

**48ES-A, 48EZ-A,
48VL-A, 48VT-A,
50ES-A, 50EZ-A,
50VL-A, 50VT-A,
574D--A, 674D--A,
704D--A, 604D--A,
577C--A, 677C--A,
707C--A, 607C--A**

**SMALL PACKAGED PRODUCT (SPP)
VERTICAL ECONOMIZER
FACTORY INSTALLED OPTION**

Installation Instructions

NOTE: Airflow data can be found in unit installation instructions.

SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. consult local building codes, the current editions of the National Fuel Gas Code (NFGC) NFPA 54/ANSI Z223.1, and the National Electrical Code (NEC) NFPA 70.

In Canada refer to the current editions of the National Standards of Canada CAN/CSA-B149.1 and .2 Natural Gas and Propane Installation codes, and Canadian Electrical Code CSA C22.1


Recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

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VERTICAL ECONOMIZER (FACTORY INSTALLED OPTION) GENERAL

Economizers are recommended for only commercial packaged products that have ECM motors. The Economizer system utilizes the latest technology available for integrating the use of free cooling with mechanical cooling for rooftop units. The solid state control system optimizes energy consumption, zone comfort, and equipment cycling by operating the compressors when the outdoor air temperature is too warm, integrating the compressor with outdoor air when free cooling is available, and locking out the compressor when outdoor air temperature is too cold. Demand ventilation is supported.

The Economizer system utilizes gear-drive technology with a direct-mount spring return actuator that will close upon loss of power. The Economizer system comes standard with an outdoor air temperature sensor, a supply air temperature sensor, and low temperature compressor lockout switch. Indoor enthalpy, outdoor enthalpy, and CO₂ sensors are available for field installation.

Barometric relief dampers provide natural building pressurization control. Barometric relief dampers are built into the design and are standard. Table 1 categorize the different models according to their chassis size and their respective coil type. Please follow the instructions according to your unit categorization. See Table 2 for Hood Package contents. See Table 3 for sensor usage.

Table 1 – Coil Type

MODELS	TYPE	SMALL	LARGE / STRAIGHT COIL	LARGE / BENT COIL
50ES	PAC	30-36	42-48	60
48ES	YAC	30-36	42-48	60
50EZ	PHP	30-36	42-48	60
48EZ	DF	30-36	42-48	60
50VL	PAC	30-36	42-48	60
48VL	YAC	30-36	42-48	60
50VT	PHP	30	36-42	48-60
48VT	DF	30	36-42	48-60
704D	PAC	30-36	42-48	60
574D	YAC	30-36	42-48	60
604D	PHP	30-36	42-48	60
674D	DF	30-36	42-48	60
707C	PAC	30-36	42-48	60
577C	YAC	30-36	42-48	60
607C	PHP	30	36-42	48-60
677C	DF	30	36-42	48-60

LEGEND

DF – Dual Fuel
PAC – Packaged Air Conditioner
PHP – Packaged Heat Pump
YAC – Packaged Air Conditioner and Gas Furnace

Table 2 – Hood Package Contents

SMALL CHASSIS		LARGE CHASSIS	
Qty	Content Description	Qty	Content Description
1	Hood Side, Right	1	Hood Side, Right
1	Hood Side, Left	1	Hood Side, Left
2	Angle, Filter	2	Angle, Filter
1	Aluminum Filter (20-1/2" x 16-1/2 x 1") (521 x 419 x 25 mm)	1	Aluminum Filter (20-1/2" x 16-1/2 x 1") (521 x 419 x 25 mm)
18	Screws (#10 – 14 x 5/8" w/Seal Washer)	18	Screws (#10 – 14 x 5/8" w/Seal Washer)
2	Screws (#8 – 18 x 3/4" Type B Pan Head)	2	Screws (#8 – 18 x 3/4" Type B Pan Head)
		1	Bracket, Sensor

NOTE: See Table 5 and 6 to determine the disposable filters provided. See Fig. 9. for shipping location of Economizer Hood package.

Table 3 – Economizer Sensor Usage

APPLICATION	ECONOMIZER WITH OUTDOOR AIR DRY BULB SENSOR		
	Accessories Required		
Outdoor Air Dry Bulb	None, The outdoor air dry bulb sensor is factory installed.		
Single Enthalpy	HH57AC078		
Differential Enthalpy	HH57AC078 and CRENTDIF004A00*		
CO ₂ for DCV Control Using a Wall-Mounted CO ₂ Sensor	33ZCSENC02 or CGCDXSEN004A00		
CO ₂ for DCV Control Using a Duct-Mounted CO ₂ Sensor	33ZCSENC02 or CGCDXSEN004A00† and 33ZCASPC02 or CGCDXASP00100**	or	CRCBDIOX005A00† †

*CRENTDIF004A00 accessory is used on many different base units. As such, these kits may contain parts that will not be needed for installation.
 †33ZCSENC02 and CGCDXSEN004A00 are accessory CO₂ sensors.
 **33ZCASPC02 AND CGCDXASP00100 are accessory aspirator boxes required for duct-mounted applications.
 ††CRCBDIOX005A00 is an accessory that contains both 33ZCSENC02 AND 33ZVASPC02 accessories.

ACCESSORIES

The economizer has several field-installed accessories available to optimize performance. Refer to Table 4 for authorized parts.

Table 4 – Accessory List

DESCRIPTION	PART NUMBER
Outdoor Air Enthalpy Sensor	HH57AC078
Indoor Air Enthalpy Sensor	CRENTDIF004A00
Return Air CO ₂ Sensor (4–20 mA)	CRCBDIOX005A00
CO ₂ Room Sensor (4–20 mA)	33ZCSENC02 Or CGCDXSEN004A00
Aspirator Box for duct Mount CO ₂ Sensor (4–20 mA)	33ZCASPC02 Or CGCDXASP001A00
Space Temperature and CO ₂ Room Sensor with Override (4–20mA)	33ZCT55C02
Space Temperature and CO ₂ Room Sensor with Override and Set Point (4–20mA)	33ZCT56C02
Heat Pump Relay Package	CPRLYKIT001A00

INSTALLATION

Small Chassis

Vertical Economizer is installed at the factory. Please follow these instructions for set-up to complete installation.

1. Make sure all power to unit is off and lockout tag is installed.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system and install lockout tag. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable.

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts.

2. Remove economizer hood top panel from the return side of the unit. See Fig. 1. Keep screws and panel next to the unit.
3. Open economizer hood package found on the top skid. See Fig. 9.
4. Remove red shipping tape that attaches the outside air temperature (OAT) sensor to the economizer assembly. Using two #8 fasteners, found in the hood package, attach the OAT sensor to the economizer according to Fig. 2.

NOTE: See label attached to economizer for OAT installing details.

5. Remove horizontal return duct cover panel and cut the wire ties that hold the hood divider to the economizer assembly. Slide hood divider off from the two slots holding it in place and place next to the unit. See Fig. 3.

If you have a gas unit: Gas units have a flue hood attached to the hood divider. Unscrew the fastener holding the flue hood in place and dispose the screw. Follow unit’s literature for flue hood installations.

ECONOMIZER

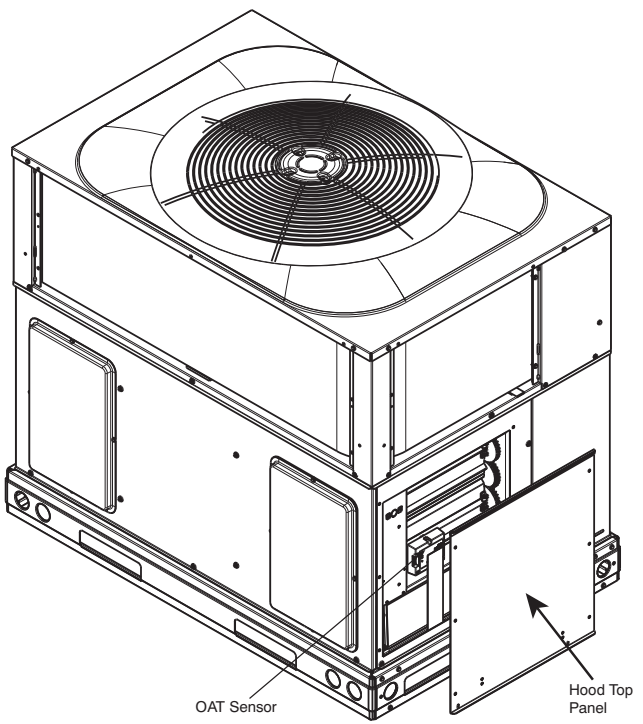


Fig. 1 - Economizer Hood Top Panel Removal

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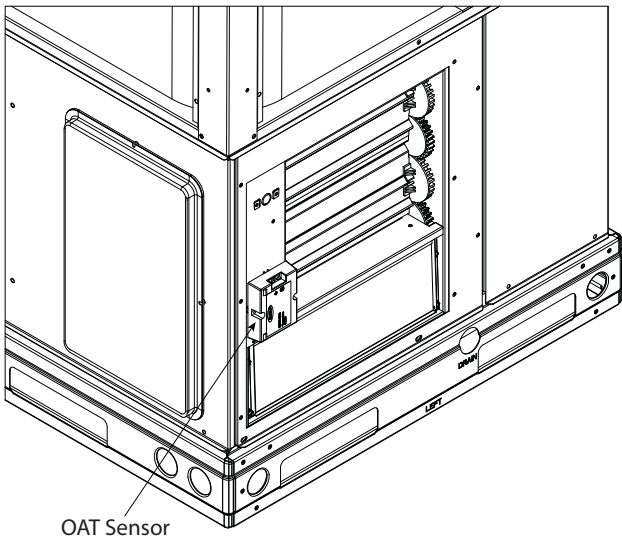


Fig. 2 - Oat Sensor Installed

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6. Replace horizontal return duct cover panel. Screw in place ensuring all seams are air and watertight.
7. Install the 2 angle filter brackets to the right and left hood side panels respectively with the #10 screws provided. See Fig. 4.

8. Assemble hood according to Fig. 5 screwing together with provided #10 sheet metal screws.
9. Install assembled hood over the economizer opening in the replacement return chamber panel. See Fig. 6. Screw in place through pre-punched holes. Make sure all seams are air and watertight.

NOTE: The two wires that connect to the outside air temperature sensor (OAT) should remain accessible.

10. Connect the outside air temperature sensor (OAT) to the economizer per wiring diagram.
11. Open the filter clips on the inside of the hood top. Insert the aluminum filter into the hood and close the clips to hold in place. See Fig. 7.
12. To replace 12 x 20 x 1 (304.8 mm x 508 mm x 25.4 mm) air filters, open the filter access door (horizontal return duct cover panel), remove old filters and install new disposable filters in filter rack. See Table 5 for filter size.

Table 5 – Small Coil Filter Sizes*

1 IN. FILTER SIZE	2 IN. FILTER SIZE†
1 – 12 x 20 x 1 (304.8 x 508 x 25.4 mm)	1 – 10 x 20 x 2 (254.0 x 508 x 50.8 mm) 1 – 12 X 20 X 2 (304.8 x 508 x 50.8 mm)

*Refer to Table 1 for coil type.

† 2-in. filters not included.

NOTE: Unscrew the bracket on the top filter rack to fit 2-in. (50.8 mm) filters.

NOTE: The economizer control settings and the filters are accessible through the filter access door.

13. Economizer controls are set to a standard factory setting. Nevertheless, you can adjust these settings through the filter access door. Review the settings in the Operation section:
 - (1.) The standard economizer controller has a factory setting of “C” for the outdoor air temperature changeover and 63°F (17°C) for the supply air (mixed air) temperature sensor. The outdoor air temperature changeover setting is adjusted on the sensor by setting the dip switches on the sensor. The ABCD potentiometer on the economizer controller should be set to the “D” position.
 - (2.) The low ambient compressor lockout switch setting is fixed at 42°F (5.6°C).
 - (3.) The minimum position for the outdoor air damper can be configured at the controller. When not using a CO₂ sensor, the DCV Max potentiometer must be completely closed (CCW) for the Minimum Position potentiometer to function correctly.
 - (4.) Settings for the optional outdoor enthalpy sensor, indoor enthalpy sensor, and CO₂ sensor can also be configured at the controller.

