

**INSTALLATION INSTRUCTIONS FOR ECONOMIZER AND OUTDOOR AIR HOOD
USED WITH KG/KC/KH 156H-300S UNITS**

Shipping and Packing List

**Package 1 of 1 contains:
Damper Assembly**

- 1- Economizer damper assembly
- 1 Economizer end plate (secured to packaging)
- 1- Bag assembly containing:
 - 1-Economizer control (A6) and harness
 - 1-Mixed air sensor (R1)
 - 1-Mounting bracket for R1
 - 1-Single sensible sensor (S175 in 13U48 kits; RT26 in 16Y99 kits)
 - 1-Mounting bracket for S175 (in 13U48 kit only)
 - 1-Sensor RT26 (in 16Y99 kits only)
 - 1-Harness (P104 to A7)
 - 1-Resistor assembly (in 13U48 kit only)
 - 2-Harnesses (J104 to A6) (in 16Y98 kits only)
 - 1-Bag assembly containing:
 - #10-16 X 5/8 Self-drilling screws
 - #6-32 X 7/8 Thread forming screws
 - #6-32 X 1 Machine screws
 - #6-32 X 1/2 Thread forming screws
 - #10-16 X 5/8 Sheet metal screws
 - 2 - D1 economizer section wiring diagrams
 - 1 - Insertion wire tie

Hood Assembly

- 1- Hood top*
- 1- Hood top seal
- 2- Hood sides*
- 2- Top filter brackets*
- 1- Bottom filter bracket*
- 2- Side filter brackets*
- 3- Filters*
- 1- Hood top stiffener
- 1- Top seal stiffener

*When economizer is factory-installed, hood sides, side filter brackets and filters are packaged separately and shipped in the blower compartment. The top and bottom filter brackets are secured to the hood top and the hood top is shipped in place on the unit.

NOTE - Gravity exhaust dampers are required with economizers and should be installed before the economizer. Refer to installation instructions provided with gravity exhaust dampers. If return air sensor(s) are specified, install sensor(s) before gravity exhaust.

⚠ 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 licensed professional HVAC installer or equivalent, service agency, or the gas supplier

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

Application

The economizer is used with KG/KC/KH 156H-300S 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 (R1) is provided in this kit and measures the supply air sensible temperature.

NOTE - On units equipped with an inverter (VFD) drive indoor blower motor, refer to the unit installation instructions for additional setup requirements.

Two types of economizers are available. See table 1.

TABLE 1

Print No.	Cat. No.	Kit Description
604592-10	13U48	Standard Economizer
604592-13	16Y99	High Performance Economizer



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General

K1ECON20C-3 Standard Economizer

The standard economizer is equipped with a W7212 economizer control module A6. The default OA temperature sensor is the OA thermostat, S175, provided in this kit. See table 2 for outdoor and return air (OA and RA) sensor options. Refer to instructions provided with sensors for installation.

**TABLE 2
STANDARD ECONOMIZER SENSORS**

Sensors	Dampers will modulate to 55°F discharge air (RT6) when:
Single OA Sensible	OA temperature (S175) is lower than free cooling setpoint.
Single OA Enthalpy	OA temperature and humidity (A7) is lower than free cooling setpoint.
Differential Enthalpy - 1 in OA and 1 in RA	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.

K1ECON22C-3 High Performance Economizer

The high performance economizer is equipped with a W7220 control module A6. This application provides low leak, fault detection and diagnostic capabilities. The default OA temperature sensor or high limit sensor (RT26) is a CEC approved, California Title 24 fixed dry bulb device (provided in this kit). See table 3 for outdoor and return air (OA and RA) sensor options. Refer to manufacturer's instructions provided for more details.

**TABLE 3
HIGH PERFORMANCE ECONOMIZERS**

Sensors	Dampers modulate to maintain 55°F mixed air (R1) when:
Single OA Sensible DEFAULT - approved for CA Title24	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.

Gravity Exhaust Damper

Gravity exhaust dampers allow exhaust air to be discharged from the system when an economizer and/or power exhaust is operating. Exhaust dampers are required unless other provisions are made to exhaust indoor air. Gravity exhaust dampers also prevent outdoor air infiltration during unit off cycle.

IAQ Sensing (A63)

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 A6 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 sensor leads to two stripped wires in the filter section labeled AQ and AQ1. Wires are located in the upper left of the filter access compartment.

Replacing Factory-Installed Economizers

Remove three shipping screws (when present) from the economizer before removing from unit. See figure 1. If installed, remove shorter hood filter bracket and filters. Remove and replace filters referring to the Outdoor Air Hood section. Refer to the Installation section to remove economizer from unit.

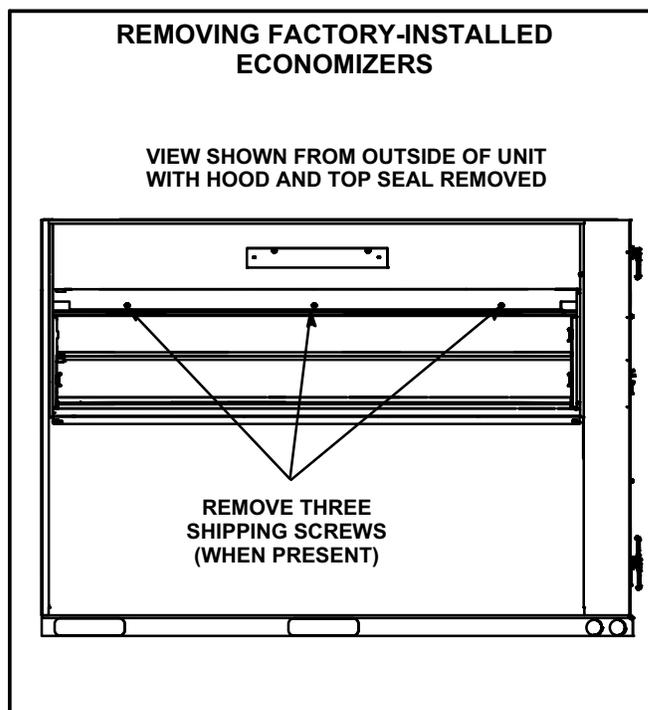


FIGURE 1

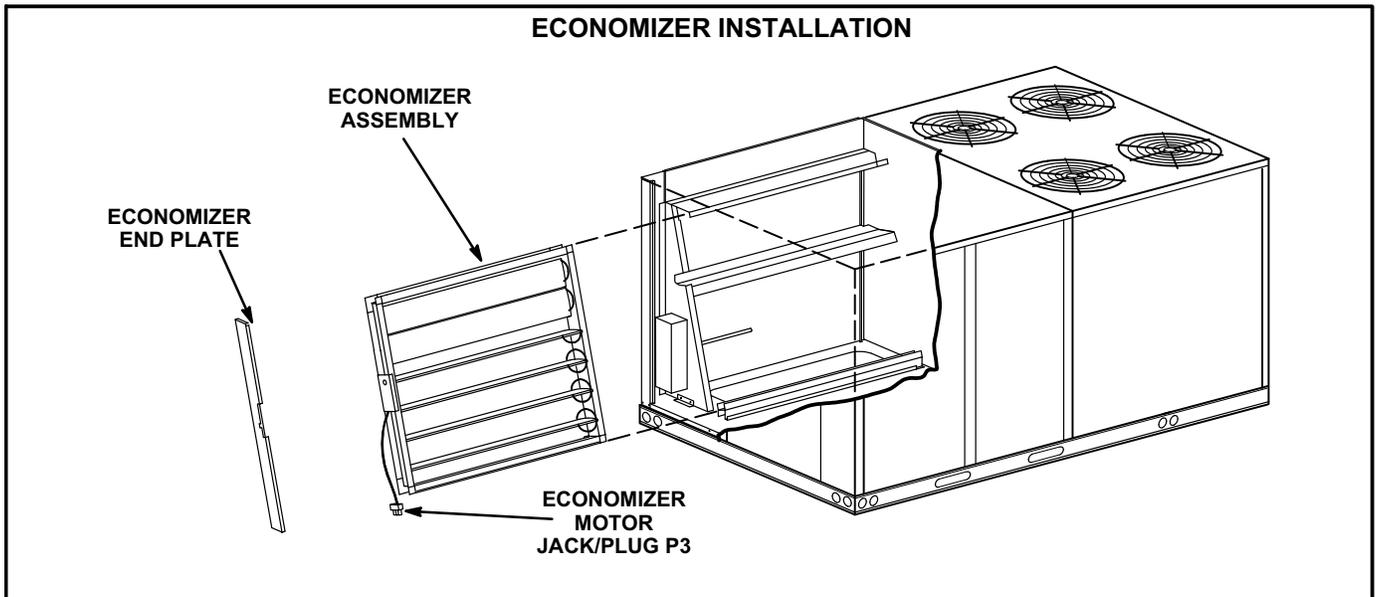


FIGURE 2

Standard Economizer - Installation

NOTE - Refer to previous section when replacing a factory-installed economizer with shipping screws.

DAMPERS

- 1- Disconnect all power to unit and open filter access panel.
- 2- Remove horizontal return air panel.
- 3- Align bottom of economizer with economizer support bracket and slide economizer into unit. See figure 2. Make sure the flanges align as shown in figure 3.
- 4- Fit economizer end plate over end of economizer and secure end plate with #10 self drilling screws.

ECONOMIZER CONTROL MODULE (A6) INSTALLATION

- 1- Install A6 economizer control on economizer side panel as shown in figure 4. Secure with #6-32 X 7/8" TFS screws provided.

MIXED AIR SENSOR (R1) INSTALLATION

- 1- Remove blower access panel.
- 2- Install sensor on bracket as shown in figure 5.

OUTDOOR AIR THERMOSTAT (S175)

- 1- Install S175 thermostat on mounting bracket using 1/2" screws.
- 2- Install mounting bracket on divider panel as shown in figure 6.

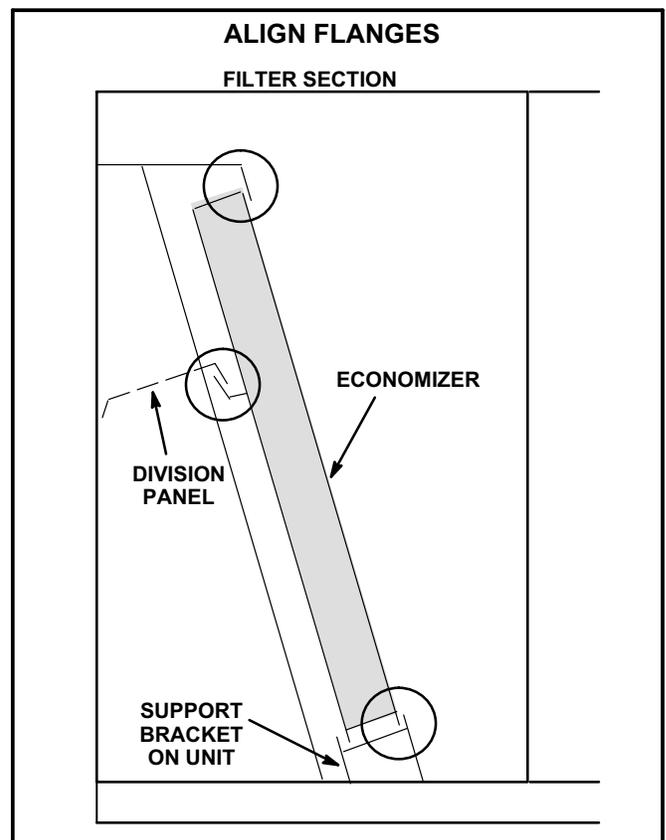


FIGURE 3

Standard Economizer - Installation
(continued)

