the occupied time period to enable the economizer. If a device is not used to enable the economizer, install a jumper between R and OC leads R and OC to maintain minimum position continuously.*

*Make wire connections to leads R and OC as shown in literature provided with thermostat or energy management system.*

1. Set thermostat to occupied mode if the feature is available. Make sure jumper is in place between leads R and OC if using a thermostat which does not have the feature.
2. Rotate MIN POS SET potentiometer to approximate desired fresh air percentage. Use care when adjusting minimum potentiometer to avoid damaging potentiometer.

*Note - Damper minimum position can be set lower than traditional minimum air requirements when an IAQ sensor is specified.*

3. Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point "A" (40°F, 4°C shown).
4. Measure return air temperature. Mark that point on the top line of chart 1 and label the point "B" (74°F, 23°C shown).
5. Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point "C" (70°F, 21°C shown).
6. Draw a straight line between point A and B.
7. Draw a vertical line through point C.
8. Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
9. If fresh air percentage is less than desired, adjust MIN POS SET potentiometer clockwise (further open). If fresh air percentage is more than desired, adjust MIN POS SET potentiometer counterclockwise (less open). Repeat steps 3 through 8 until calculation reads desired fresh air percentage.



## DCV SET AND DCV MAX SETTING

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO<sub>2</sub> sensor, dampers will start to open when the IAQ sensor reads approximately 1000ppm. Adjust the DCV SET potentiometer to the approximate setting specified by the controls contractor. Refer to figure 10.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO<sub>2</sub> rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the control contractor. Refer to figure 10.

*Note - DCV Max must be set higher than economizer minimum position setting for proper demand control ventilation.*

## Economizer Operation

When the outdoor air is suitable, dampers will modulate between minimum position and full open to maintain 55°F (12°C) supply air.

See Table 4 for economizer operation when outdoor air is suitable. See Table 5 for economizer operation when outdoor air is NOT suitable.

### IAQ Sensor

During the occupied period, dampers will open to DCV MAX when IAQ reading is above setpoint (regardless of thermostat demand or outdoor air suitability). DCV MAX will NOT override damper full-open position. The DCV MAX setting may override damper free cooling position when occupancy is high and outdoor air temperatures are low.

*Note - If mixed air sensor senses mixed air temperature below 45°F (7°C), dampers will move to minimum position until mixed air temperature rises to 48°F (9°C)*

**TABLE 4**

### ECONOMIZER OPERATION

OUTDOOR AIR IS **SUITABLE** FOR FREE COOLING -- FREE COOL LED

THERMOSTAT DEMAND	DAMPER		MECHANICAL COOLING
	UNOCCUPIED	OCCUPIED <sup>1</sup>	
OF	Closed	Closed	No
F	Closed	Minimum	No
Y1	Modulating*	Modulating*	No
Y2	Modulating*	Modulating*	STAGE 1

\*IAQ sensor can open damper to DCV max.

<sup>1</sup>Damper position when no occupied/unoccupied signal is available from building thermostat or energy management system.

**TABLE 5**

### ECONOMIZER OPERATION

OUTDOOR AIR IS **NOT SUITABLE** FOR FREE COOLING -- FREE COOL LED

THERMOSTAT DEMAND	DAMPER		MECHANICAL COOLING
	UNOCCUPIED	OCCUPIED <sup>1</sup>	
OF	Closed	Closed	No
F	Closed	Minimum*	No
Y1	Closed	Minimum*	STAGE 1
Y2	Closed	Minimum*	STAGE 1

\*IAQ sensor can open damper to DCV max.

<sup>1</sup>Damper position when no occupied/unoccupied signal is available from building thermostat or energy management system.