14. Replace the filter access panel. Screw in place ensuring all seams are air and watertight.
15. Install all economizer accessories then power HVAC unit and test cycle economizer.

ECONOMIZER

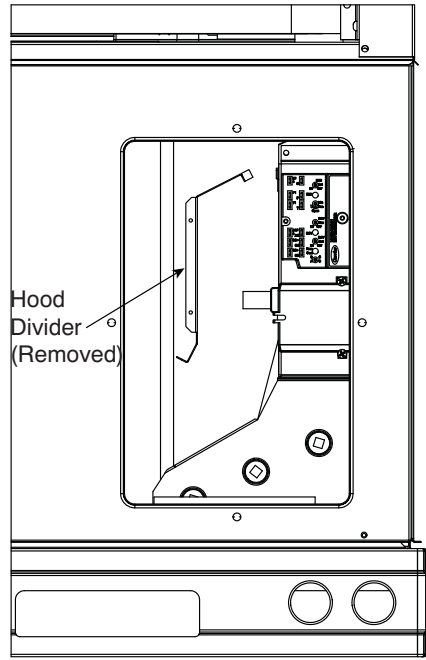
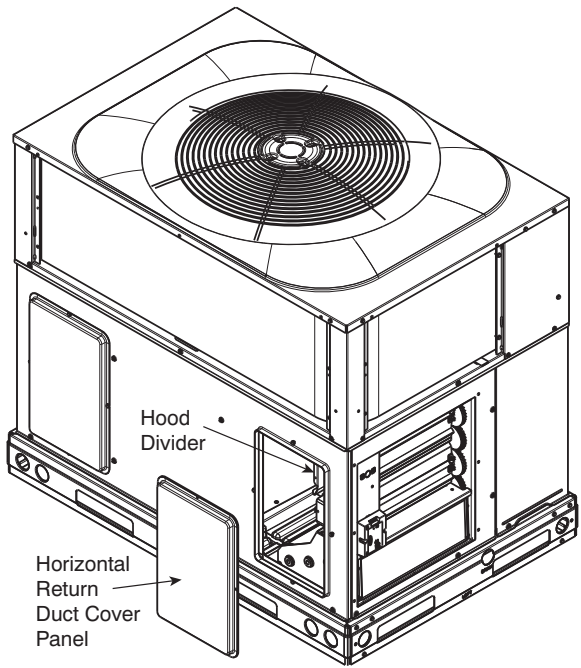


Fig. 3 - Horizontal Return Duct Cover Panel Removal

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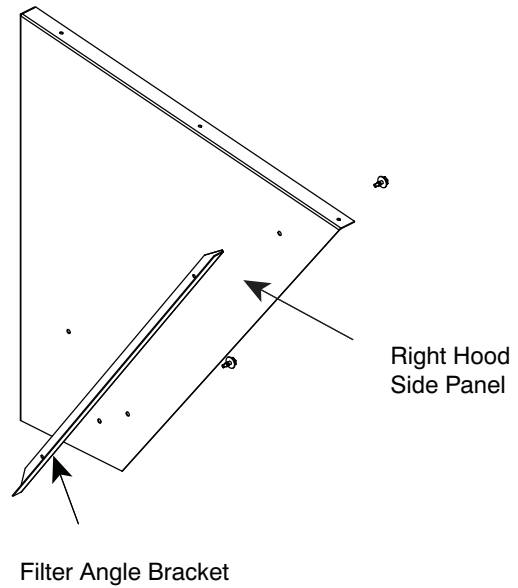
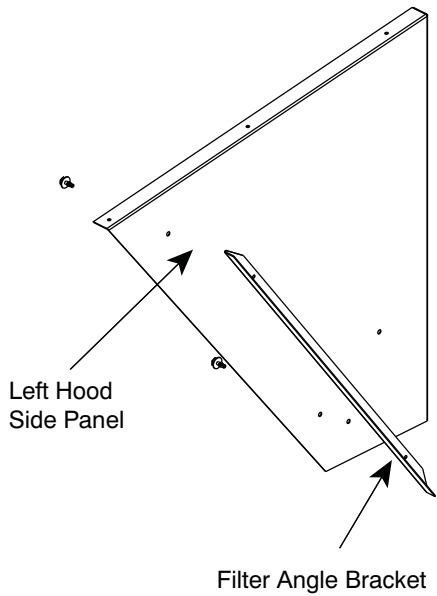


Fig. 4 - Filter Angle Bracket Installation

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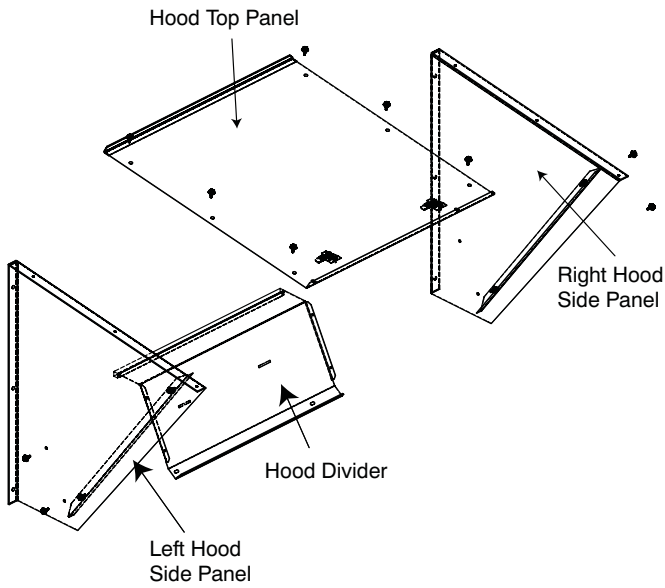


Fig. 5 - Economizer Hood Assembly

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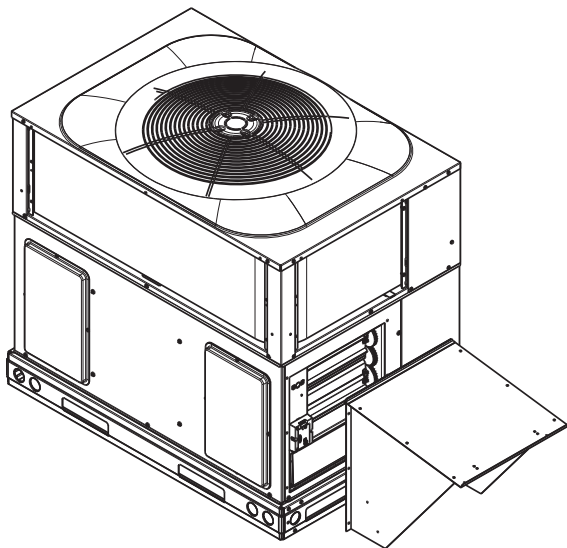


Fig. 6 - Economizer Hood Installation

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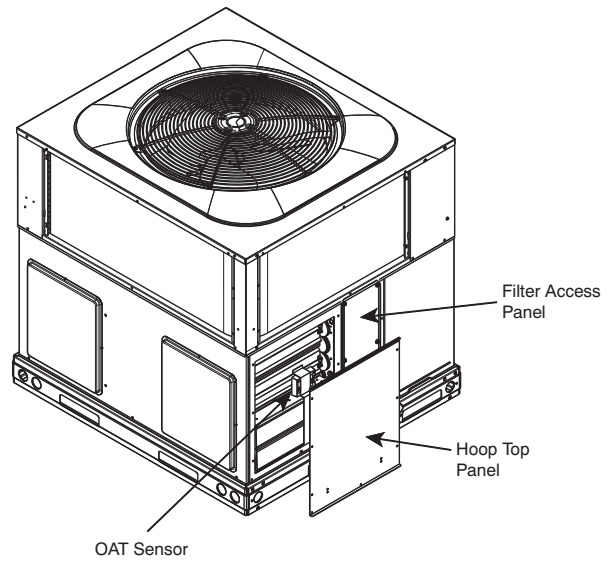


Fig. 8 - Economizer Hood Top Panel Removal

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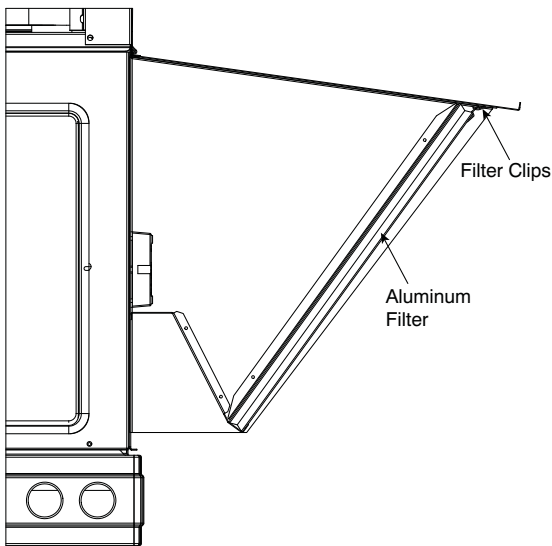


Fig. 7 - Filter Installation (See Through View)

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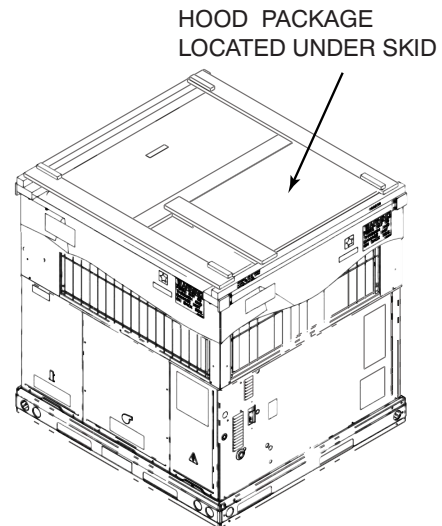


Fig. 9 - Hood Package Location

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Large Chassis

Vertical Economizer is installed at the factory. Please follow these instructions for set-up to complete installation.

1. Make sure all power to unit is off and lockout tag is installed.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system and install lockout tag. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable.

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts.

2. Remove economizer hood top panel from the return side of the unit. See Fig. 8. Keep screws and panel next to the unit.
3. Remove red shipping tape that attaches the outside air temperature (OAT) sensor to the economizer assembly and place sensor next to the unit.

4. Remove horizontal return duct cover panel and cut the wire ties that hold the hood divider to the economizer assembly. Slide hood divider off from the two slots holding it in place and place next to the unit. See Fig. 10.

If you have a gas unit: Gas units have a flue hood attached to the hood divider. Unscrew the fastener holding the flue hood in place and dispose of the screw. Follow unit's literature for flue hood installations.

5. Replace horizontal return duct cover panel. Screw in place ensuring all seams are air and watertight.
6. Open economizer hood package found on the top skid. See Fig. 9. Mount OAT sensor to its assigned bracket by screwing together with provided two #8 fasteners. Afterwards install OAT sensor to the right side hood panel with the provided #10 screws. See Fig. 11.
7. Install the 2 angle filter brackets to the right and left hood side panels respectively with the #10 screws provided. See Fig. 12.
8. Assemble hood according to Fig. 13 screwing together with provided #10 sheet metal screws.
9. Install assembled hood over the economizer opening in the replacement return chamber panel. See Fig. 14. Screw in place through pre-punched holes. Make sure all seams are watertight.

NOTE: The two wires that connect to the outside air temperature sensor (OAT) should remain accessible.