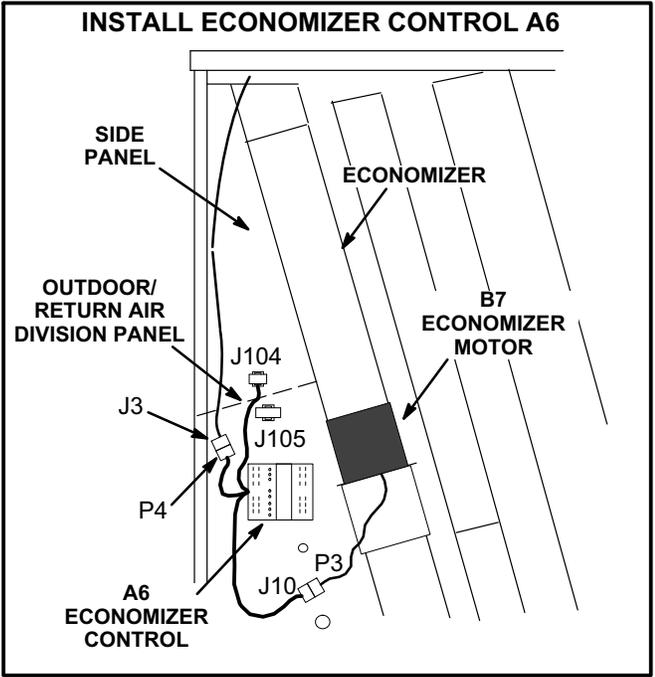


FIGURE 4

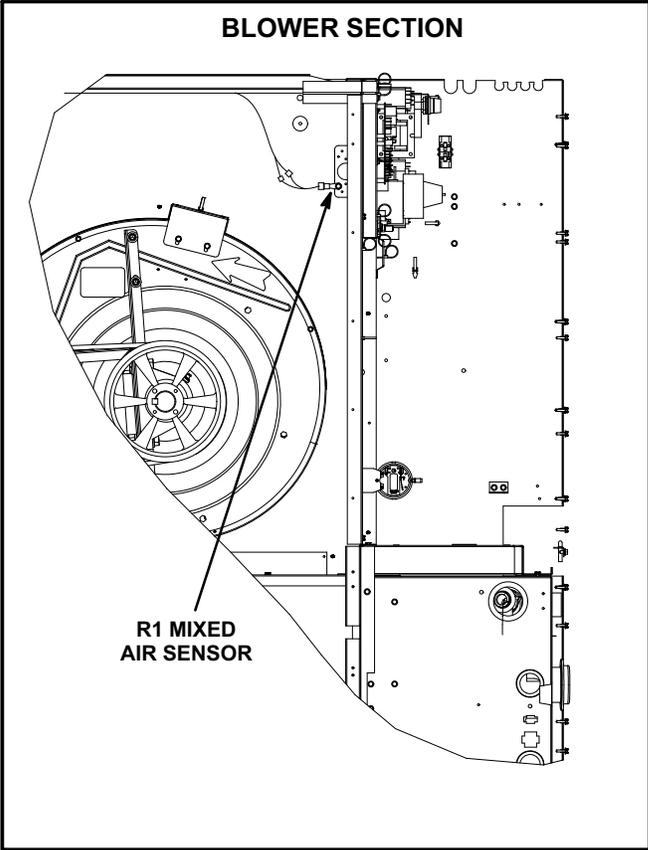


FIGURE 5

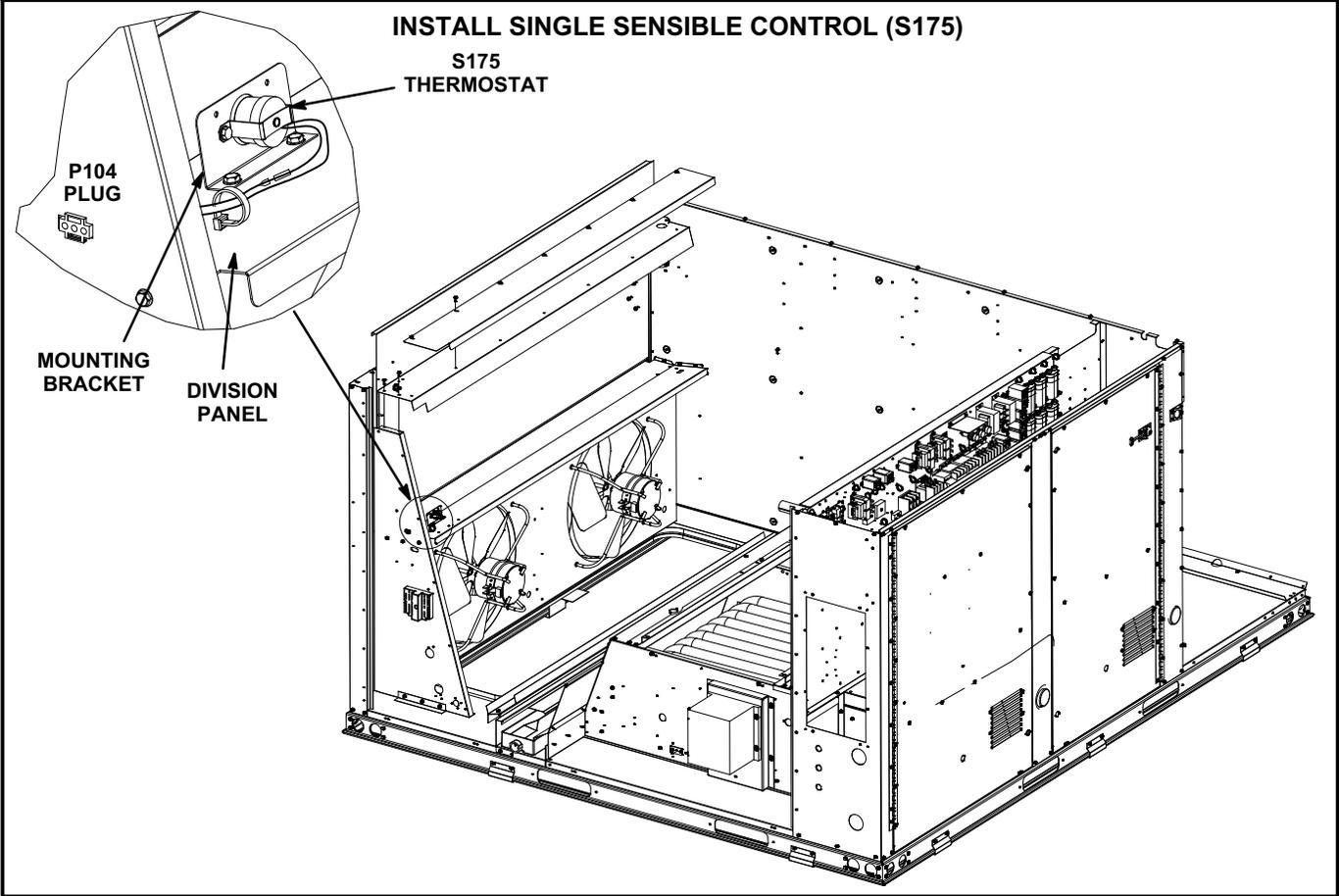


FIGURE 6

Standard Economizer - Electrical (continued)

ECONOMIZER CONTROL (A6) HARNESS CONNECTIONS

- 1- Locate 15-pin J3 economizer jack harness hanging on left side of compartment. Disconnect P3 jumper plug from J3 and retain for future troubleshooting. Connect 15-pin P4 economizer plug on A6 economizer control harness to J3 economizer jack. Refer to figure 4.
- 2- Insert 2-pin J104 jack from economizer control harness into opening on side panel and snap into place. See figure 4 for location of opening.
- 3- Connect 15-pin J10 economizer jack to P3 economizer motor plug as shown in figure 4.
- 4- Affix D1 economizer wiring diagram section to inside of compressor access panel. Position diagram to the right of C1 control wiring diagram section.

MIXED AIR SENSOR (R1) CONNECTIONS

- 1- Locate two wires labeled R1 in wire bundle in top of blower section. Connect spade connectors on wire to sensor terminals. Refer to figure 5.

OUTDOOR AIR THERMOSTAT (S175)

- 1- Make wiring connections as shown in figure 7. Secure harness with wire tie provided in kit.
- 2- Insert P104 plug into the side of the economizer as shown in figure 6.

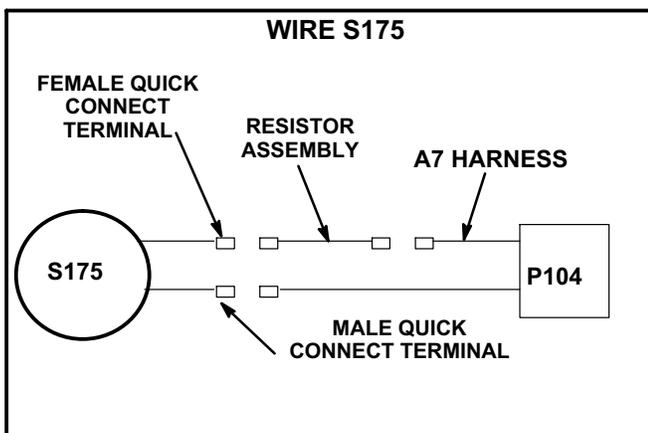


FIGURE 7

UNITS EQUIPPED WITH AN OPTIONAL VFD ONLY

- 1- Remove the jumper between P and P1 terminals on A6 economizer control. See figure 8.
- 2- Locate the wires marked P and P1 in the economizer compartment. Connect the P and P1 wires to P and P1 terminals on A6 respectively.
- 3- Adjust the minimum position potentiometer (MIN POS) on A6 fully open (completely clockwise).

OPTIONAL SENSOR CONNECTIONS

- 1- Connect any optional sensors as shown in figure 9.

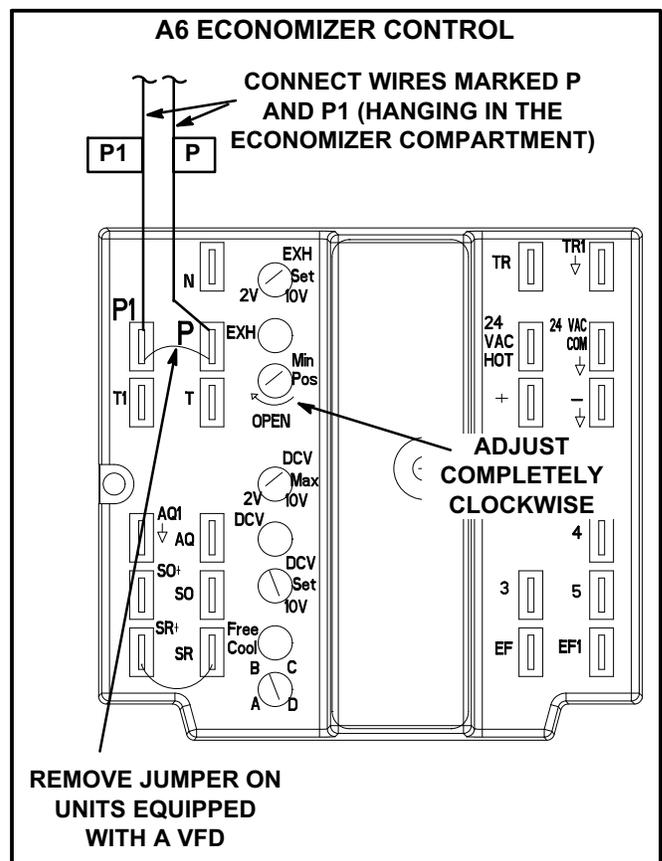


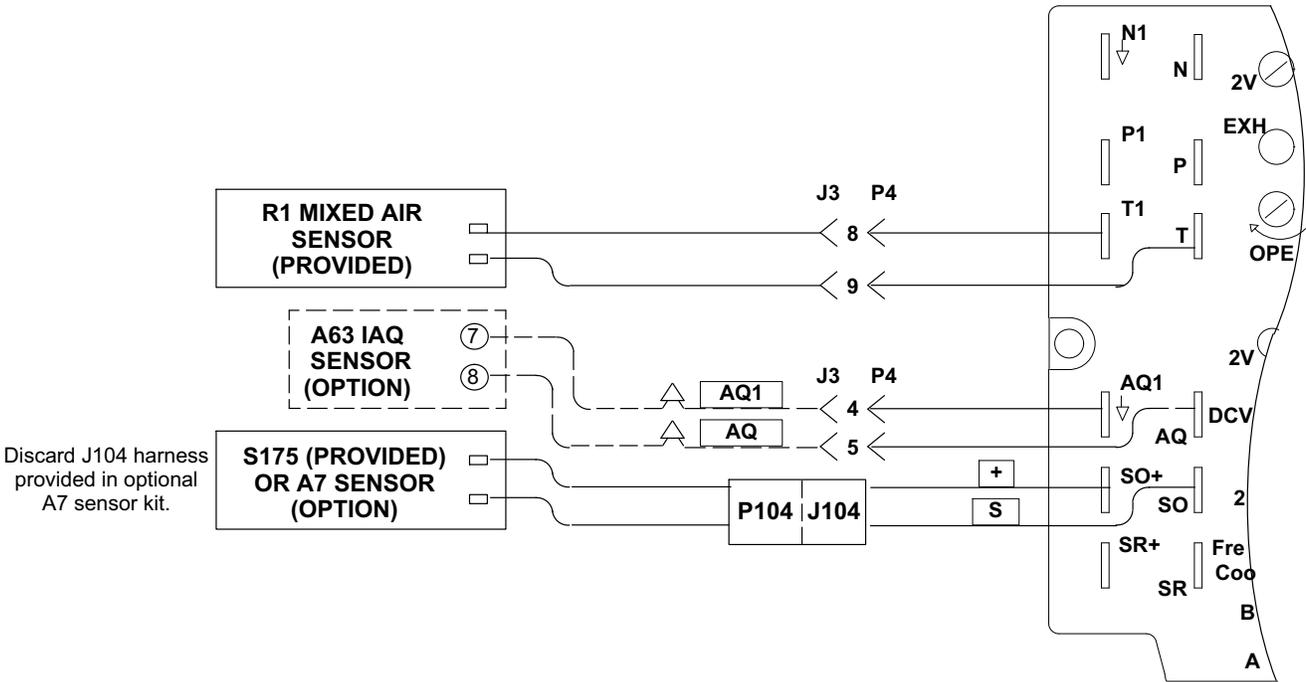
FIGURE 8

WIRE CONNECTIONS - STANDARD ECONOMIZERS

Field-Installed - - - -

SINGLE SENSING

**A6
ECONOMIZER
CONTROL**



DIFFERENTIAL SENSING

**A6
ECONOMIZER
CONTROL**

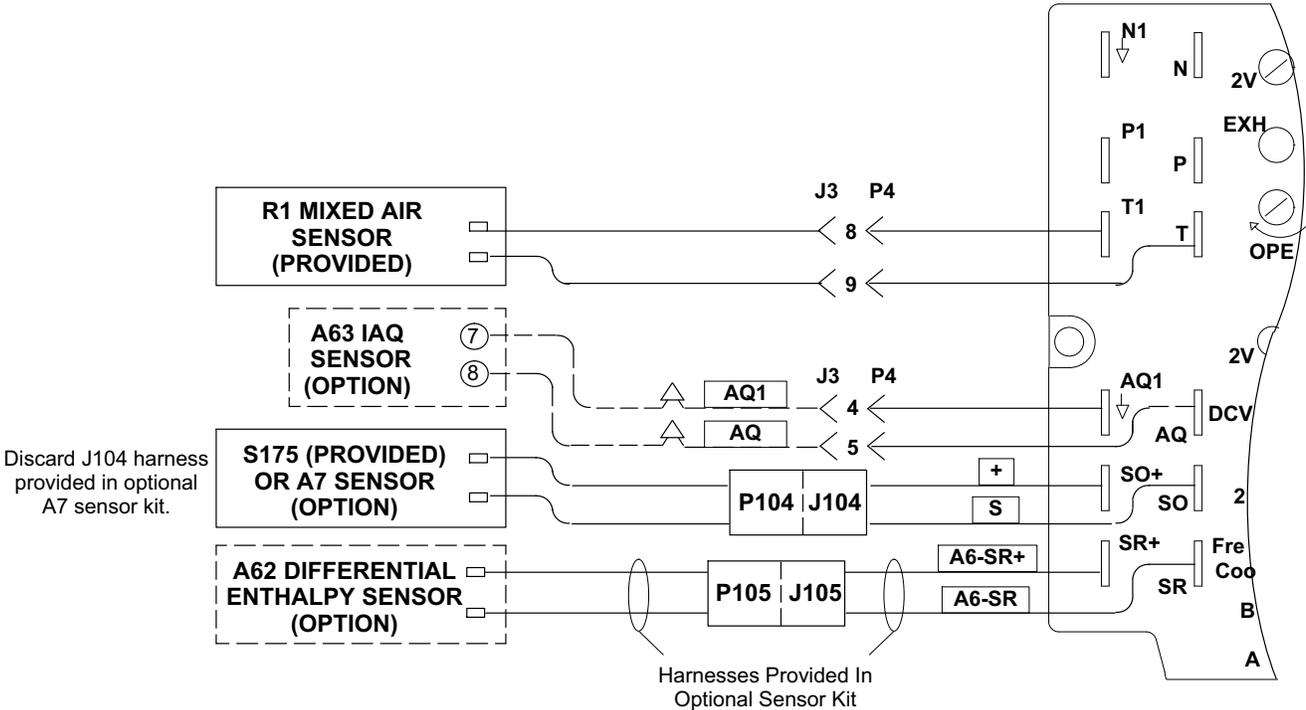


FIGURE 9

Standard Economizer - Settings

LEDs

A steady green Free Cool LED indicates that outdoor air is suitable for free cooling. A steady green DCV LED indicates that the IAQ reading is higher than setpoint requiring more fresh air. See figure 10.

FREE COOLING SETPOINT

Single Temperature or Enthalpy Sensing:

The economizer control (A6) setpoint may be adjusted when an enthalpy (A7) sensor is used to determine outdoor air suitability, See figure 10.

Free cooling will be enabled when outdoor air temperature or enthalpy are lower than the free cooling setpoint. The free cooling setpoints for sensible temperature sensors is 55°F. Table 2 shows the free cooling setpoints for enthalpy sensors. Use the recommended setpoint and adjust as necessary.

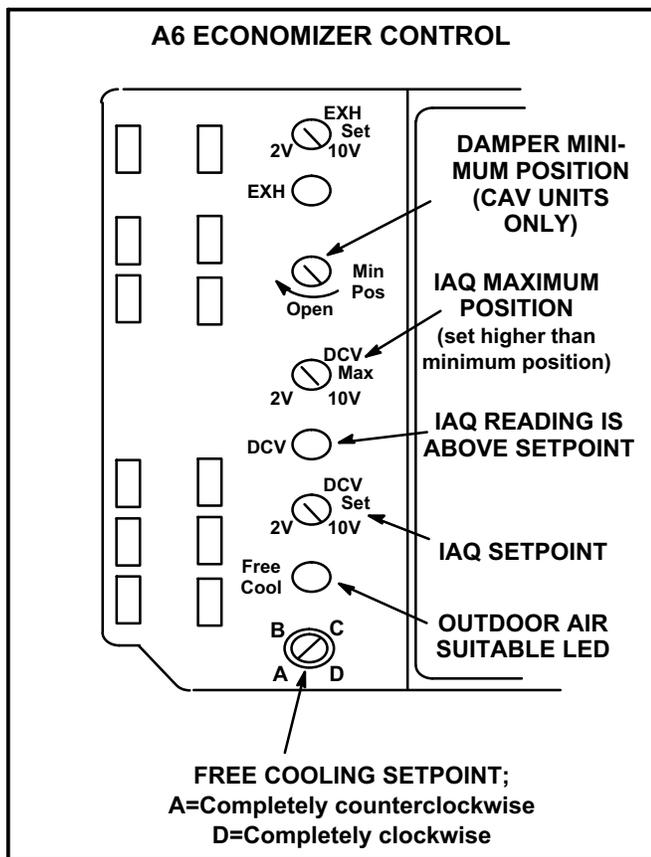


FIGURE 10

For example: At setting A (table 2), 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.

TABLE 2
ENTHALPY FREE COOLING SETPOINTS

Control Setting	Enthalpy Setpoint At 50% RH
A*	73° F (23° C)
B	70° F (21° C)
C	67° F (19° C)
D	63° F (17° C)

*Setting A is recommended.

Differential Sensing:

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. Adjust the free cooling setpoint to "D" in this application.

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

DAMPER MINIMUM POSITION SETTING

NOTE - A jumper is factory-installed between TB1 R and OC terminals to maintain occupied status (allowing minimum fresh air). See figure 11. When using an electronic thermostat or energy management system with an occupied/unoccupied feature, remove jumper. Make wire connections to R and OC as shown in literature provided with thermostat or energy management system literature. Either the jumper wire or optional device must be connected to R and OC for the economizer to function.

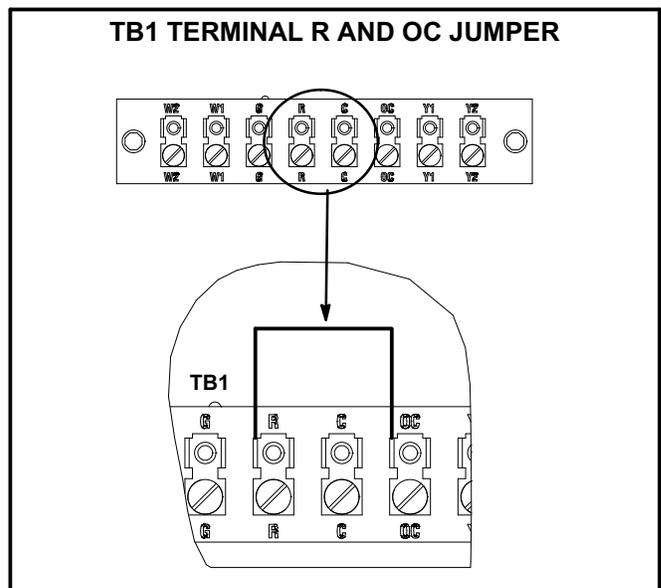


FIGURE 11

Units Equipped With A VFD - Set minimum damper position on the VFD control board. Refer to unit installation instructions for details.

Standard Economizer - Settings (continued)

- 1- Set thermostat to occupied mode if the feature is available. Make sure jumper is in place between TB1 terminals R and OC if using a thermostat which does not have the feature. Turn on the blower using the thermostat or a jumper between TB1 terminals R and G.
- 2- Rotate MIN POS SET potentiometer to approximate desired fresh air percentage.

IMPORTANT - On unit equipped with an inverter (VFD) driven supply air blower motor, the VFD control board controls the economizer minimum damper position. Refer to the unit installation instructions for additional setup requirements.

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).

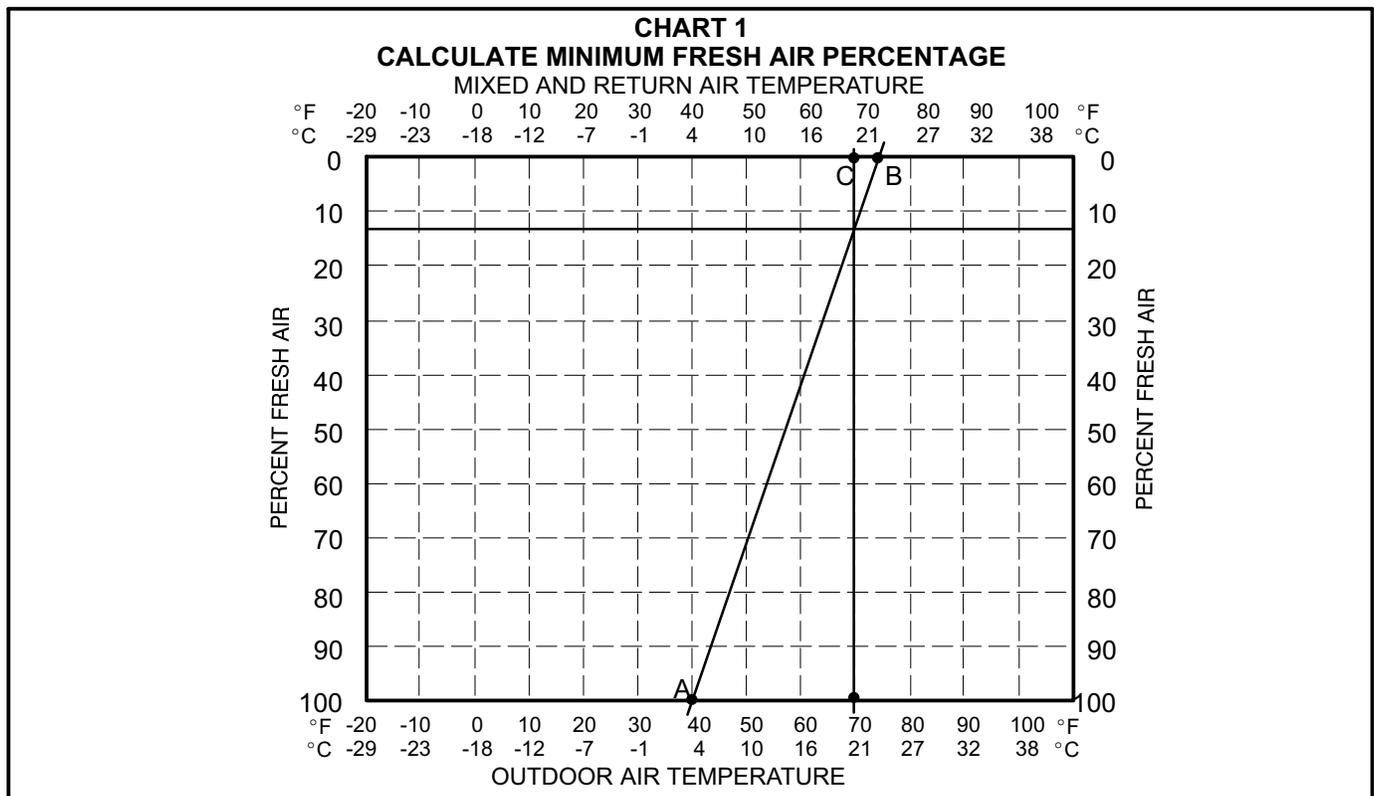
- 5- Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point "C" (70°F, 21°C shown).

- 6- Draw a straight line between points 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.



Standard Economizer - Settings (continued)

DCV SET AND DCV MAX SETTINGS

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO₂ 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 CO₂ rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 10.

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

Standard Economizer - Sequence of Operation

When the outdoor air is suitable, dampers will modulate between minimum position and full open to maintain 55°F (12.8°C) supply air.

See table 3 for economizer operation when outdoor air is suitable. See table 4 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 - R1 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 3

ECONOMIZER OPERATION-OUTDOOR AIR IS SUITABLE FOR FREE COOLING – FREE COOL LED “ON”

THERMOSTAT DEMAND	DAMPER POSITION		MECHANICAL COOLING
	UNOCCUPIED	OCCUPIED	
Off	Closed	Closed	No
G	Closed	Minimum	No
Y1	Modulating	Modulating	No
Y2	Modulating	Modulating	Stage 1

TABLE 4

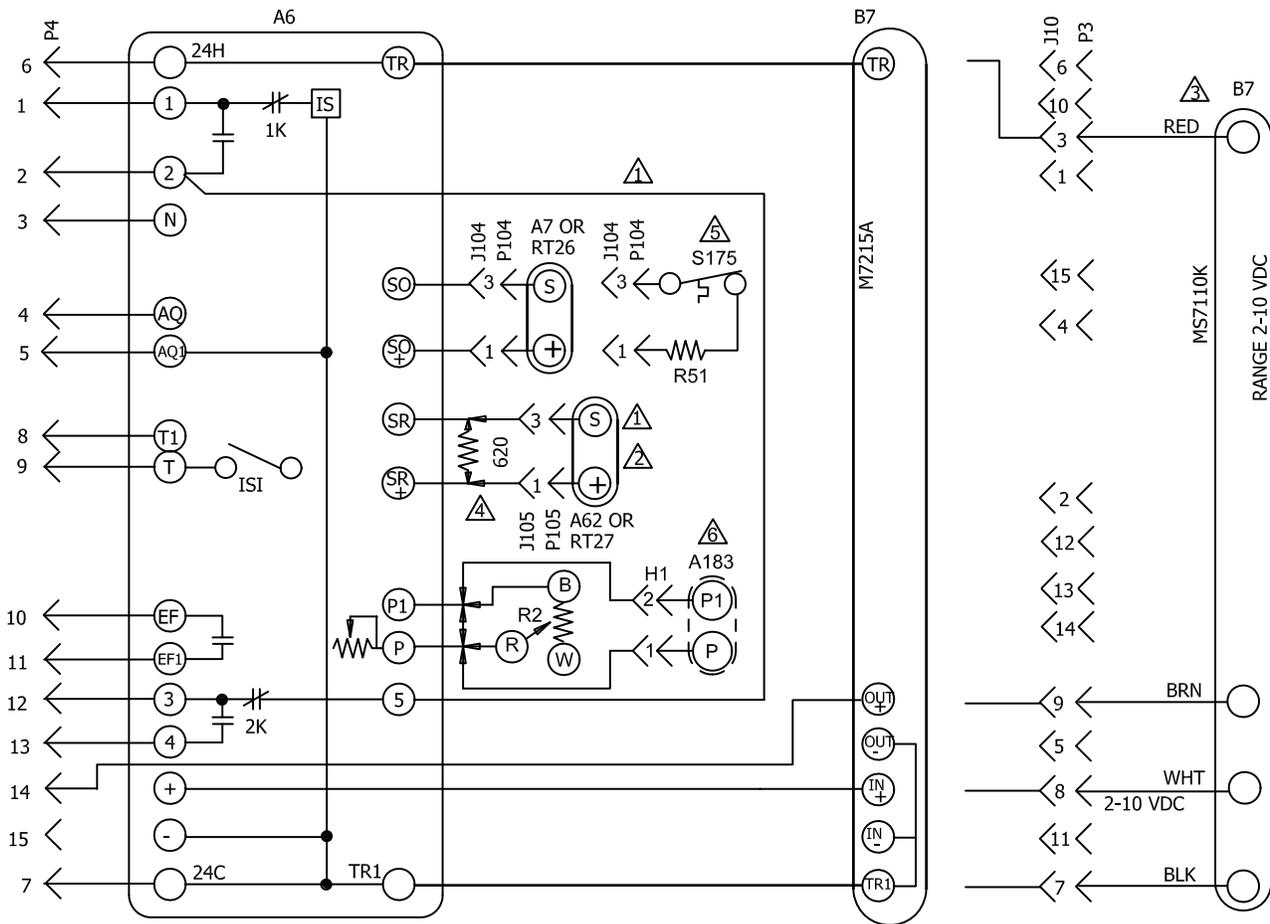
ECONOMIZER OPERATION-OUTDOOR AIR IS NOT SUITABLE FOR FREE COOLING – FREE COOL LED “OFF”

THERMOSTAT DEMAND	DAMPER POSITION		MECHANICAL COOLING
	UNOCCUPIED	OCCUPIED	
Off	Closed	Closed	No
G	Closed	Minimum*	No
Y1	Closed	Minimum*	Stage 1
Y2	Closed	Minimum*	Stage 2

*IAQ sensor can open damper to DCV max.