10. Connect the outside air temperature sensor (OAT) to the economizer per wiring diagram.

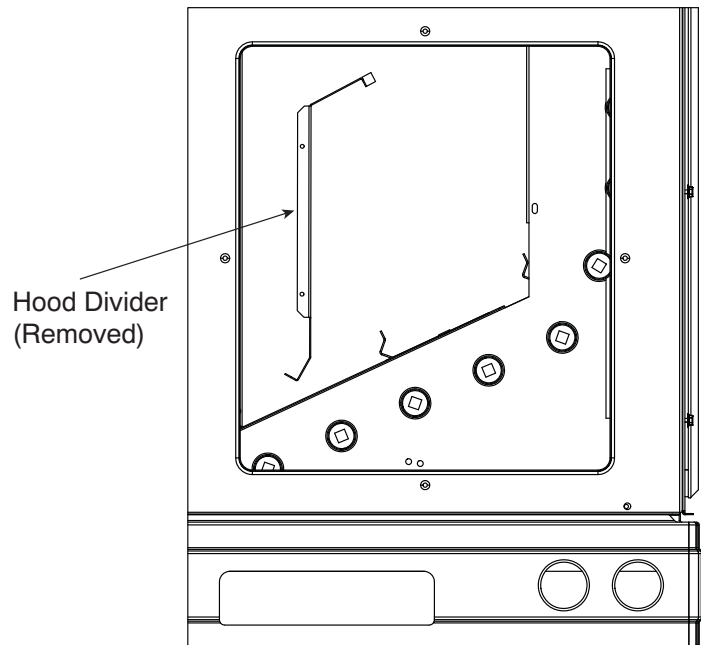
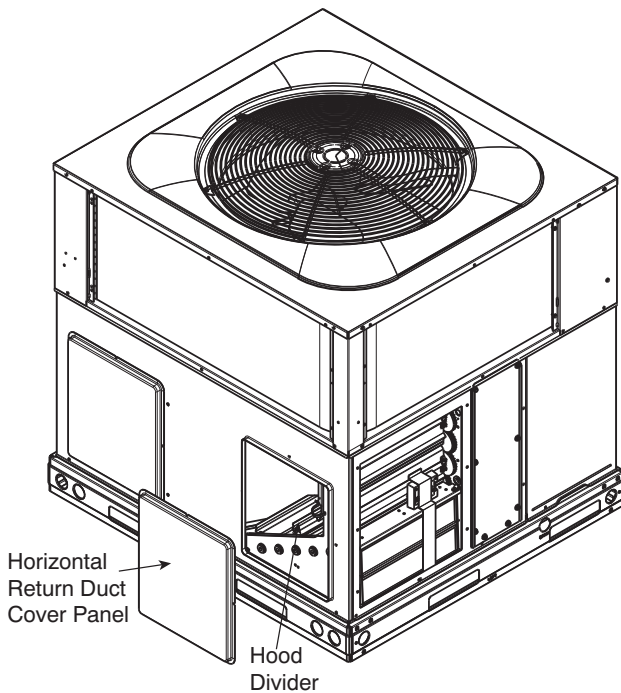


Fig. 10 - Horizontal Return Duct Cover Panel and Hood Divider Removal

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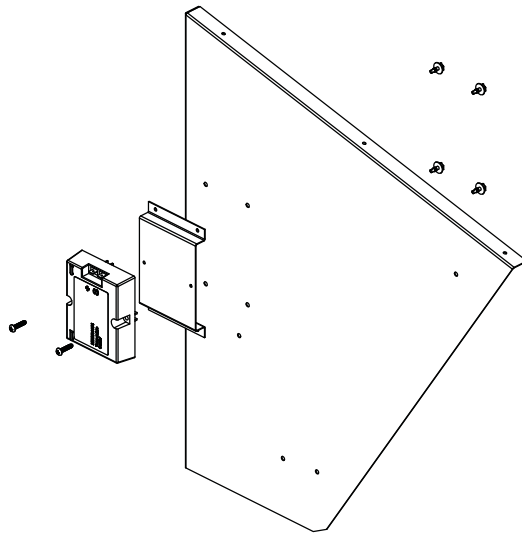
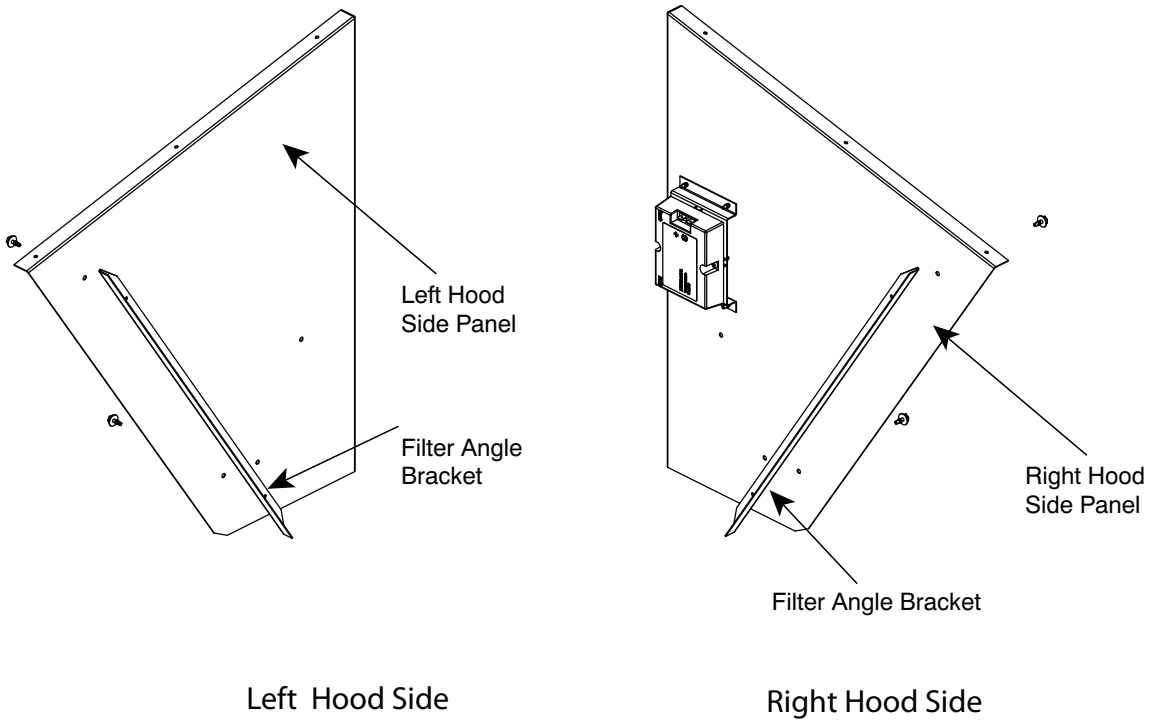


Fig. 11 - OAT Bracket Installation

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ECONOMIZER



Left Hood Side

Right Hood Side

Fig. 12 - Filter Angle Bracket Installation

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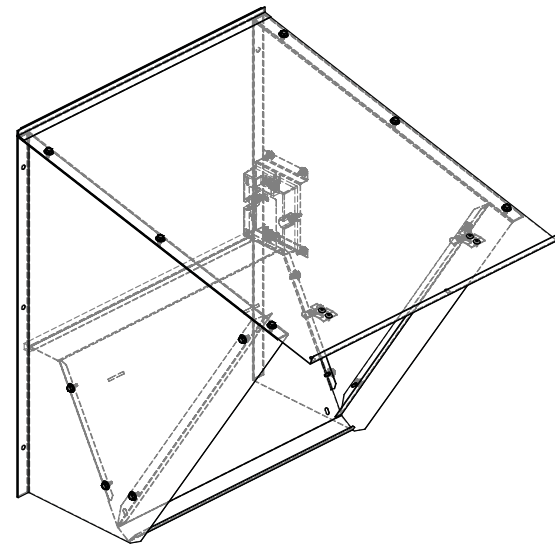
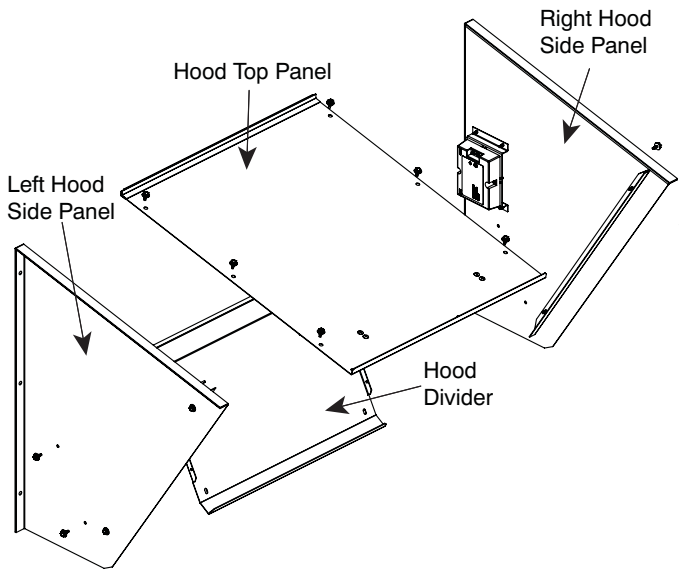


Fig. 13 - Hood Assembly

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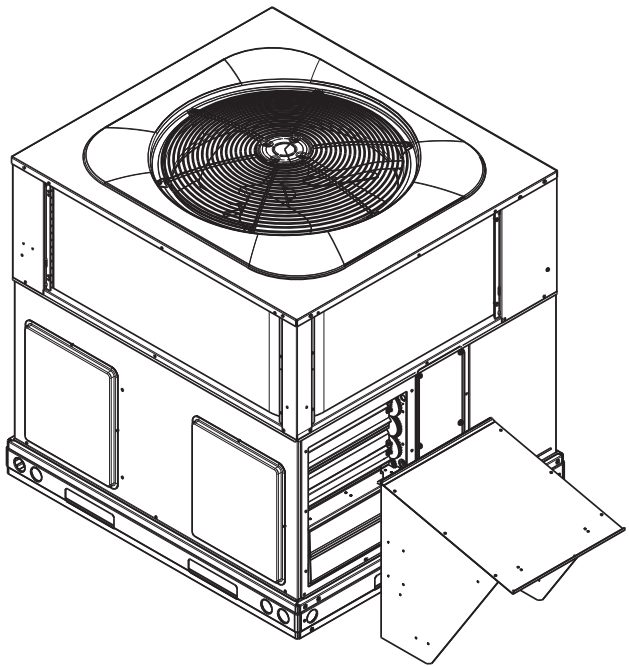


Fig. 14 - Economizer Hood Installation

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11. Open the filter clips on the inside of the hood top. Insert the aluminum filter into the hood and close the clips to hold in place. See Fig. 15.
12. To replace air filters, open filter access door remove old filters and install new disposable filters in filter rack. See Table 6 for filter size.

IMPORTANT: On the the bent coil (See Table 1 to determine coil type) filter rack, the 18 X 24 X 1 (457.2 X 609.6 x 25.4 mm) filter must be installed through the filter access door first then install the 16 x 24 x 1 (406.4 X 609.6 X 25.4 mm) filter.

NOTE: The economizer control settings and the filters are accessible through the filter access door.

Table 6 – Coil Filter Size*

1 IN. FILTER SIZE	2 IN. FILTER SIZE‡
Large Straight Coil	
1 – 14 x 24 x 1 (355.6 x 609.6 x 25.4 mm)	1 – 14 x 24 x 2 (355.6 x 609.6 x 50.8 mm)
1 – 16 X 24 X 1 (406.4 X 609.6 X 25.4 mm)	1 – 16 X 24 X 2 (406.4 X 609.6 X 50.8 mm)
Large Bent Coil	
16 x 24 x 1 (406.4 x 609.6 x 25.4 mm)	2 – 10 X 24 X 2† (254.0 X 609.6 X 50.8 mm)
18 x 24 x 1 (457.2 x 609.5 x 25.4 mm)	1 – 14 X 24 X 2† (355.6 X 609.6 X 50.8)

*Refer to Table 1 for coil type.