Standard Economizer - Wiring Diagram

TYPICAL ECONOMIZER WIRING DIAGRAM - KG, KC & KH UNITS



KEY	COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
A183	CONTROL, VFD BOARD
B7	MOTOR-DAMPER, ECONOMIZER
H1	HEADER 1 ON LANDMARK VFD BOARD
J10	JACK-ECONOMIZER
J104	JACK-SENSOR,OUTDOOR ENTHALPY
J105	JACK-SENSOR,RETURN AIR ENTHALPY
P3	PLUG-LESS ECONOMIZER
P4	PLUG-ECONOMIZER
P104	PLUG-SENSOR,OUTDOOR ENTHALPY
P105	PLUG-SENSOR,RETURN AIR ENTHALPY
R2	POT-MINIMUM POSITION
R51	RESISTOR-SENSIBLE 820 OHM
RT26	SENSOR-OUTDOOR AIR TEMP
RT27	SENSOR-INDOOR AIR TEMP
S175	THERMOSTAT-SENSIBLE TEMP 55-70F

- ⚠️ RT26 AND RT27, TEMPERATURE SENSORS MAY BE USED INSTEAD OF A7 AND A62 ENTHALPY SENSORS
- ⚠️ A62 ENTHALPY SENSOR OR RT27 USED FOR DIFFERENTIAL SENSING
- ⚠️ USED ON C BOX UNITS
- ⚠️ REPLACE A7 OR RT26 WITH 620 OHM RESISTOR FOR CONTROLS WITH GLOBAL ECON
- ⚠️ OPTIONAL OUTDOOR THERMOSTAT TO REPLACE RT26 SENSIBLE SENSOR
- ⚠️ A183 USED ON UNITS WITH VFD ONLY

← — — — — — → DESIGNATES OPTIONAL WIRING
 — — — — — CLASS II FIELD WIRING

2018/09		LANDMARK WIRING DIAGRAM 537080-02	18/09
		ACCESSORIES	
ECONOMIZER		SECTION D	
Supersedes		New Form No. 537080-02	REV 1
© 2011		Lennox Commercial	

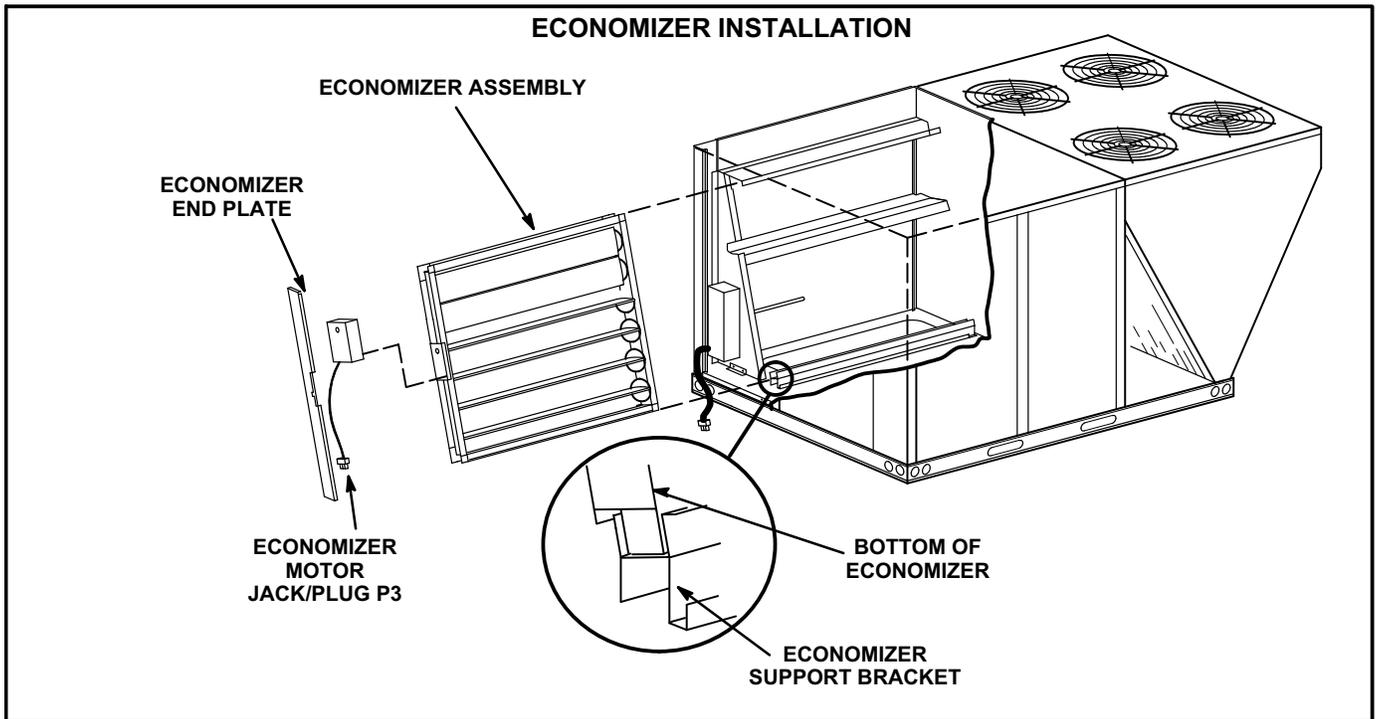


FIGURE 12

High Performance Economizer - Installation

NOTE - Refer to the General section when replacing a factory-installed economizer with shipping screws.

DAMPERS

- 1- Disconnect all power to unit and open filter access panel.
- 2- Remove horizontal return air panel.
- 3- Align bottom of economizer with economizer support bracket and slide economizer into unit. See figure 12. Make sure the flanges align as shown in figure 13.
- 4- Fit economizer end plate over end of economizer and secure end plate with #10 self drilling screws.

ECONOMIZER CONTROL (A6) INSTALLATION

- 1- Install A6 economizer control on economizer side panel as shown in figure 14. Secure with #6-32 X 7/8" TFS screws provided.

MIXED AIR SENSOR (R1) INSTALLATION

- 1- Remove blower access panel.
- 2- Install sensor on bracket as shown in figure 15.

OUTDOOR AIR SENSOR (RT26) INSTALLATION

- 1- Install RT26 sensor onto the divider panel as shown in figure 16. Use #6-32 X 7/8" TFS screws provided.

NOTE - When enthalpy sensing is specified, A7 enthalpy sensor is installed in the same location as RT26.

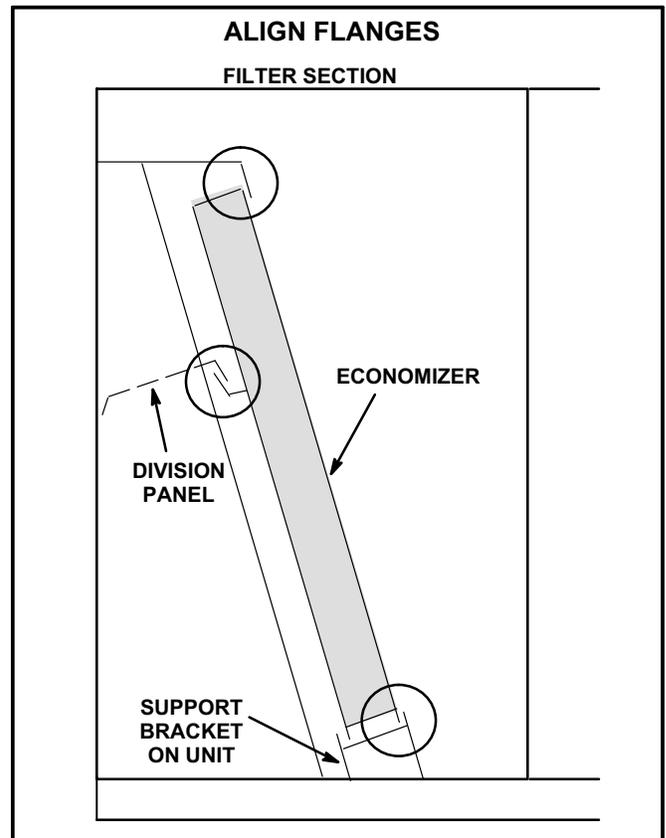


FIGURE 13

High Performance Economizer - Installation (continued)

INSTALL ECONOMIZER CONTROL A6

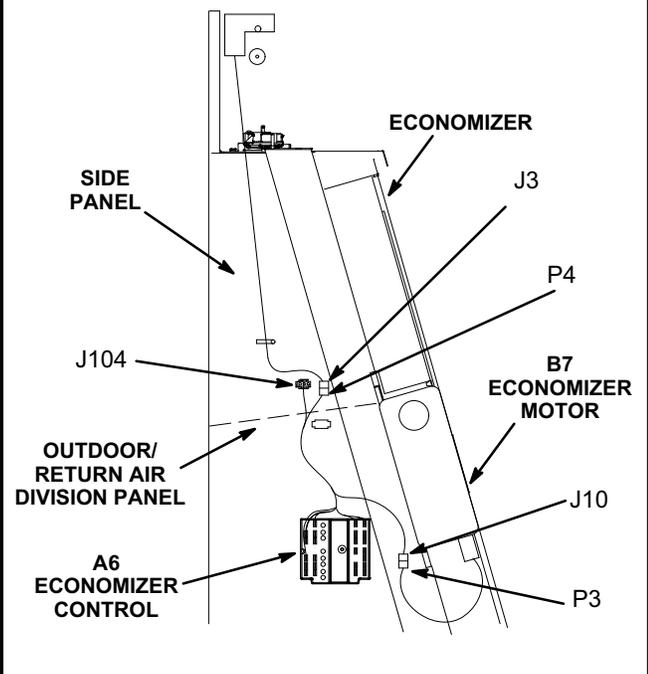


FIGURE 14

BLOWER SECTION

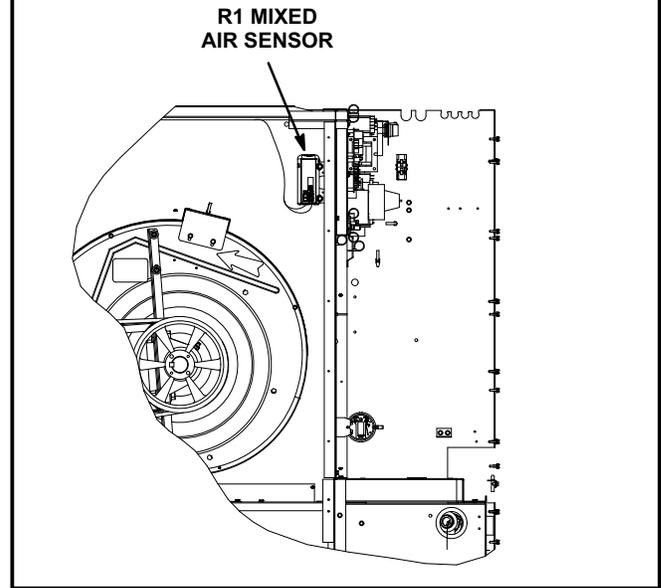


FIGURE 15

INSTALL SINGLE SENSIBLE SENSOR (RT26)

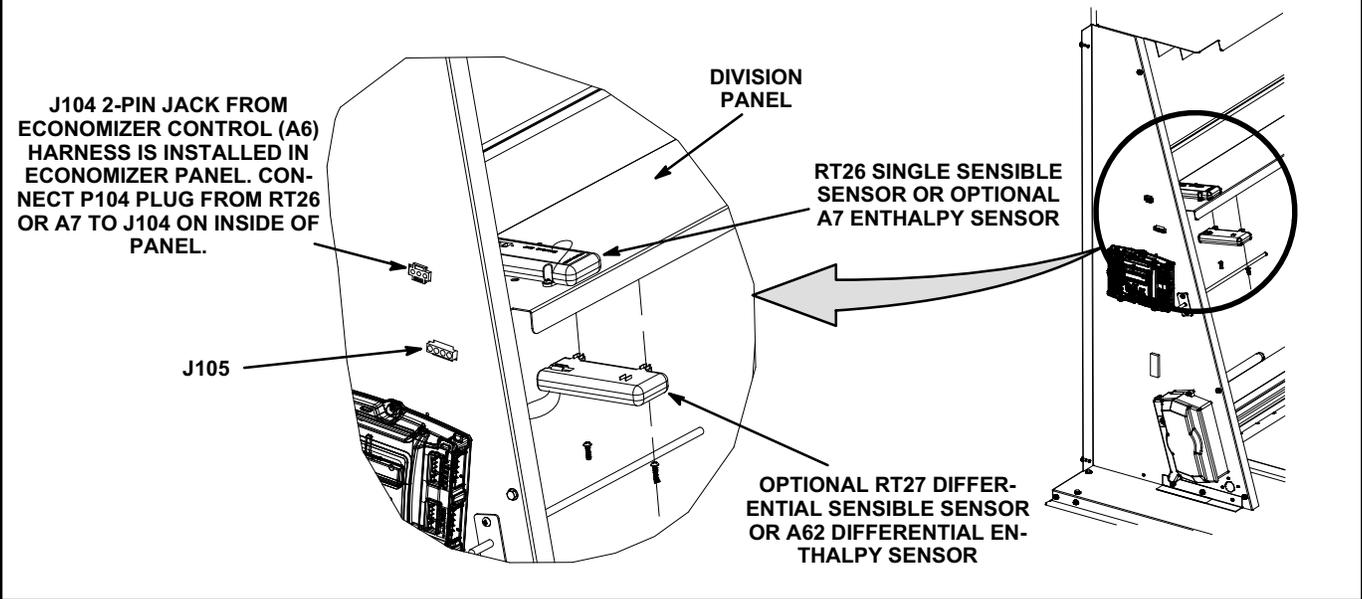


FIGURE 16

High Performance Economizer-Electrical

ECONOMIZER CONTROL (A6) HARNESS CONNECTIONS

NOTE - Wires marked P and P1 are hanging in the control section. These wires are connected on units equipped with standard economizers AND a VFD only.