†Place 14 x 24 in. (355.6 x 609.6 mm) filter at the right side of the coil and 10 x 24 in. (254.0 x 609.6 mm) filters at the left side in this order.

‡ 2-in. filters not included.

NOTE: Unscrew two brackets on the top filter rack to fit 2-in. (50.8 mm) filters.

13. Economizer controls are set to a standard factory setting. Nevertheless, you can adjust these settings through the filter access door. Review the settings in the Operation section:
 - (1.) The standard economizer controller has a factory setting of “C” for the outdoor air temperature changeover and 63°F (17°C) for the supply air (mixed air) temperature sensor. The outdoor air temperature changeover setting is adjusted on the sensor by setting the dip switches on the sensor. The ABCD potentiometer on the economizer controller should be set to the “D” position.
 - (2.) The low ambient compressor lockout switch setting is fixed at 42°F (5.6°C).
 - (3.) The minimum position for the outdoor air damper can be configured at the controller. When not using a CO₂ sensor, the DCV Max potentiometer must be completely closed (CCW) for the Minimum Position potentiometer to function correctly.
 - (4.) Settings for the optional outdoor enthalpy sensor, indoor enthalpy sensor, and CO₂ sensor can also be configured at the controller.
14. Replace the filter access panel. Screw in place ensuring all seams are air and watertight.
15. Install all economizer accessories then power HVAC unit and test cycle economizer.

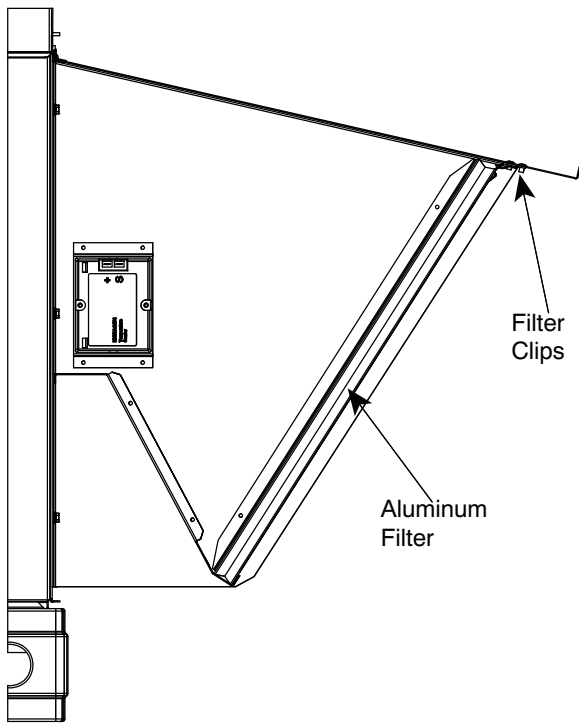


Fig. 15 - Filter Installation (See through view)

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CONFIGURATION

Economizer Standard Sensors

OUTDOOR AIR TEMPERATURE (OAT) SENSOR— The outdoor air temperature sensor (HH57AC080) is a 10 to 20mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the Economizer can be used for free cooling. The operating range of temperature measurement is 40 to 100°F (4.4 to 37.8°C). The sensor has 8 selectable temperature changeover setpoints. The temperature changeover is set using 3 dip switches on the sensor. The ABCD potentiometer on the controller should be set to the “D” position. See Fig. 22.

SUPPLY AIR TEMPERATURE (SAT) SENSOR—The supply air temperature sensor is a 3 KΩ thermistor located at the inlet of the indoor fan. See Fig. 16. The operating range of temperature measurement is 0° to 158°F (-17.8° to 70°C). See Table 7 for sensor temperature/resistance values. The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the “crimp end” and is sealed from moisture.

Table 7 – Supply Air Sensor Temperature/Resistance Values

TEMPERATURE (°F)	CELSIUS (°C)	RESISTANCE (OHMS)
-22	-30	53,010
-4	-20	29,091
14	-10	16,590
32	0	9,795
50	10	5,970
68	20	3,747
77	25	3,000
86	30	2,416
104	40	1,597
122	50	1,080
140	60	746
158	70	525

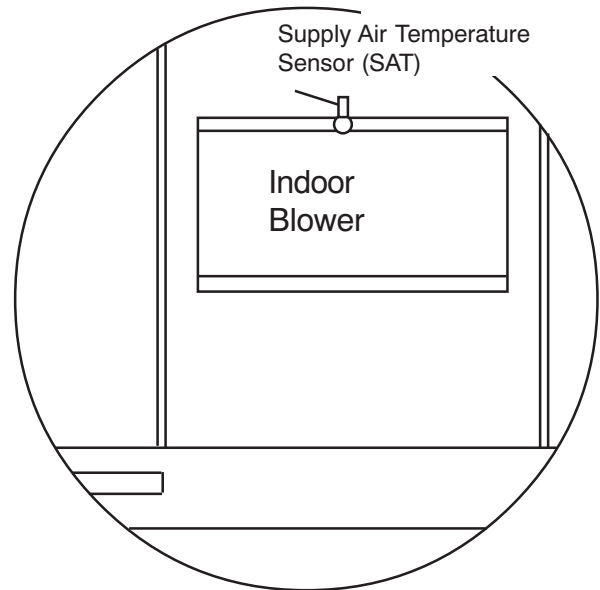


Fig. 16 - SAT Location

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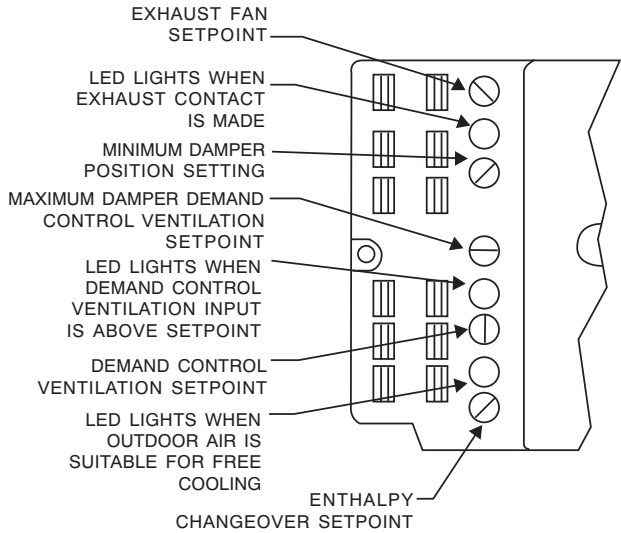
LOW TEMPERATURE COMPRESSOR LOCKOUT SWITCH—The Economizer is equipped with a low ambient temperature lockout switch located in the outdoor airstream which is used to lock out the compressors below a 42°F (5.6°C) ambient temperature.

Economizer Control Modes — Determine the Economizer control mode before set up of the control. Some modes of operation may require different sensors. Refer to Table 3. The Economizer is supplied from the factory with a supply air temperature sensor, a low temperature compressor lockout switch, and an outdoor air temperature sensor. This allows for operation of the Economizer with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the Economizer and unit.

OUTDOOR DRY BULB CHANGEOVER—The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. The outdoor air and supply air temperature sensors are included as standard.

For this control mode, the outdoor temperature is compared to a selectable set point on the sensor See Fig. 18. If the outdoor-air temperature is above the set point, the Economizer will adjust the outdoor air dampers to minimum position. If the outdoor-air temperature is below the set point, the position of the outdoor-air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the LED next to the free cooling set point potentiometer will be on. The changeover temperature set point is set using the switches on the sensor. See Fig. 18 for the corresponding temperature changeover values.

ECONOMIZER



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Fig. 17 - Economizer Controller Potentiometer and LED Locations

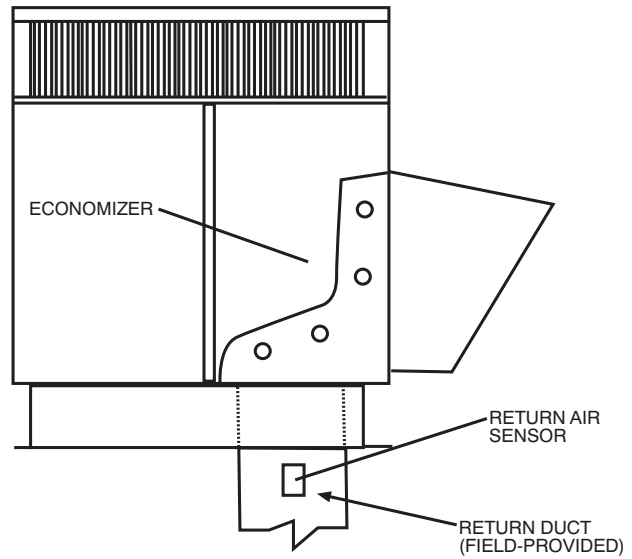
DIP SWITCH POSITION	CHANGEOVER TEMPERATURE
ON OFF 1 2 3	48°F (8.9°C)
ON OFF 1 2 3	53°F (11.7°C)
ON OFF 1 2 3	55°F (12.8°C)
ON OFF 1 2 3	58°F (14.4°C)
ON OFF 1 2 3	63°F (17.2°C)
ON OFF 1 2 3	68°F (20°C)
ON OFF 1 2 3	73°F (22.8°C)
ON OFF 1 2 3	78°F (25.6°C)

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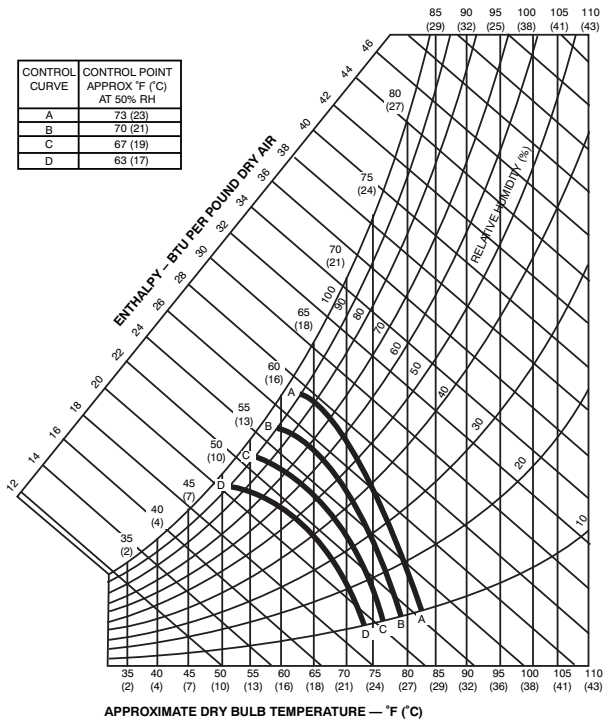
Fig. 18 - Outdoor Air Temperature Changeover Set Points

OUTDOOR ENTHALPY CHANGEOVER—For enthalpy control, accessory enthalpy sensor (part number HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location.



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Fig. 19 - Enthalpy Sensor Mounting Location



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Fig. 20 - Enthalpy Changeover Setpoints

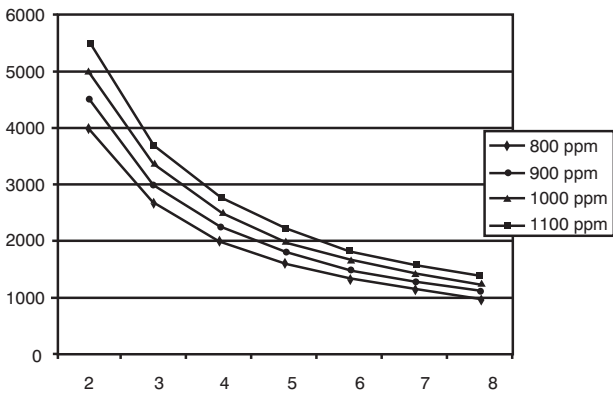


Fig. 21 - CO₂ Sensor Maximum Range Setting

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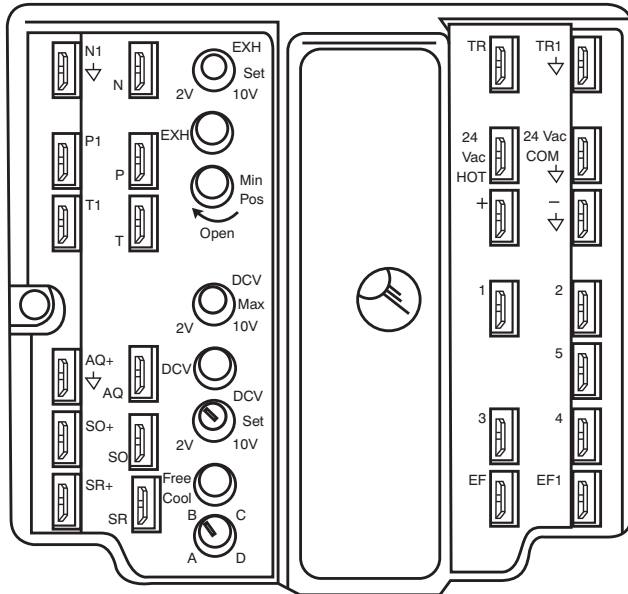


Fig. 22 - Economizer Controller

A09712

When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the Economizer controller. The set points are A, B, C, and D. See Fig. 20. The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on the Economizer controller. See Fig. 22 and Fig. 23 or Fig. 24.

DIFFERENTIAL ENTHALPY CONTROL — For differential enthalpy control, the Economizer controller uses two enthalpy sensors (HH57AC078 and CRENTDIF004A00), one in the outside air and one in the return airstream. The Economizer controller compares the outdoor air enthalpy to the return air enthalpy to determine Economizer use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air and is below the set point, the Economizer opens to bring in outdoor air for free cooling. Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. Mount the return air enthalpy sensor in the return air duct. See Fig. 19. When using this mode of changeover control, turn the enthalpy set point potentiometer fully clockwise to the D setting.

INDOOR AIR QUALITY (IAQ) SENSOR INPUT —The IAQ input can be used for demand control ventilation control based on the level of CO₂ measured in the space or return air duct. Mount the

accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user determined set point. See Fig. 21. If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the Economizer control board will be damaged.

EXHAUST SET POINT ADJUSTMENT—The exhaust set point will determine when the exhaust fan runs based on damper position (if power exhaust is installed). The set point is modified with the Exhaust Fan Set Point (EXH SET) potentiometer. See Fig. 23 or 24 for Wiring Diagram. The set point represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the Economizer controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

MINIMUM POSITION CONTROL — There is a minimum damper position potentiometer on the Economizer controller. See Fig. 17 and Fig. 23 or 24. The minimum damper position maintains the minimum airflow into the building during the occupied period. When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compound) ventilation requirements. The DCV Max potentiometer must be fully closed (CCW) to allow the minimum position potentiometer to function correctly.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise. Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10°F (12.2°C) temperature difference between the outdoor and return-air temperatures. To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed air temperature using the following formula:

$$(T_o \times OA/100) + (T_R \times RA/100) = T_M$$

$$T_o = \text{Outdoor-Air Temperature}$$

$$OA = \text{Percent of Outdoor Air}$$

$$T_R = \text{Return-Air Temperature}$$

$$RA = \text{Percent of Return Air}$$

$$T_M = \text{Mixed-Air Temperature}$$

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60°F (15.6°C), and return-air temperature is 75°F (23.9°C). $(60 \times .10) + (75 \times .90) = 73.5^\circ\text{F}$ (23.1°C)
2. Disconnect the supply air sensor from terminals T and T1.
3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 23 or Fig. 24 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured mixed-air temperature matches the calculated value.
6. Reconnect the supply air sensor to terminals T and T1.

Remote control of the Economizer damper is desirable when requiring additional temporary ventilation. If a field-supplied remote potentiometer (Honeywell part number S963B1128) is wired to the Economizer controller, the minimum position of the damper can be controlled from a remote location. To control the minimum damper position remotely, remove the factory installed jumper on the P and P1 terminals on the Economizer controller.

Wire the field-supplied potentiometer to the P and P1 terminals on the Economizer controller. See Fig. 22 and Fig. 23 or 24.

DAMPER MOVEMENT — Damper movement from full open to full closed (or vice versa) takes 2 1/2 minutes.

THERMOSTATS — The Economizer control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The Economizer control does not support space temperature sensors. Connections are made at the thermostat terminal connection board located in the main control box.

OCCUPANCY CONTROL — The factory default configuration for the Economizer control is occupied mode. Occupied status is provided by the black jumper from terminal TR to terminal N. When unoccupied mode is desired, install a field supplied time clock function in place of the jumper between TR and N. See Fig. 23 or 24. When the time clock contacts are closed, the Economizer control will be in occupied mode. When the time clock contacts are open (removing the 24-v signal from terminal N), the Economizer will be in unoccupied mode.

DEMAND CONTROLLED VENTILATION (DCV)—When using the Economizer for demand controlled ventilation, there are some equipment selection criteria which should be considered. When selecting the heat capacity and cool capacity of the equipment, the maximum ventilation rate must be evaluated for design conditions. The maximum damper position must be calculated to provide the desired fresh air. Typically the maximum ventilation rate will be about 5 to 10% more than the typical CFM required per person, using normal outside air design criteria. An exponential anticipatory strategy should be taken with the following conditions: a zone with a large area, varied occupancy, and equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy. An exponential-anticipatory strategy will cause the fresh air supplied to increase as the room CO₂ level increases even though the CO₂ set point has not been reached. By the time the CO₂ level reaches the set point, the damper will be at maximum ventilation and should maintain the set point. In order to have the CO₂ sensor control the economizer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The following equation may be used to determine the percent of outside-air entering the building for a given damper position. For best results there should be at least a 10°F (12.2°C) difference in outside and return-air temperatures.

$$(T_o \times OA/100) + (T_R \times RA/100) = T_M$$

T_O = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T_R = Return-Air Temperature

RA = Percent of Return Air

T_M = Mixed-Air Temperature

Once base ventilation has been determined, set the minimum damper position potentiometer to the correct position. The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 CFM per person). Use Fig. 21 to determine the maximum setting of the CO₂ sensor. For example, a 1100 ppm set point relates to a 15 CFM per person design. Use the 1100 ppm curve on Fig. 21 to find the point when the CO₂ sensor output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the CO₂ sensor should be 1800 ppm. The Economizer controller will output the 6.7 volts from the CO₂ sensor to the actuator when the CO₂ concentration in the space is at 1100 ppm.

The DCV set point may be left at 2 volts since the CO₂ sensor voltage will be ignored by the Economizer controller until it rises above the 3.6 volt setting of the minimum position potentiometer. Once the fully occupied damper position has been determined, set the maximum damper demand control ventilation potentiometer to this position. Do not set to the maximum position as this can result in over ventilation to the space and potential high-humidity levels.

CO₂ SENSOR CONFIGURATION — The CO₂ sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. Use setting 1 or 2 for equipment. See Table 8.

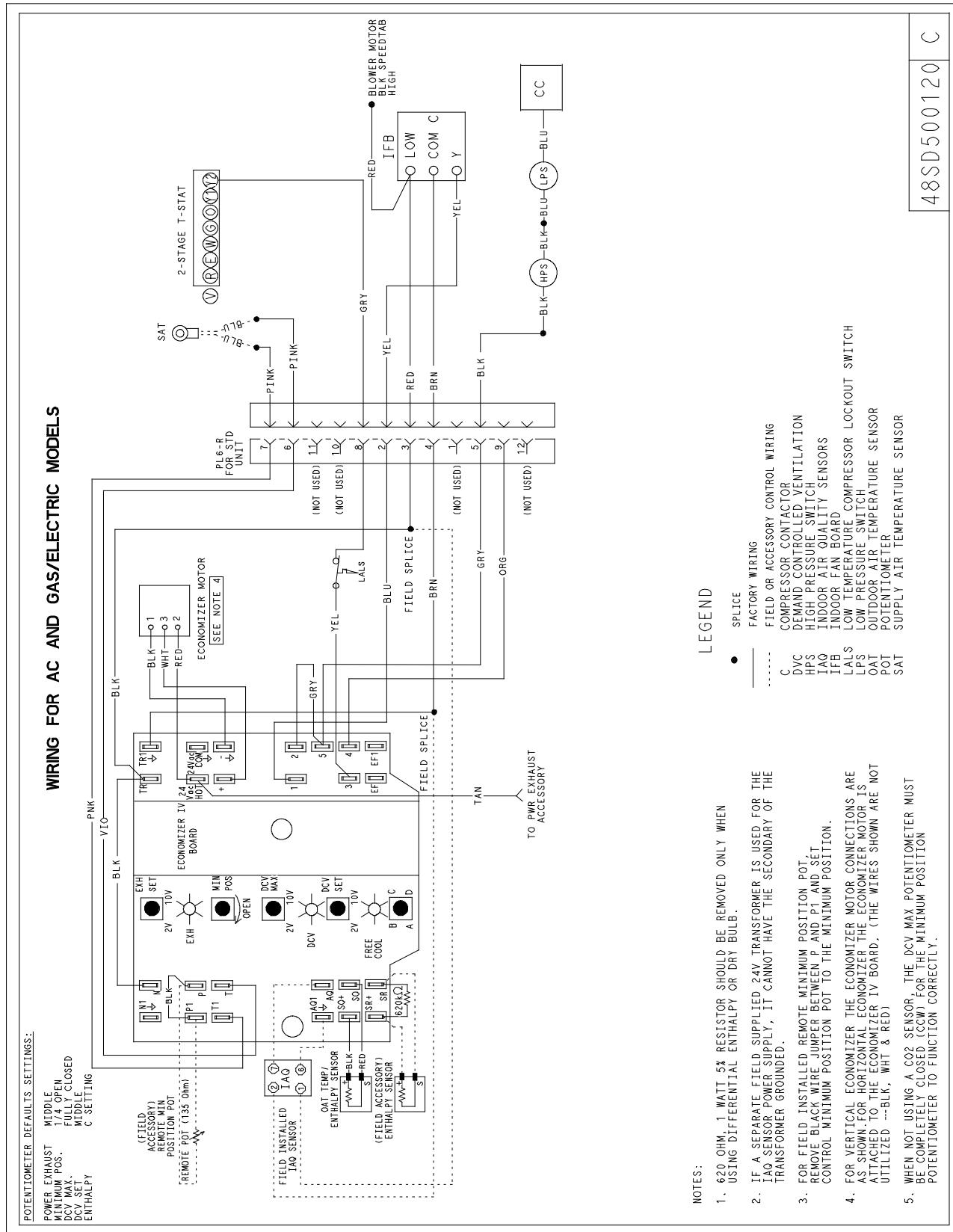
1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. See Table 8.
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

The custom settings of the CO₂ sensor can be changed anytime after the sensor is energized. Follow the steps below to change the nonstandard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to toggle to the NONSTD menu and press Enter.
4. Use the Up/Down button to toggle through each of the nine variables, starting with Altitude, until the desired setting is reached.
5. Press Mode to move through the variables.
6. Press Enter to lock in the selection, then press Mode to continue to the next variable.

DEHUMIDIFICATION OF FRESH AIR WITH DCV CONTROL—Information from ASHRAE indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, an energy recovery unit can be added to reduce the moisture content of the fresh air being brought into the building when the enthalpy is high. In most cases, the normal heating and cooling processes are more than adequate to remove the humidity loads for most commercial applications.

If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.