- 1- Locate 15-pin J3 unit control harness hanging on left side of filter compartment. See figure 14. Disconnect P3 jumper plug from J3 and retain jumper plug for future troubleshooting.
- 2- Connect the 15-pin male plug P4 from the economizer control (A6) harness to the 15-pin female jack J3 on the unit control harness. See figure 14.
- 3- *Installations Using Sensible Sensors -*
Locate **orange kit harness** with wires labeled J104-1 & J104-2 on one end and A6-OAT on the other end. Insert the connector with wires labeled J104-1 & 2 into the opening on economizer side panel and snap into place. See figure 14 or 16. Connect other end of J104 harness into the orange OAT terminals on the economizer control (A6). See figure 17.
- 4- *Installation Using Optional Enthalpy Sensors -*
Locate **brown kit harness** with wires labeled J104-1 & J104-2 on one end and A6-SBUS on the other end. Insert the connector with wires labeled J104-1 & 2 into the opening on economizer side panel and snap into place. See figure 14 or 16. Connect other end of J104 harness into the brown SBUS terminals on the economizer control (A6). See figure 17.
- 5- Connect the 15-pin female plug J10 to the 15-pin male plug P3 from the damper motor. See figure 14.
- 6- Affix D1 economizer wiring diagram section to inside of compressor access panel. Position diagram to the right of "C" control wiring diagram section.

MIXED AIR SENSOR CONNECTION (R1)

- 1- Locate two wires labeled R1 in wire bundle in top of blower section. Connect spade connectors on wire to R1 sensor terminals. See figure 15. Make sure to secure wires away from moving parts.

RT26 HARNESS CONNECTIONS (Single Sensible Sensing)

- 1- Locate **brown kit harness** with wires labeled P104-1 & P104-2 one one end and A7-1 & 2 on the other end. Insert the connector with wires labeled P104-1 & 2 into J104 jack previously installed on the side of the economizer. See figure 16. Connect wires on other end of P104 harness to RT26 on divider panel. See figure 17.

The brown harness labeled J104-1 & J104-2 on one end and A6-SBUS on the other end can be discarded.

RT27 OPTIONAL SENSOR CONNECTIONS (Differential Sensible Sensing)

An optional return air sensible sensor (RT27) can be installed for differential sensible sensing. Use the P105 harness provided in the sensor kit.

The brown harness labeled J104-1 & J104-2 on one end and A6-SBUS on the other end can be discarded.

A7 OPTIONAL SENSOR CONNECTIONS (Single Enthalpy Sensing)

- 1- Locate **brown kit harness** with wires labeled P104-1 & P104-2 one one end and A7-1 & 2 on the other end. Insert the connector with wires labeled P104-1 & 2 into J104 jack previously installed on the side of the economizer. See figure 16. Connect wires on other end of P104 harness to A7 enthalpy sensor on divider panel. See figure 17.

The orange harness labeled P104-1 & P104-2 on one end and A6-OAT on the other end can be discarded.

A62 OPTIONAL SENSOR CONNECTIONS (Differential Enthalpy Sensing)

An optional return air enthalpy sensor (A62) can be installed for differential sensible sensing. Use the P105 harness provided in the sensor kit.

The orange harness labeled P104-1 & P104-2 on one end and A6-OAT on the other end can be discarded.

A63 OPTIONAL SENSOR CONNECTIONS (CO₂ Sensing)

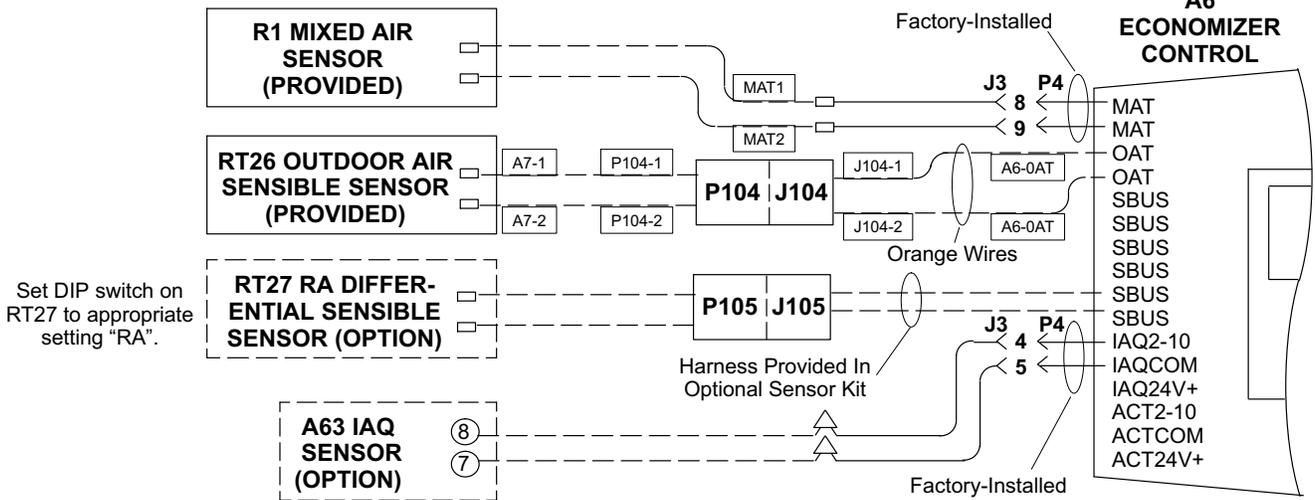
An optional CO₂ sensor (A63) can be added for demand control ventilation (DCV).

Refer to installation instructions shipped with optional sensor for more details.

WIRE CONNECTIONS - HIGH PERFORMANCE ECONOMIZERS

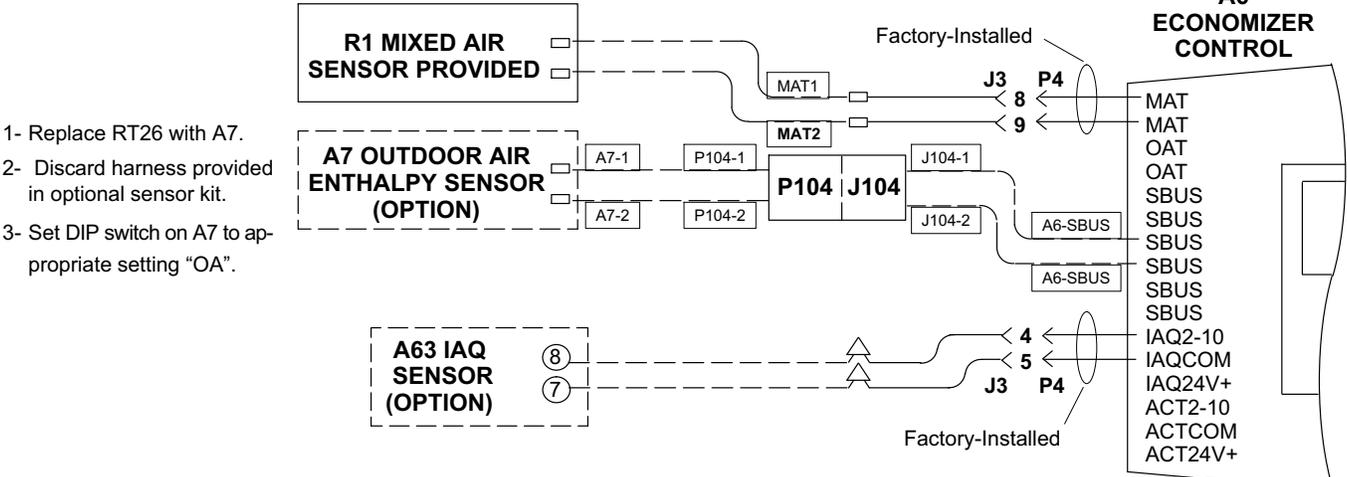
SINGLE AND DIFFERENTIAL SENSIBLE SENSING

Field-Installed - - - -



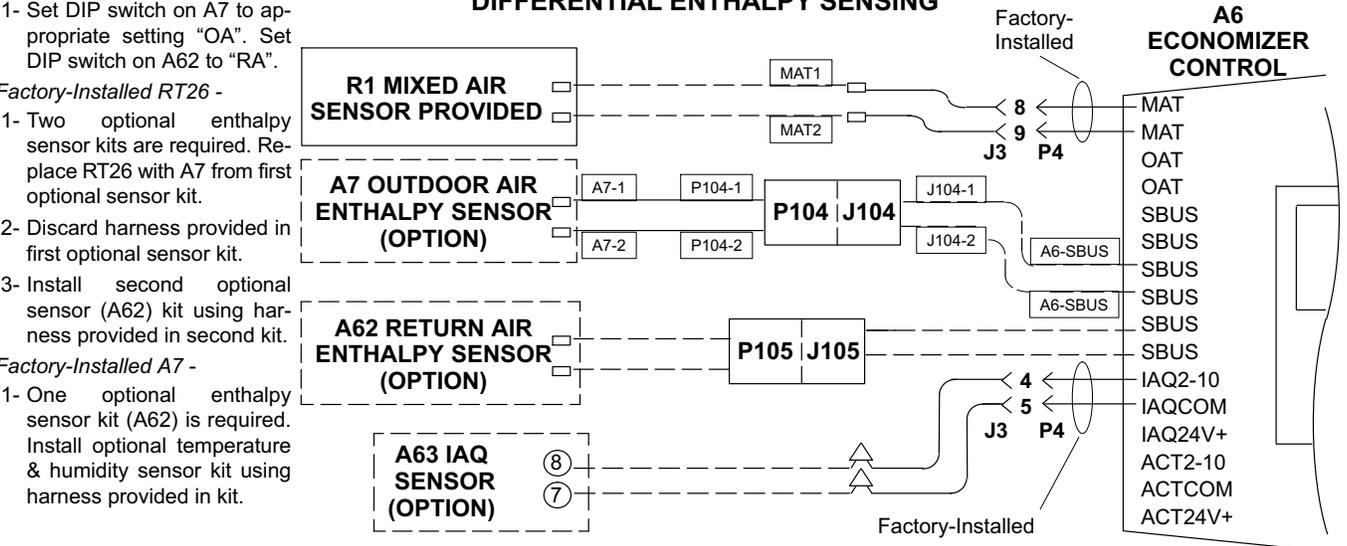
Set DIP switch on RT27 to appropriate setting "RA".

SINGLE ENTHALPY SENSING



- 1- Replace RT26 with A7.
- 2- Discard harness provided in optional sensor kit.
- 3- Set DIP switch on A7 to appropriate setting "OA".

DIFFERENTIAL ENTHALPY SENSING



- 1- Set DIP switch on A7 to appropriate setting "OA". Set DIP switch on A62 to "RA".
- Factory-Installed RT26 -*
- 1- Two optional enthalpy sensor kits are required. Replace RT26 with A7 from first optional sensor kit.
 - 2- Discard harness provided in first optional sensor kit.
 - 3- Install second optional sensor (A62) kit using harness provided in second kit.
- Factory-Installed A7 -*
- 1- One optional enthalpy sensor kit (A62) is required. Install optional temperature & humidity sensor kit using harness provided in kit.

FIGURE 17

High Performance Economizer-A6 Control

NOTE - The A6 economizer control will be in the “setup” mode for the first sixty minutes after powered. If a sensor for outdoor air or SBUS device (sensor, actuator) is disconnected during the set up mode, the A6 will not alarm that failure. The R1 mixed air sensor is a system “critical” sensor; if the mixed air sensor is removed during the set up mode, the A6 will alarm. After sixty minutes the A6 will change to operation mode and all components removed or failed will alarm in the operation mode.

INITIAL SETUP

Factory-Installed Economizer -

The A6 economizer control is pre-programmed and a limited number of parameters need to be set during the initial setup in the field. See ‘Setup and Configuration - Factory-Installed Economizer’ section.

Field-Installed Economizer -

A default program must be modified for proper operation in each application. This is done during the initial setup procedure. See ‘Setup and Configuration - Field-Installed Economizer’ section.