48SD500120 C

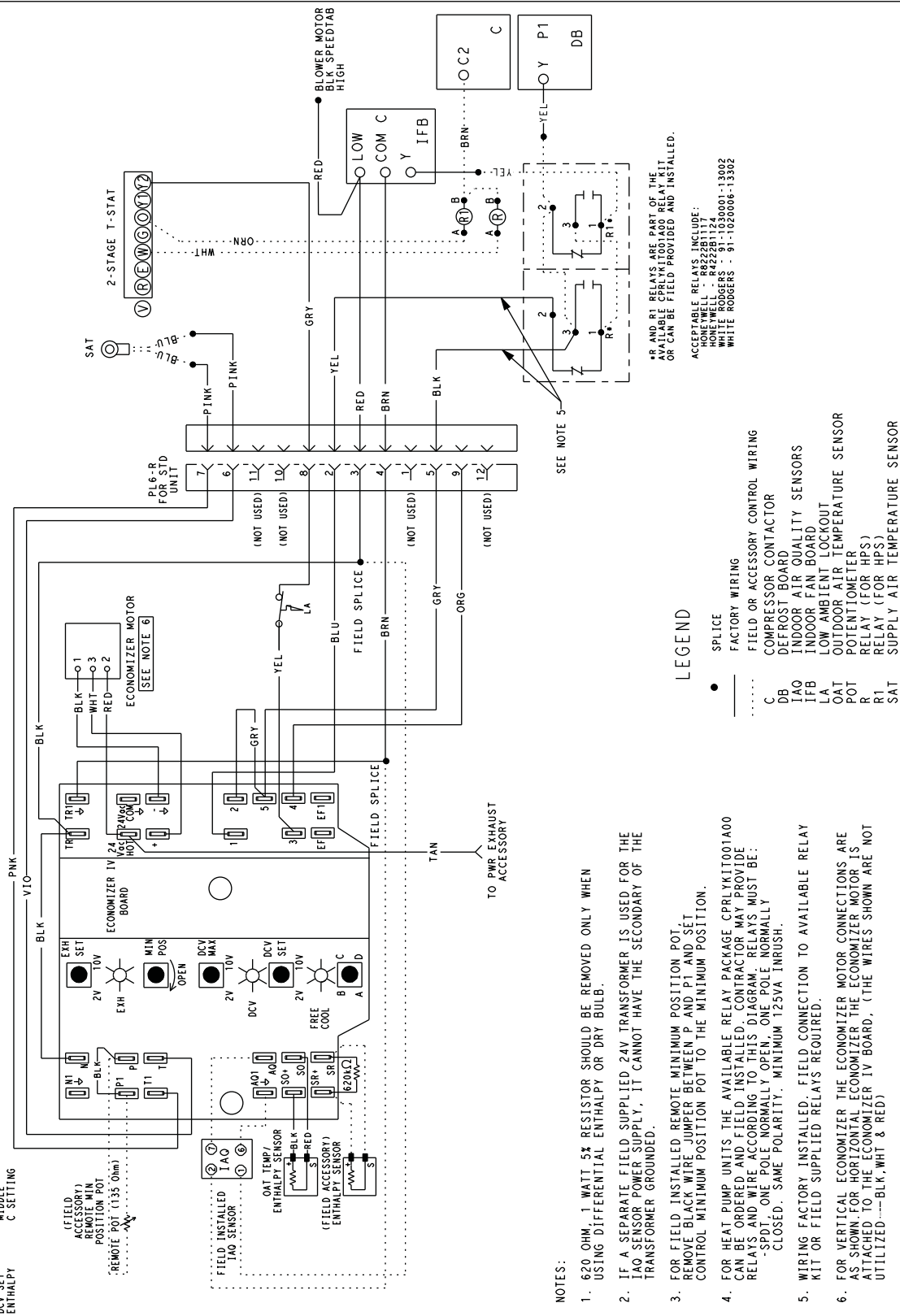
ECONOMIZER

Fig. 23 - Economizer Wiring Diagram for Packaged Air Conditioner and Gas/Electric Models

A10098

ECONOMIZER

WIRING FOR HEAT PUMP AND DUAL FUEL MODELS



50SD500305 C

Fig. 24 - Economizer Wiring Diagram for Packaged Heat Pump and Dual Fuel Models

A10059

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

NOTES:

1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH TYPE 90 DEG. C WIRE OR ITS EQUIVALENT.
2. SEE PRICE PAGES FOR THERMOSTAT AND SUBBASES.
3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - "DO NOT DISCONNECT UNDER LOAD"
5. LS2 USED ON SMALL CHASSIS ONLY.
6. INDUCER CAPACITOR AND WIRING ON CERTAIN MODELS ONLY. IF CAP2 IS PRESENT, YELLOW WIRES FROM IGC AND IDM CONNECT ON SAME SIDE OF CAP2.
7. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
8. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257005.
9. DEHUMIDIFICATION FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED.

SCHEMATIC
208/230-3-60

COLOR CODE

BK	BLACK
BL	BLUE
BR	BROWN
GY	GRAY
G	GREEN
O	ORANGE
P	PINK
R	RED
V	VIOLET
W	WHITE
Y	YELLOW

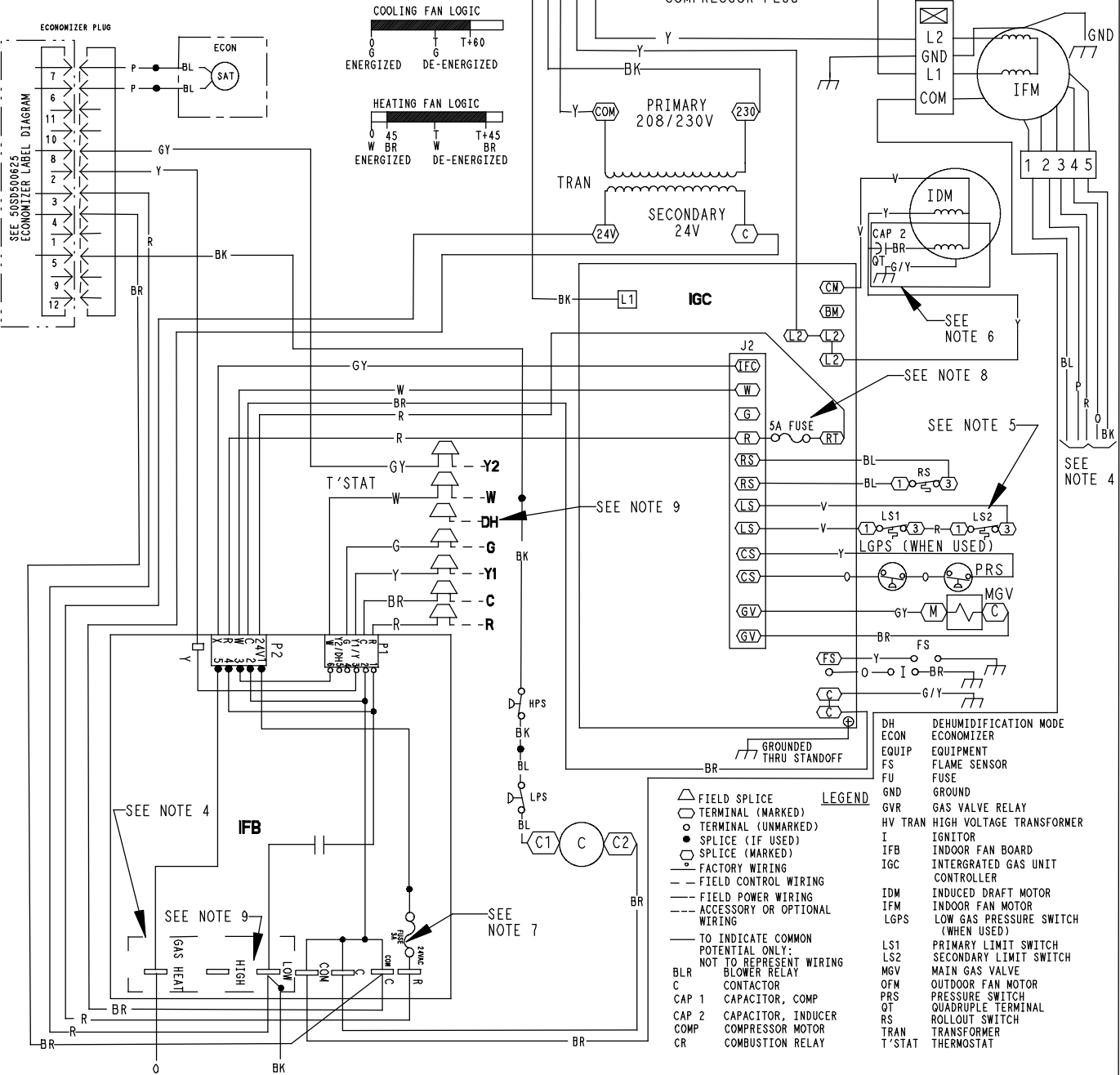


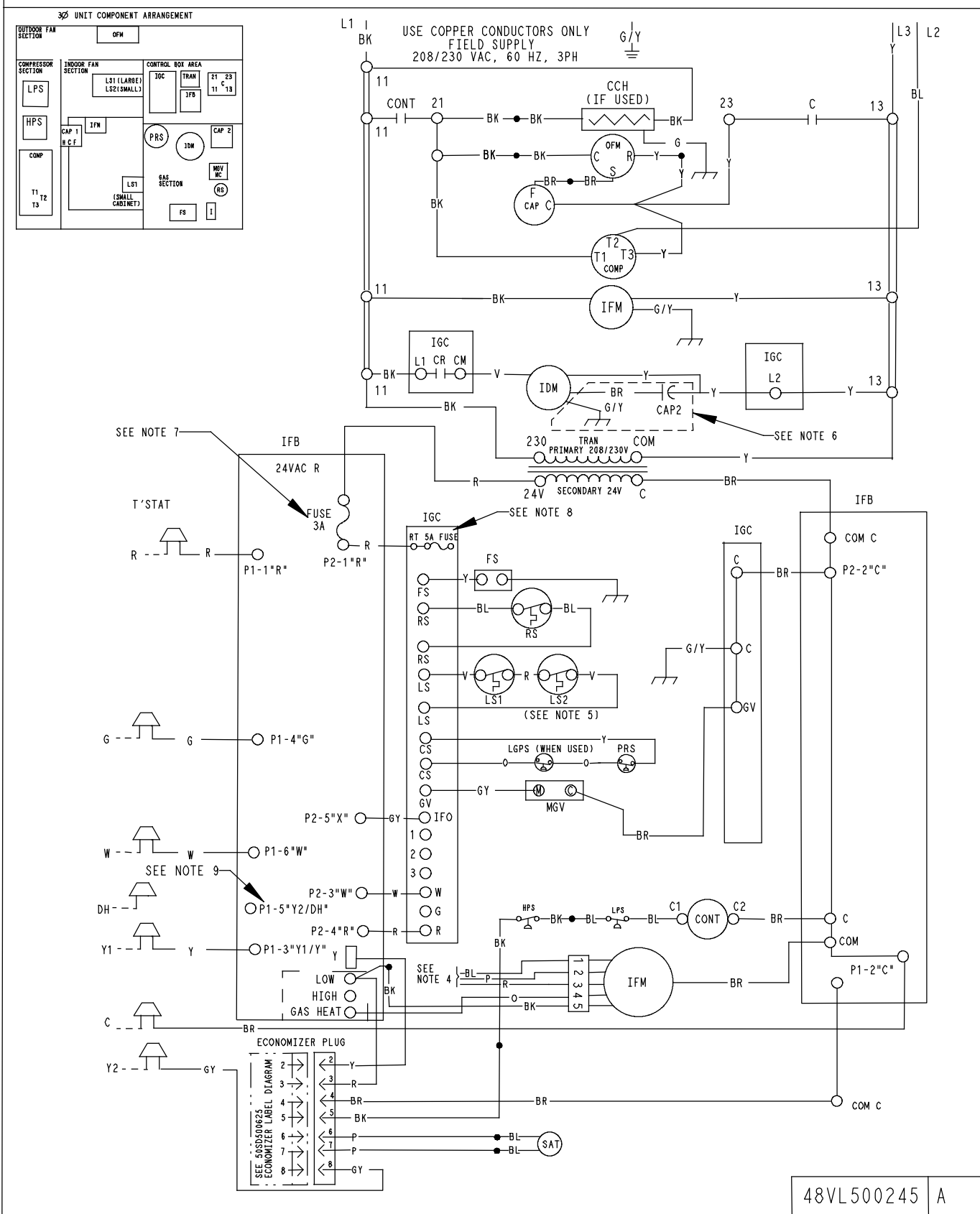
Fig. 25 - Packaged Air Conditioner and Gas Furnace Units Connection Wiring Diagram 230-3