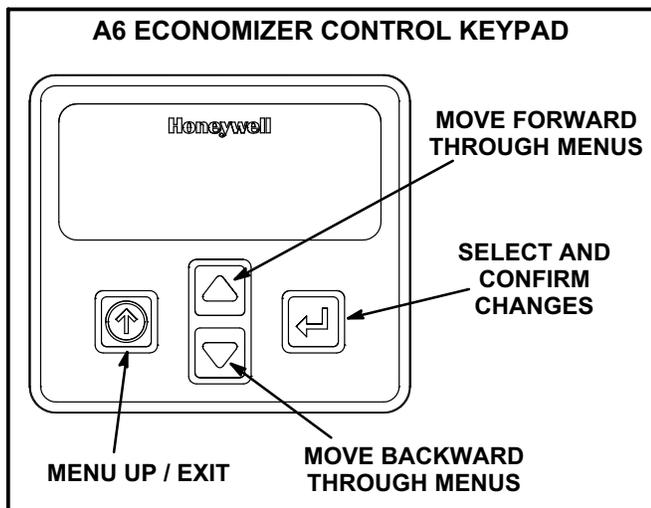


FIGURE 18

USING THE KEYPAD

Use the keypad as follows:

- Navigate to the desired menu.
- Press the ← button (enter) to display the first item in the currently displayed menu.
- Use the ▲ and ▼ buttons to scroll to the desired parameter.
- Press the ← enter button (enter) to display the value of the currently displayed item.
- Press the ▲ button to increase (change) the displayed parameter value.^a
- Press the ▼ button to decrease (change) the displayed parameter value.^a
- Press the ← enter button (enter) to accept the displayed value and store it in non-volatile RAM.

- CHANGE STORED displays.
- Press the ← button (enter) to return to the current menu parameter.
- Press the ⬆ button (MenuUp/Exit) to return to the previous menu.

^aWhen values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

MENU STRUCTURE

The menus in display order are:

- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

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

IMPORTANT - Menu parameters will be different depending on each configuration. For example: if a DCV (CO₂) sensor is not used, none of the DCV parameters will appear and only MIN POS will display. If a CO₂ sensor is used, the DCV SET, VENTMIN and VENTMAX will appear.

SETUP AND CONFIGURATION - FACTORY-INSTALLED ECONOMIZER

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

IMPORTANT - During setup, the economizer control is live at all times.

The setup process uses a hierarchical menu structure. Press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the ← button to select and confirm setup item changes.

1- In the **SYSTEM SETUP** Menu

- | | |
|----------|--|
| INSTALL | (MM/DD/YY) enter installation date |
| FAN CFM | () enter rooftop unit indoor blower CFM. |
| AUX1 OUT | (NONE) enter SYS if controller is wired for remote alarm monitoring. |

2- In the **SETPOINTS** Menu

- | | |
|---------|--|
| MIN POS | (VDC) 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.

**High Performance Economizer -
A6 Control** (continued)

IMPORTANT - During setup, the economizer control is live at all times.

The setup process uses a hierarchical menu structure. Press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the ← button to select and confirm setup item changes.

1- In the **SYSTEM SETUP** Menu

- INSTALL (MM/DD/YY) enter installation date
- EQUIPMENT (CONV)
- AUX2 IN (HEAT W1)
- FAN SPEED (1SPEED CAV unit)
(2SPEED MSAV unit)
- FAN CFM () enter highest indoor blower capacity of rooftop unit.
- AUX1 OUT (NONE) change to SYS if A6 controller is wired for remote alarm monitoring.
- OCC (INPUT)

2- In the **ADVANCED SETUP** Menu

- MA LO SET (45°F)
- FREEZE POS (CLOSE)
- STG3 DLY (2HRS)
- SD DMPR POS (CLOSED)

3- In the **SETPOINTS** Menu

- MA SET (55°F)
- LO T LOCK (32°F)
- MIN POS (VDC) refer to minimum position setting section for details.

ALARM MONITORING

The controller is equipped with a 24V output signal that can be configured for remote alarm monitoring.

In the “SYSTEM SETUP” menu change the “AUX1 OUT” setting to “SYS”. Refer to figure 19 for wiring connections provided.

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.

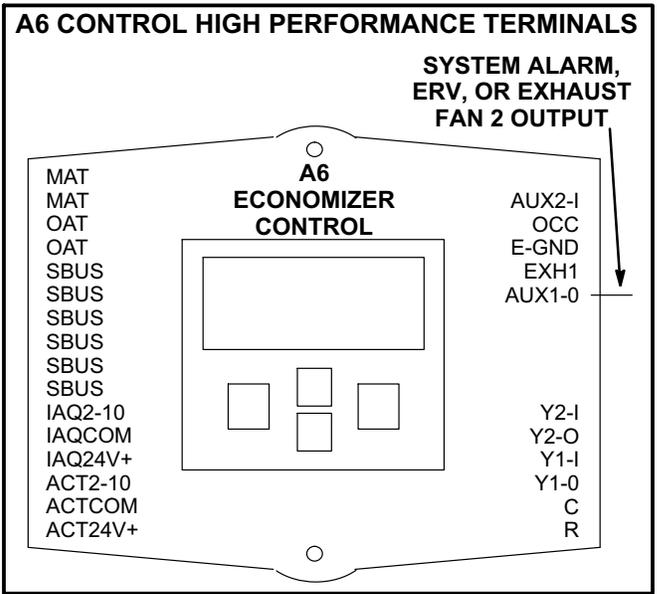


FIGURE 19

High Performance Economizer - Settings

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 1.
- 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 1.

**TABLE 1
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 “*SETPOINTS*” menu and change the “*DRYBLB SET*” parameter accordingly.

Single OA Enthalpy Sensing (Optional) -

The controller uses enthalpy boundary “curves” for economizing when used with an enthalpy sensor. Refer to the Honeywell installation instruction for details.

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.

DAMPER MINIMUM POSITION

NOTE - 24 volts must be provided at unit TB1 terminals **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 TB1 **R** and **OC** terminals. The thermostat will provide 24 volts

to the A6 economizer control during the occupied time period to enable economizer minimum position. If a device is not used to enable the economizer, install a jumper wire between TB1 terminals **R** and **OC** to maintain minimum position continuously. See figure 20.

Make wire connections to TB1 terminals **R** and **OC** as shown in literature provided with thermostat or energy management system.

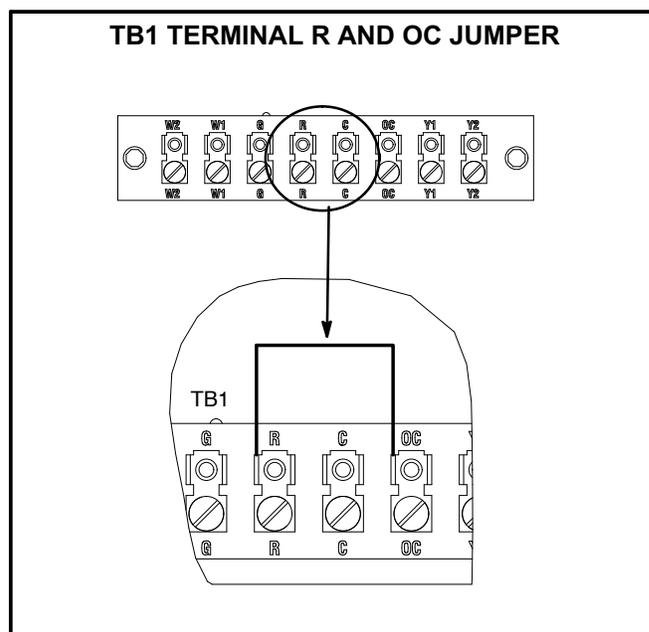


FIGURE 20

UNITS WITH 1-SPEED SUPPLY AIR BLOWER

- 1- Set thermostat to occupied mode if the feature is available. Make sure jumper is in place between TB1 terminals R and OC if using a thermostat which does not have the feature.
- 2- Turn on the blower using the thermostat or a jumper between TB1 terminals R and G.
- 3- Navigate to the “*SETPOINTS*” menu and select “*MIN POS*”. Adjust value (2-10VDC) to the approximate desired fresh air percentage.

3.0 VDC - 12% Open Damper

3.5 VDC - 18% Open Damper

4.0 VDC - 25% Open Damper

4.5 VDC - 31% Open Damper

5.0 VDC - 37% Open Damper

5.5 VDC - 43% Open Damper

6.0 VDC - 50% Open Damper

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

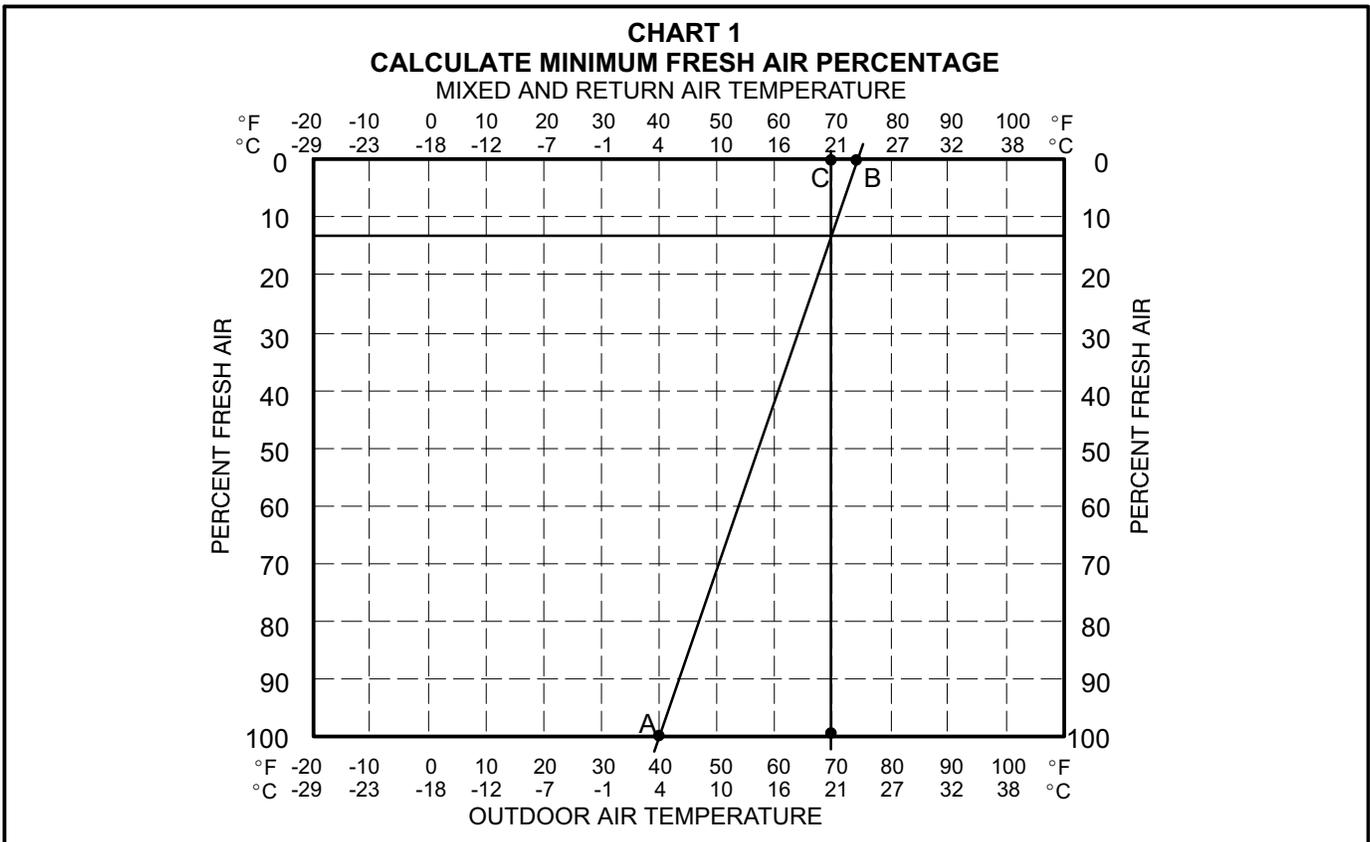
- 4- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point “A” (40°F, 4°C shown).

High Performance Economizer - Settings (continued)

- 5- Measure return air temperature. Mark that point on the top line of chart 1 and label the point "B" (74°F, 23°C shown).
- 6- 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).
- 7- Draw a straight line between points A and B.
- 8- Draw a vertical line through point C.

- 9- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
- 10- Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

If fresh air percentage is less than desired, use the A6 keypad to adjust "MIN POS" values higher (further open). If fresh air percentage is more than desired, adjust "MIN POS" values lower (less open). Repeat steps 3 through 8 until calculation reads desired fresh air percentage.



High Performance Economizer - Settings (continued)

UNITS WITH 2-SPEED SUPPLY AIR BLOWER

NOTE - AFTER setting minimum positions, set the “VENT SPEED” switch on the VFD control board to “LO”. See figure 21. Minimum position potentiometers do not function when the unit is equipped with a W7220 economizer control.

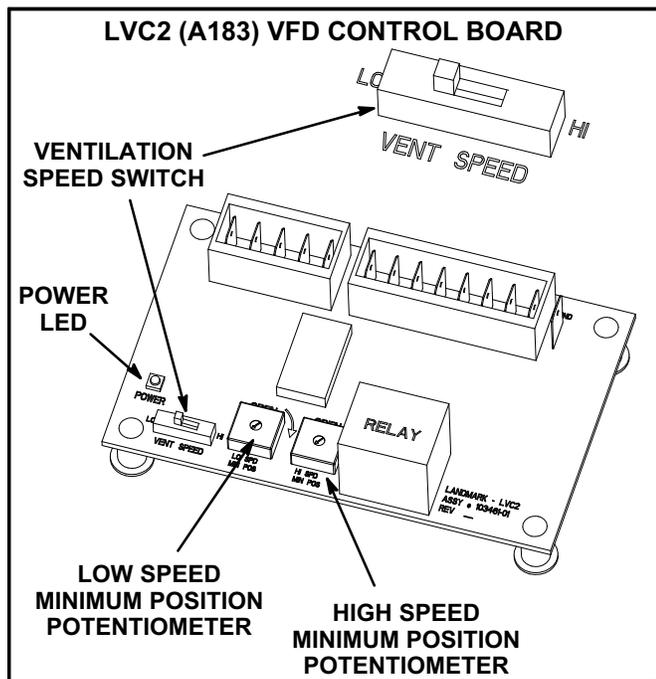


FIGURE 21

- 1- Set thermostat to occupied mode if the feature is available. Make sure a jumper is in place between TB1 terminals R and OC when using a thermostat which does not have this feature.
- 2- **Minimum damper position setting - Low Speed**
Switch the blower speed setting on the VFD control board to “LO”.
- 3- Turn on the indoor blower using the thermostat or by placing a jumper between TB1 terminals R and G. The inverter or variable frequency drive (VFD) should display “40.00Hz”.
- 4- Navigate to the “SETPOINTS” menu and select “MIN POS L”. Adjust value (2-10VDC) to the approximate desired fresh air percentage and save the input.
 - 3.0 VDC - 12% Open Damper
 - 3.5 VDC - 18% Open Damper
 - 4.0 VDC - 25% Open Damper
 - 4.5 VDC - 31% Open Damper
 - 5.0 VDC - 37% Open Damper
 - 5.5 VDC - 43% Open Damper
 - 6.0 VDC - 50% Open Damper

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

- 5- Navigate to the “CHECKOUT” menu and select “VMAX-LS”. Press ←.
- 6- Display will read “DAMPER VMAX-LS RUN?”. Press ←.
- 7- Damper will drive to the setpoint value stored in step 4-.
- 8- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point “A” (40°F, 4°C shown).
- 9- Measure return air temperature. Mark that point on the top line of chart 1 and label the point “B” (74°F, 23°C shown).
- 10- 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).
- 11- Draw a straight line between points A and B.
- 12- Draw a vertical line through point C.
- 13- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
- 14- Repeat steps 4 through 13 until calculation reads desired fresh air percentage.

If fresh air percentage is less than desired, use the A6 keypad to adjust “MIN POS L” values higher (further open). If fresh air percentage is more than desired, adjust “MIN POS L” values lower (less open).

- 15- **Minimum damper position setting - High Speed**
Switch the blower speed setting on the VFD control board to “HI”. The VFD should display “60.00HZ”.
- 16- Navigate to the “SETPOINTS” menu and select “MIN POS H”. Adjust value (2-10VDC) to the approximate desired fresh air percentage.
 - 3.0 VDC - 12% Open Damper
 - 3.5 VDC - 18% Open Damper
 - 4.0 VDC - 25% Open Damper
 - 4.5 VDC - 31% Open Damper
 - 5.0 VDC - 37% Open Damper
 - 5.5 VDC - 43% Open Damper
 - 6.0 VDC - 50% Open Damper

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

- 17- Navigate to the “CHECKOUT” menu and select “VMAX-HS”. Press ←.
- 18- Display will read “DAMPER VMAX-HS RUN?”. Press ←.

High Performance Economizer - Settings (continued)

- 19- Damper will drive to the setpoint value stored in step 16-.
- 20- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point "A" (40°F, 4°C shown).
- 21- Measure return air temperature. Mark that point on the top line of chart 1 and label the point "B" (74°F, 23°C shown).
- 22- 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).
- 23- Draw a straight line between points A and B.
- 24- Draw a vertical line through point C.
- 25- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.

26- Repeat steps 16 through 25 until calculation reads desired fresh air percentage.

If fresh air percentage is less than desired, use the A6 keypad to adjust "*MIN POS H*" values higher (further open). If fresh air percentage is more than desired, adjust "*MIN POS H*" values lower (less open).

27- Set the "VENT SPEED" switch on the VFD control board to "LO".

DEMAND CONTROL VENTILATION (DCV)

When a 2-10VDC CO₂ sensor is wired to the controller (leads provided), the *DCV SET*, *VENTMIN*, and *VENTMAX* parameters will appear under "*SETPOINTS*" menu. Navigate to the "*SETPOINTS*" menu to adjust setpoints as desired. Refer to the Honeywell manual provided for more details.

High Performance Economizer - Sequence of Operation

Refer to tables 2, 3, 4 or 5.

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 “2SP FAN DELAY” 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 Honeywell manual provided for details.

**TABLE 2
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 3
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

**TABLE 4
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 2SP FAN DELAY (Advance Setup 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.

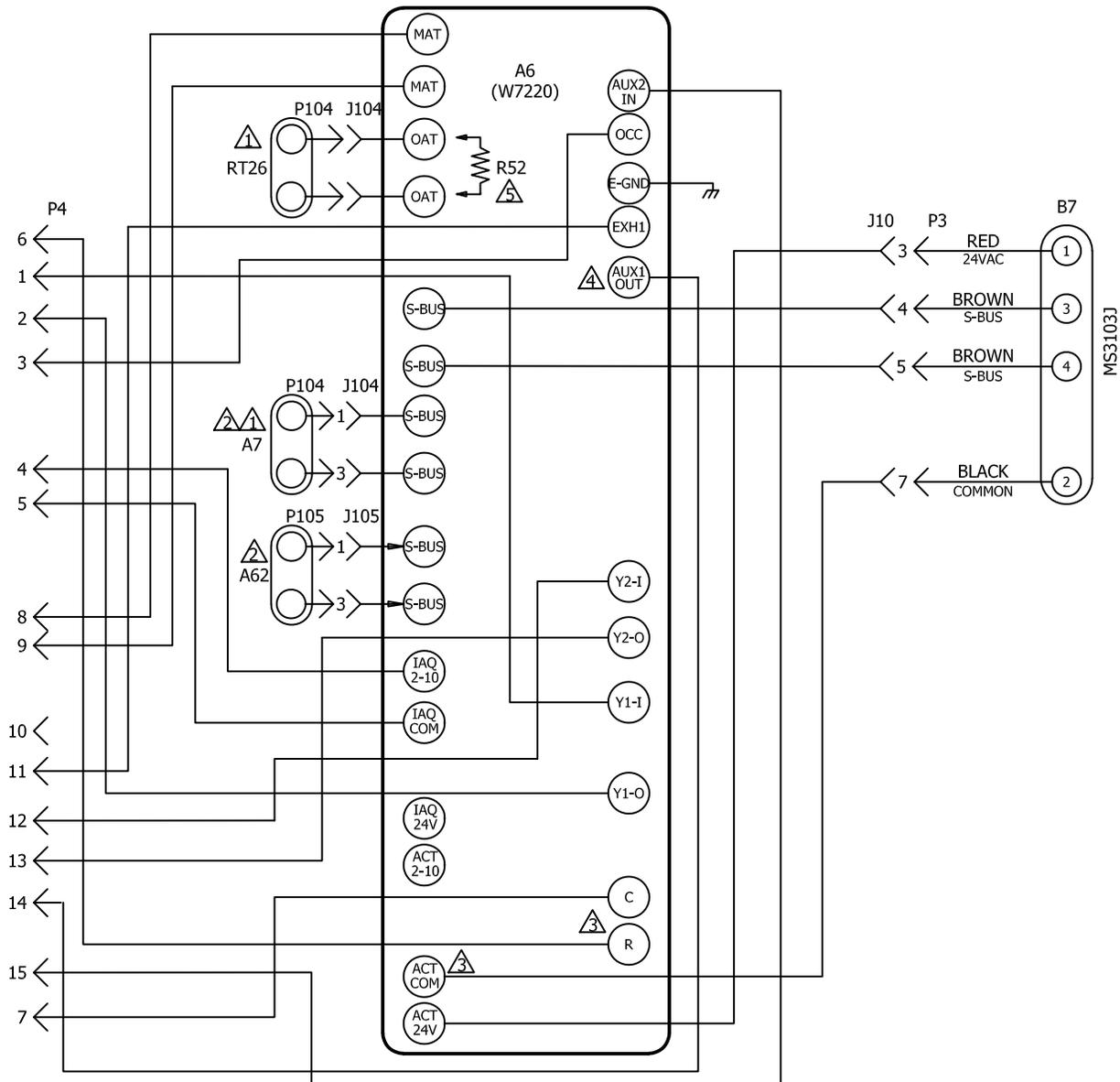
**TABLE 5
ECONOMIZER OPERATION - WITH DCV (CO₂ SENSOR, 2-SPEED SUPPLY FAN)**

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 2SP FAN DELAY (Advance Setup 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.

High Performance Economizer - Wiring Diagram

TYPICAL ECONOMIZER WIRING DIAGRAM - KG, KC & KH UNITS



KEY	COMPONENT
A6	CONTROL - ECONOMIZER
A7	SENSOR - OUTDOOR ENTHALPY
A62	SENSOR - INDOOR ENTHALPY
B7	MOTOR - DAMPER, ECONOMIZER
J10	JACK - ECONOMIZER MOTOR
J104	JACK - SENSOR OUTDOOR
J105	JACK - SENSOR RETURN AIR
P3	PLUG - ECONOMIZER MOTOR
P4	PLUG - ECONOMIZER
P104	PLUG - SENSOR OUTDOOR
P105	PLUG - SENSOR RETURN AIR
RT26	SENSOR - OUTDOOR AIR TEMP
R52	RESISTOR, OAT BYPASS

DESIGNATES OPTIONAL WIRING
 CLASS II FIELD WIRING

- OUTDOOR AIR TEMP SENSOR RT26 OR OUTDOOR AIR ENTHALPY SENSOR A7 MAY BE USED
- FOR DIFFERENTIAL ENTHALPY SENSING USE OUTDOOR ENTHALPY SENSOR A7 AND INDOOR ENTHALPY SENSOR A62
- REFER ALSO TO MAIN UNIT WIRING DIAGRAM SECTION C
- PROGRAMMABLE, USE FOR EXHAUST FAN 2 OUTPUT OR ERV OR SYSTEM ALARM OUTPUT
- R52 USED WITH NOVAR 2024 OR 2051 DDC CONTROLS.

2019/01		WIRING DIAGRAM	01/19
		537636-02	
ACCESSORIES			
JADE CONTROL ECONOMIZER (B & C-BOX)			
SECTION B			REV 0
Supersedes 537636-02		New Form No. 537636-03	

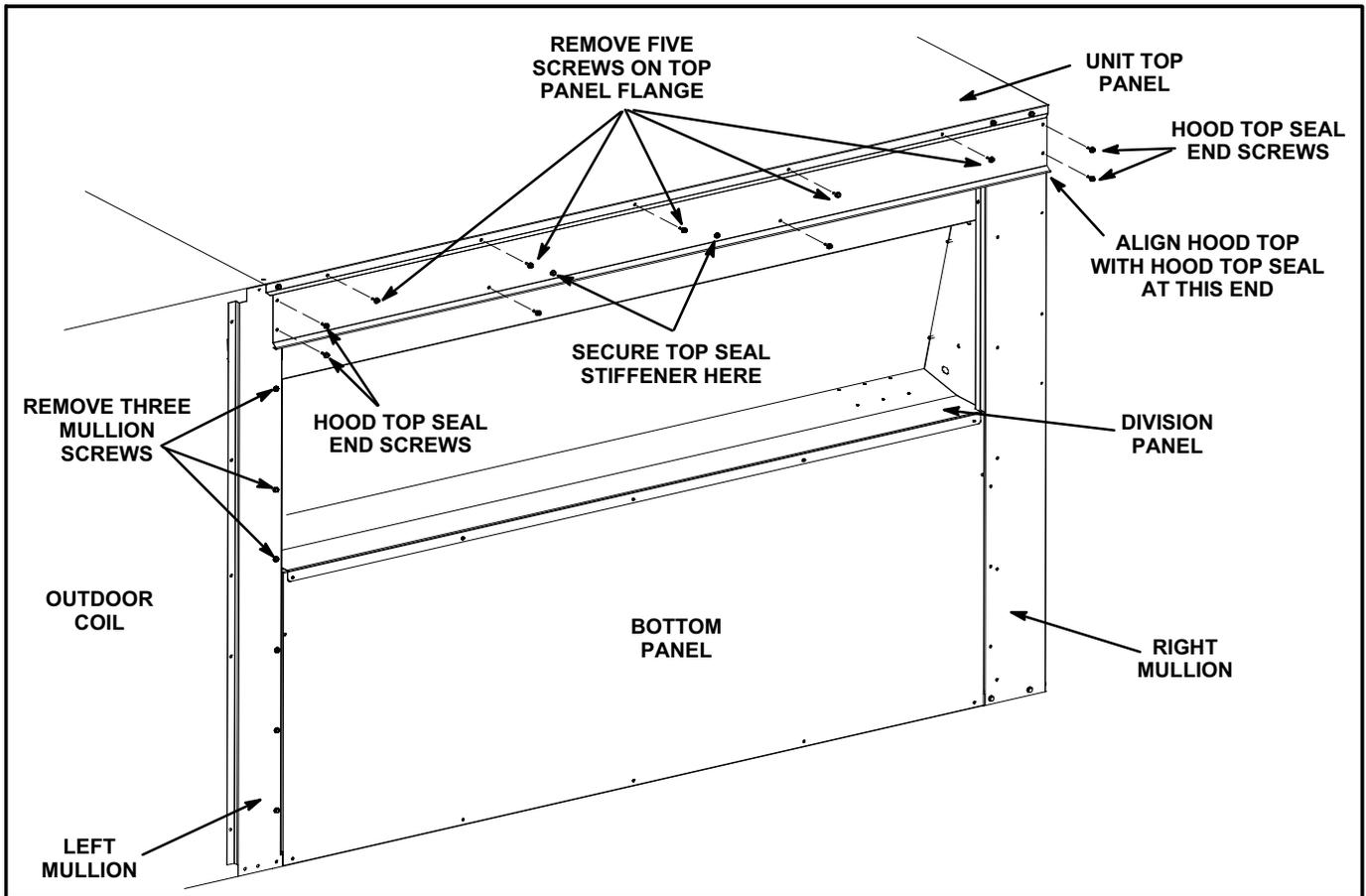


FIGURE 22

Outdoor Air Hood

NOTE - Install outdoor air sensor according to instructions provided with the sensor before installing hood.

The outdoor air hood is packaged separately but attached to the damper assembly crate. Use #10 self drilling screws to install hood unless noted otherwise. Refer to figures 22, 23 and 24.