A10073

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

ECONOMIZER



48VL500245 A

Fig. 25 Cont. - Packaged Air Conditioner and Gas Furnace Units Ladder Wiring Diagram 230-3

A10073

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

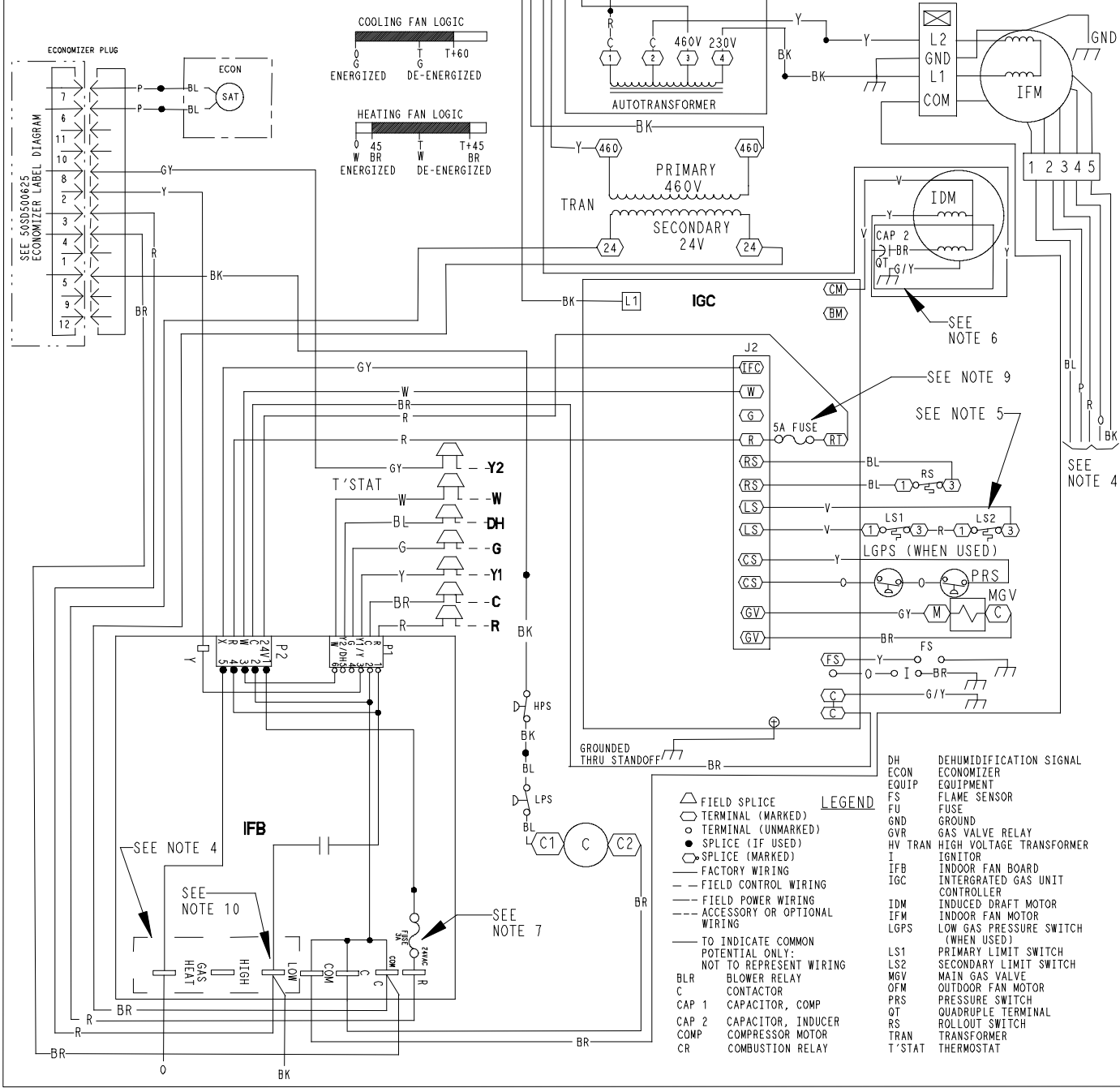
NOTES:

1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH TYPE 90 DEG. C WIRE OR ITS EQUIVALENT.
2. SEE PRICE PAGES FOR THERMOSTAT AND SUBBASES.
3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - "DO NOT DISCONNECT UNDER LOAD"
5. LS2 USED ON SMALL CHASSIS ONLY.
6. INDUCER CAPACITOR AND WIRING ON CERTAIN MODELS ONLY. IF CAP2 IS PRESENT, YELLOW WIRES FROM CONTACTOR AND IDM CONNECT ON SAME SIDE OF CAP2.
7. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
8. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257005.
9. THESE FUSES ARE MANUFACTURED BY COOPER BUSSMAN, P/N FNO-R-5.
10. DEHUMIDIFICATION FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED.

SCHEMATIC
460-3-60

COLOR CODE

BK	BLACK
BL	BLUE
BR	BROWN
GY	GRAY
G	GREEN
O	ORANGE
P	PINK
R	RED
V	VIOLET
W	WHITE
Y	YELLOW



ECONOMIZER

Fig. 26 - Packaged Air Conditioner and Gas Furnace Units Connection Wiring Diagram 460-3

A10087

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

SCHEMATIC
208/230-3-60

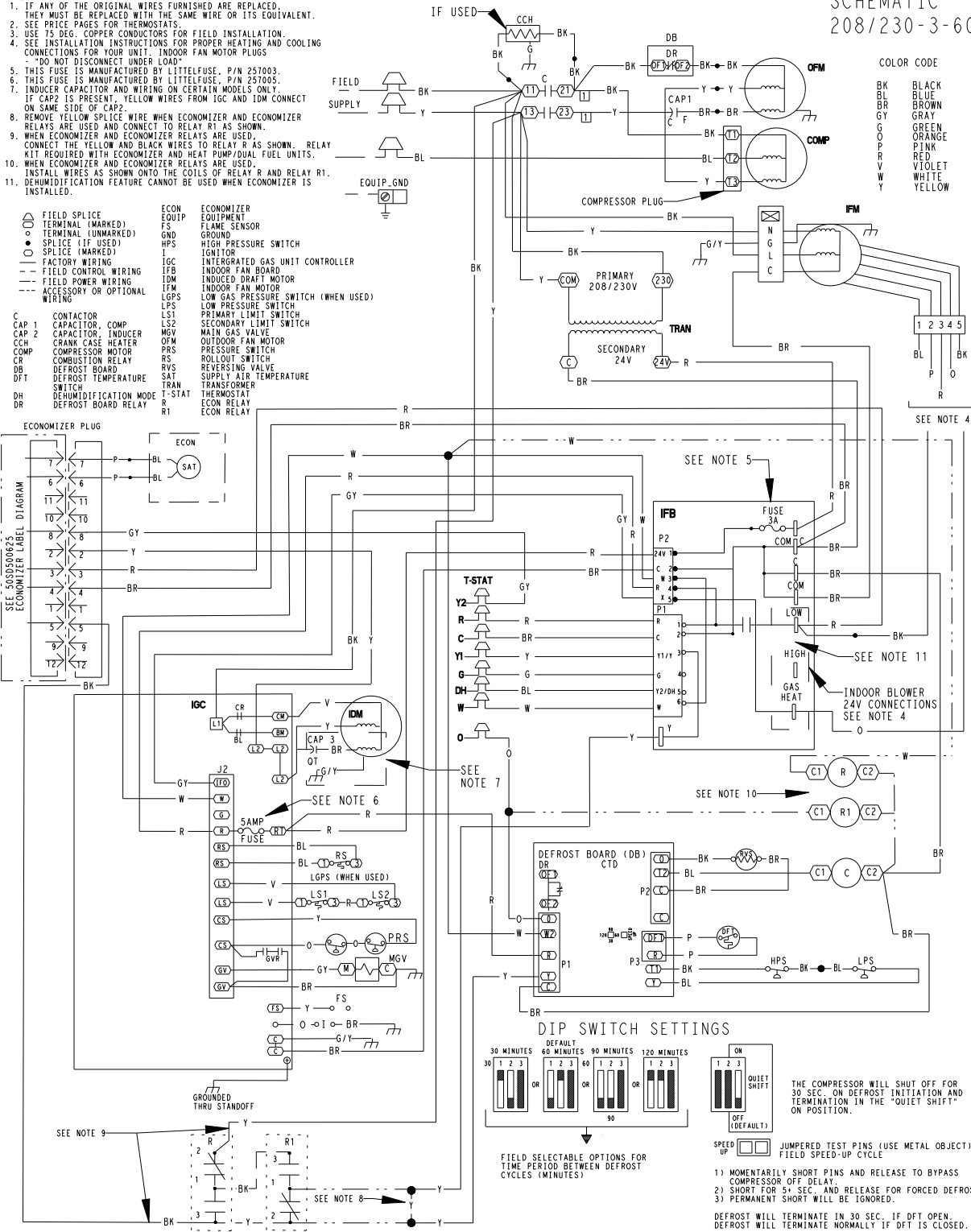
NOTES:

- IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
- SEE PRICE PAGES FOR THERMOSTATS.
- USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
- SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - "DO NOT DISCONNECT UNDER LOAD"
- THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 25T003.
- THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 25T005.
- INDUCER CAPACITOR AND WIRING ON CERTAIN MODELS ONLY. IF CAP2 IS PRESENT, YELLOW WIRES FROM IGC AND IDM CONNECT ON SAME SIDE OF CAP2.
- REMOVE YELLOW SPLICE WIRE WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED AND CONNECT TO RELAY R1 AS SHOWN.
- WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, CONNECT THE YELLOW AND BLACK WIRES TO RELAY R AS SHOWN. RELAY KIT REQUIRED WITH ECONOMIZER AND HEAT PUMP/DUAL FUEL UNITS.
- WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, INSTALL WIRES AS SHOWN ONTO THE COILS OF RELAY R AND RELAY R1.
- DEHUMIDIFICATION FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED.