- 1- Remove and retain screws securing unit top back panel; remove and discard panel.
- 2- Secure top seal stiffener to back side of hood top seal. See figures 22 and 23.
- 3- Slide hood top seal under unit cabinet top and secure using five retained top screws. Install, but do not tighten, the two screws on each end of the hood to seal. Refer to figure 22.
- 4- Remove and retain top three screws on the left mullion of the outdoor air section. See figure 22.
- 5- Secure hood top stiffener to unpainted side of the hood top with ten screws. See figures 23 and 24.
- 6- Position the hood top edge V-channel under the corresponding V-channel on the hood top seal and slide into place from right to left. See figure 22 and 23.

- 7- Tighten the two screws on each end of the hood top seal left loose in step 3.

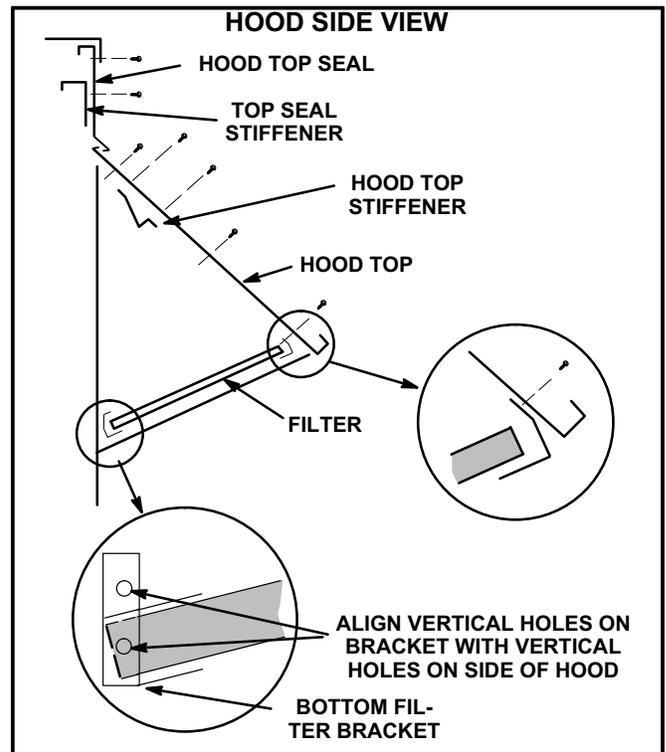


FIGURE 23

- 8- Install L-shaped left side filter bracket to left hood side. See figure 24.
- 9- Secure left hood side to the hood top. See figure 25. Secure the left hood side to the unit using three screws removed in step 4. See figure 25.
- 10- Install the right side filter bracket to the right hood side. See figure 24.
- 11- *Factory-Installed Economizers* - Remove the bottom filter bracket from the hood top assembly panel. See figure 27.
- 12- *Factory-Installed Economizers* - Remove the short and long top filter brackets from the hood top assembly panel. See figure 27.
- 13- Secure the right hood side to the hood top. See figure 26. Do NOT secure the right hood side to unit.
- 14- Align the two holes on the left hood side with the two holes in the bottom filter bracket. See figures 23 and 25. Secure with screws.

- 15- Secure bottom filter bracket to right hood side in the same manner. See figures 23 and 26.
- 16- Secure the right hood side to the unit as shown in figure 26.
- 17- Secure the top filter bracket (long) to the hood top. See figures 23 and 24. Slide two filters into place.

NOTE - Slide the filters to the left side of the hood. Make sure there are no air gaps between either two filters or the filter and the left hood side.

- 18- Insert the third filter into the bottom filter bracket. Position the top filter bracket (short) as shown in figures 23 and 24. Secure the bracket to the hood top with screws.
- 19- Make sure there are no gaps between the filters by sliding the filters to the left.
- 20- Caulk (field-provided) both ends of the top seal and hood top as shown in figures 25 and 26.

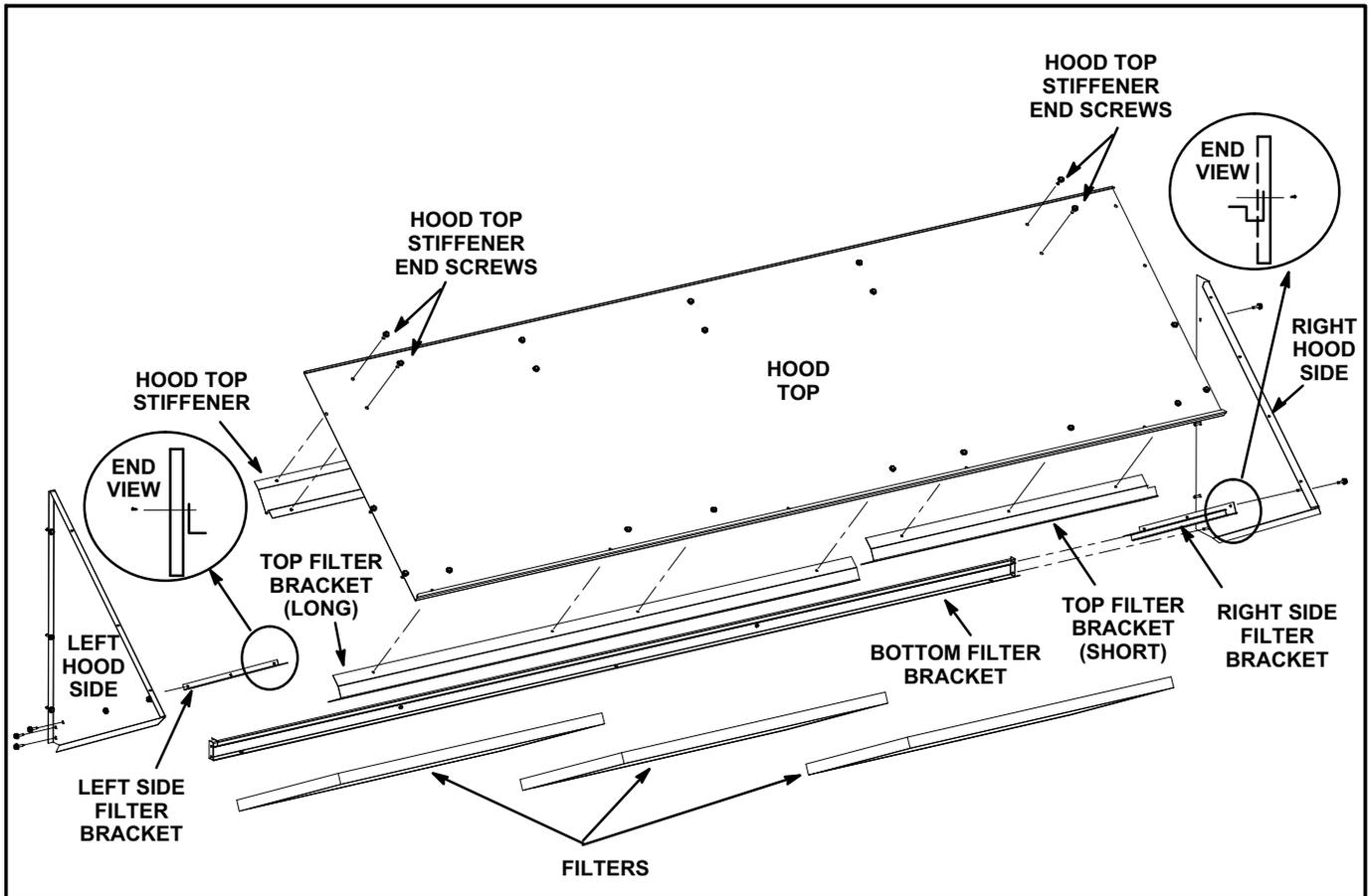


FIGURE 24

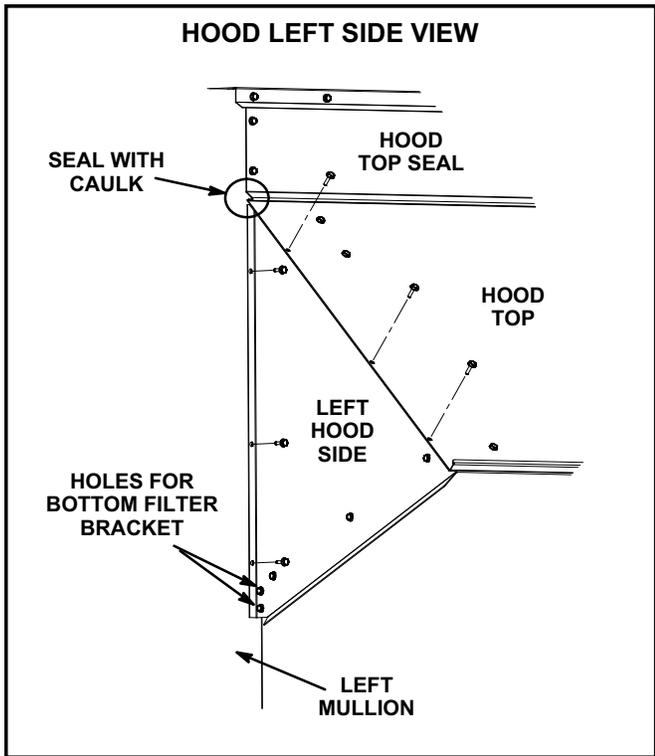


FIGURE 25

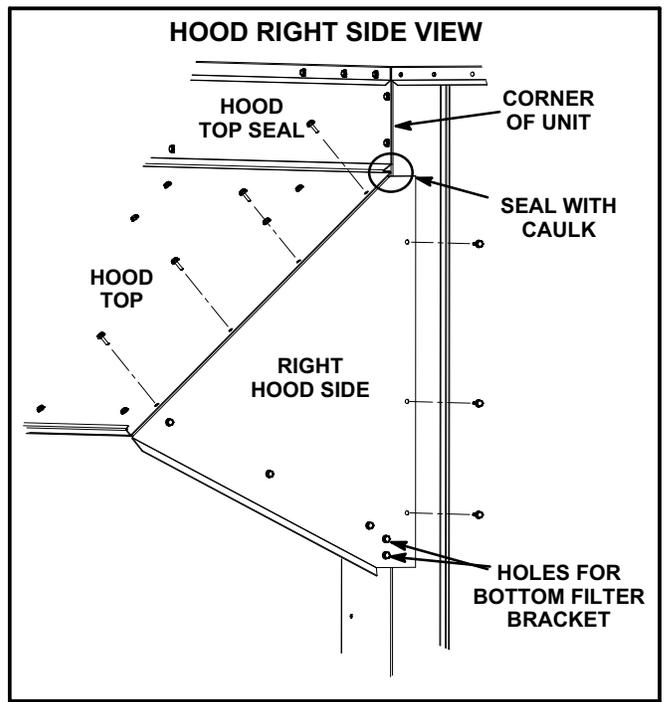


FIGURE 26

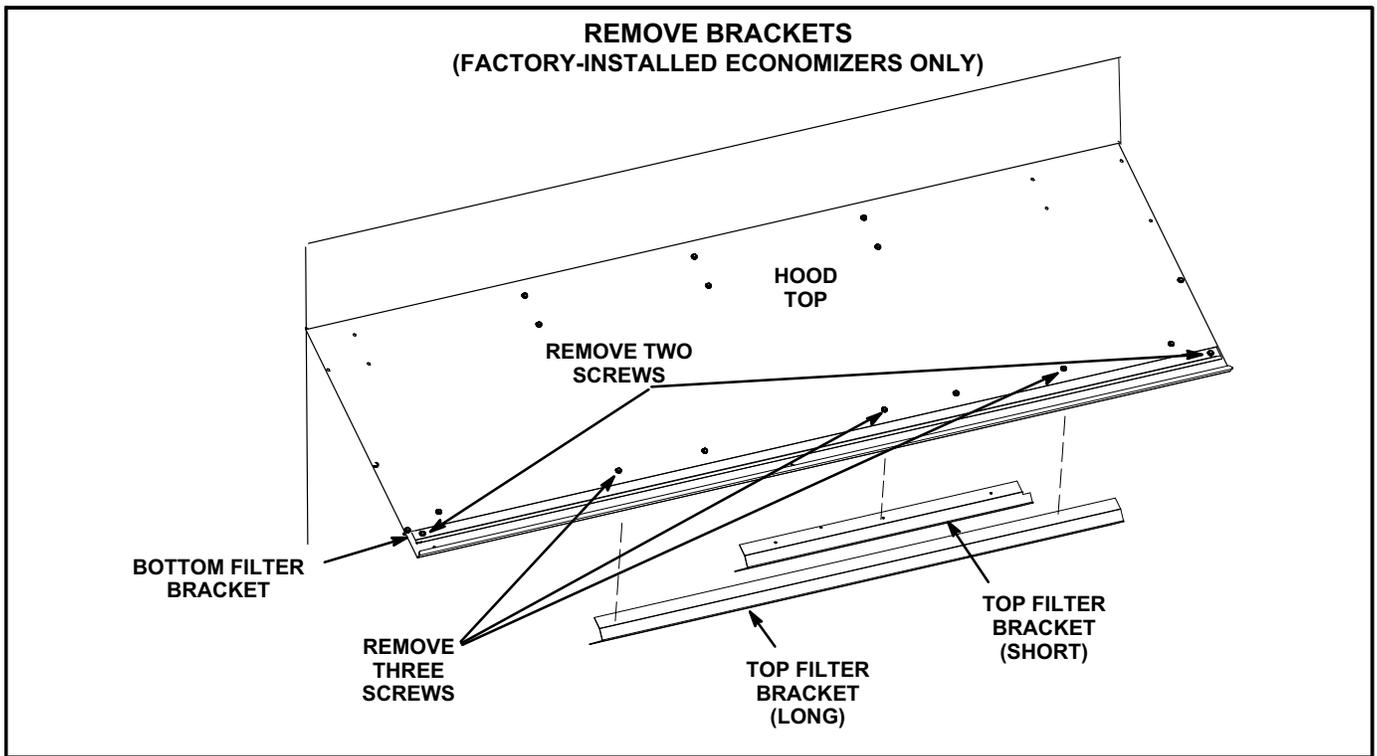


FIGURE 27