- | | |
|--|---|
| <ul style="list-style-type: none"> ○ FIELD SPLICE ○ TERMINAL (UNMARKED) ○ SPLICE (IF USED) ○ SPLICE (MARKED) ○ FACTORY WIRING ○ FIELD CONTROL WIRING ○ FIELD POWER WIRING ○ ACCESSORY OR OPTIONAL WIRING | <ul style="list-style-type: none"> ECON ECONOMIZER EQUIPMENT FS FLAME SENSOR GND GROUND HPS HIGH PRESSURE SWITCH I IGNITOR IGC INTEGRATED GAS UNIT CONTROLLER IFB INDOOR FAN BOARD IDM INDUCED DRAFT MOTOR IFM INDOOR FAN MOTOR LGPS LOW GAS PRESSURE SWITCH (WHEN USED) LPS LOW PRESSURE SWITCH LS1 PRIMARY LIMIT SWITCH LS2 SECONDARY LIMIT SWITCH MGV MAIN GAS VALVE OFM OUTDOOR FAN MOTOR PRS PRESSURE SWITCH RS ROLL-OUT SWITCH RVS REVERSING VALVE SAT SUPPLY AIR TEMPERATURE SWITCH TRAN TRANSFORMER T-STAT THERMOSTAT R1 ECON RELAY |
|--|---|

COLOR CODE

BK	BLACK
BL	BLUE
BR	BROWN
GY	GRAY
GR	GREEN
OR	ORANGE
P	PINK
R	RED
V	VIOLET
W	WHITE
Y	YELLOW



ECONOMIZER

Fig. 27 - Packaged Heat Pump and Dual Fuel Units Connection Wiring Diagram 230-3

A10075C

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

ECONOMIZER

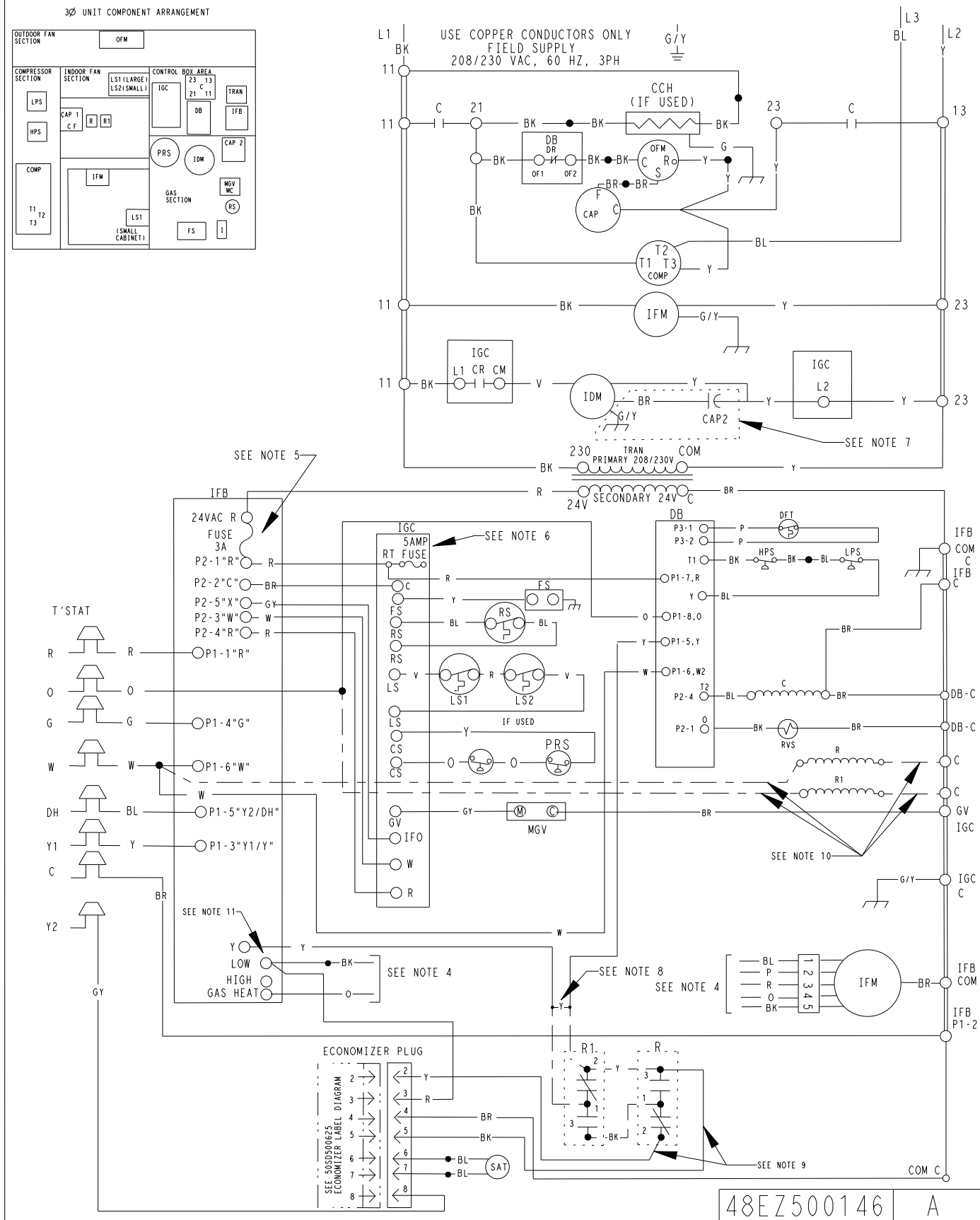


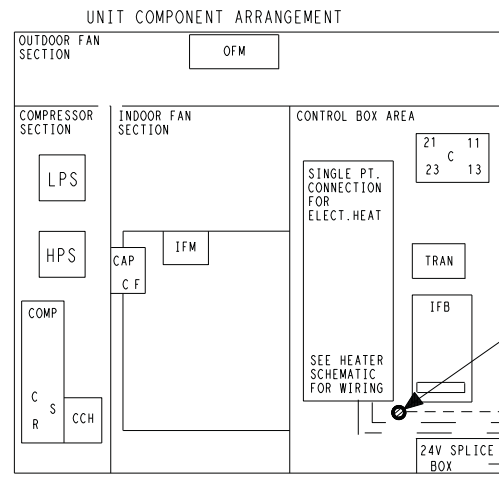
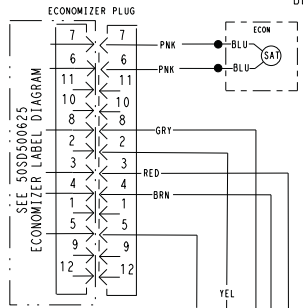
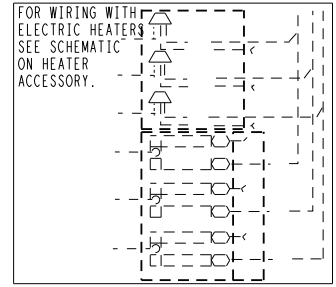
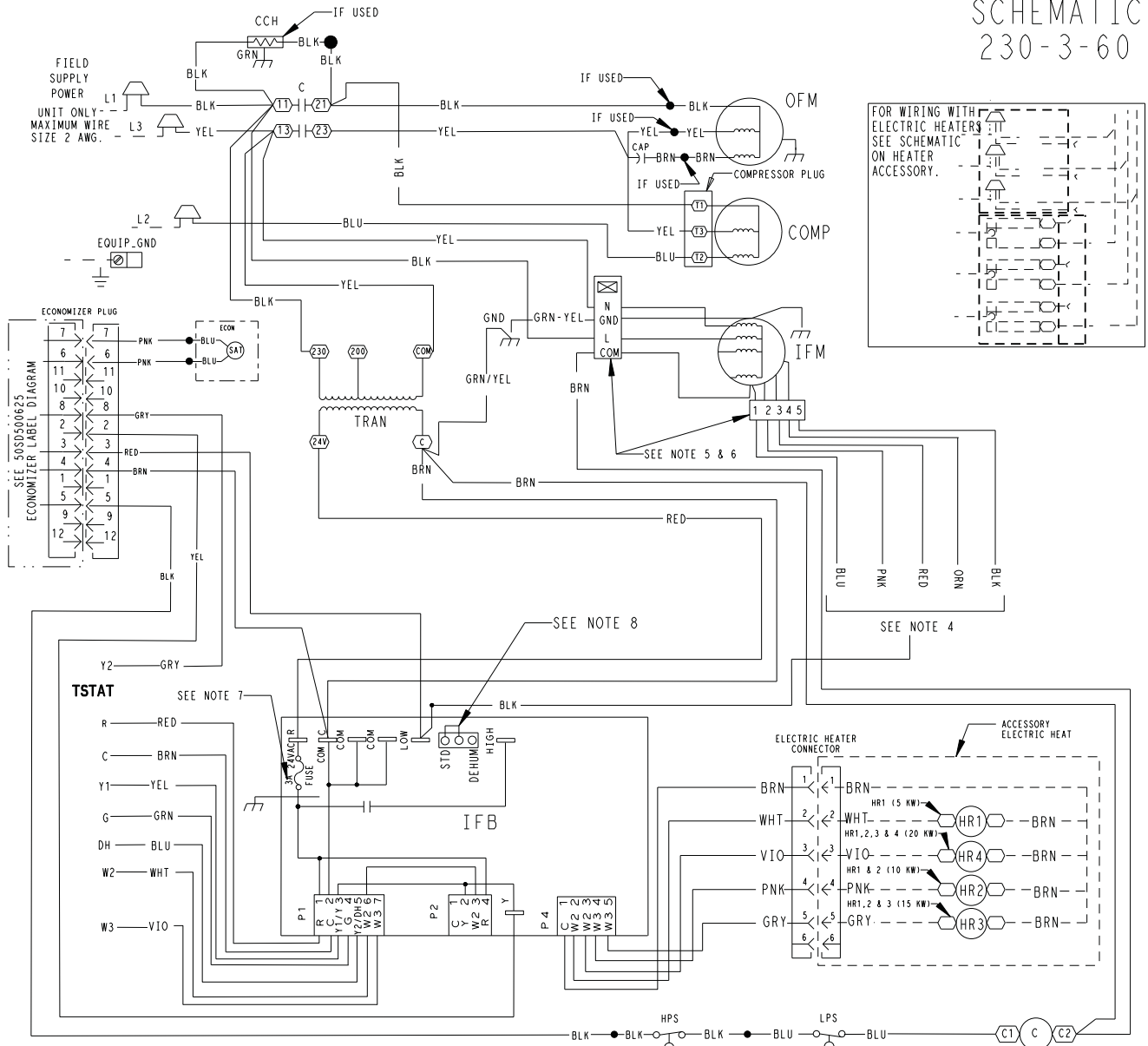
Fig. 27 Cont. - Packaged Heat Pump and Dual Fuel Units Ladder Wiring Diagram 230-3

A10075L

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

SCHEMATIC
230-3-60



COLOR CODE

BLK	BLACK
BLU	BLUE
BRN	BROWN
GRY	GRAY
GRN	GREEN
ORN	ORANGE
PNK	PINK
RED	RED
VIO	VIOLET
WHT	WHITE
YEL	YELLOW

LEGEND

△	FIELD SPLICE	CAP	CAPACITOR
○	TERMINAL (MARKED) ENERGIZED	CCH	CRANK CASE HEATER
○	TERMINAL (UNMARKED)	COMP	COMPRESSOR MOTOR
●	SPLICE (IF USED)	DH	DEHUMIDIFICATION MODE
○	SPLICE (MARKED)	DEHUM	DEHUMIDIFICATION MODE
---	FACTORY WIRING	ECON	ECONOMIZER
---	FIELD CONTROL WIRING	GND	GROUND
---	FIELD POWER WIRING	HPS	HIGH PRESSURE SWITCH
---	ACCESSORY OR OPTIONAL WIRING	HR	HEATER RELAY
---	TO INDICATE COMMON	IFB	INTERFACE FAN BOARD
POTENTIAL ONLY:		IFM	INDOOR FAN MOTOR
NOT TO REPRESENT WIRING		LPS	LOW PRESSURE SWITCH
		OFM	OUTDOOR FAN MOTOR
		STD	STANDARD MODE
		TRAN	TRANSFORMER

- NOTES:**
- IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR IT'S EQUIVALENT.
 - SEE PRICE PAGES FOR THERMOSTATS.
 - USE 75 DEGREE COPPER CONDUCTORS FOR FIELD INSTALLATION.
 - REFER TO INSTALLATION INSTRUCTIONS FOR CORRECT SPEED SELECTION OF IFM.
 - RELOCATION OF SPEED TAPS MAY BE REQUIRED WHEN USING FIELD INSTALLED ELECTRIC HEATERS, CONSULT INSTALLATION INSTRUCTIONS TO DETERMINE CORRECT SPEED TAP SETTING.
 - "DO NOT DISCONNECT PLUG UNDER LOAD."
 - THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003
 - DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPED IN STD MODE.

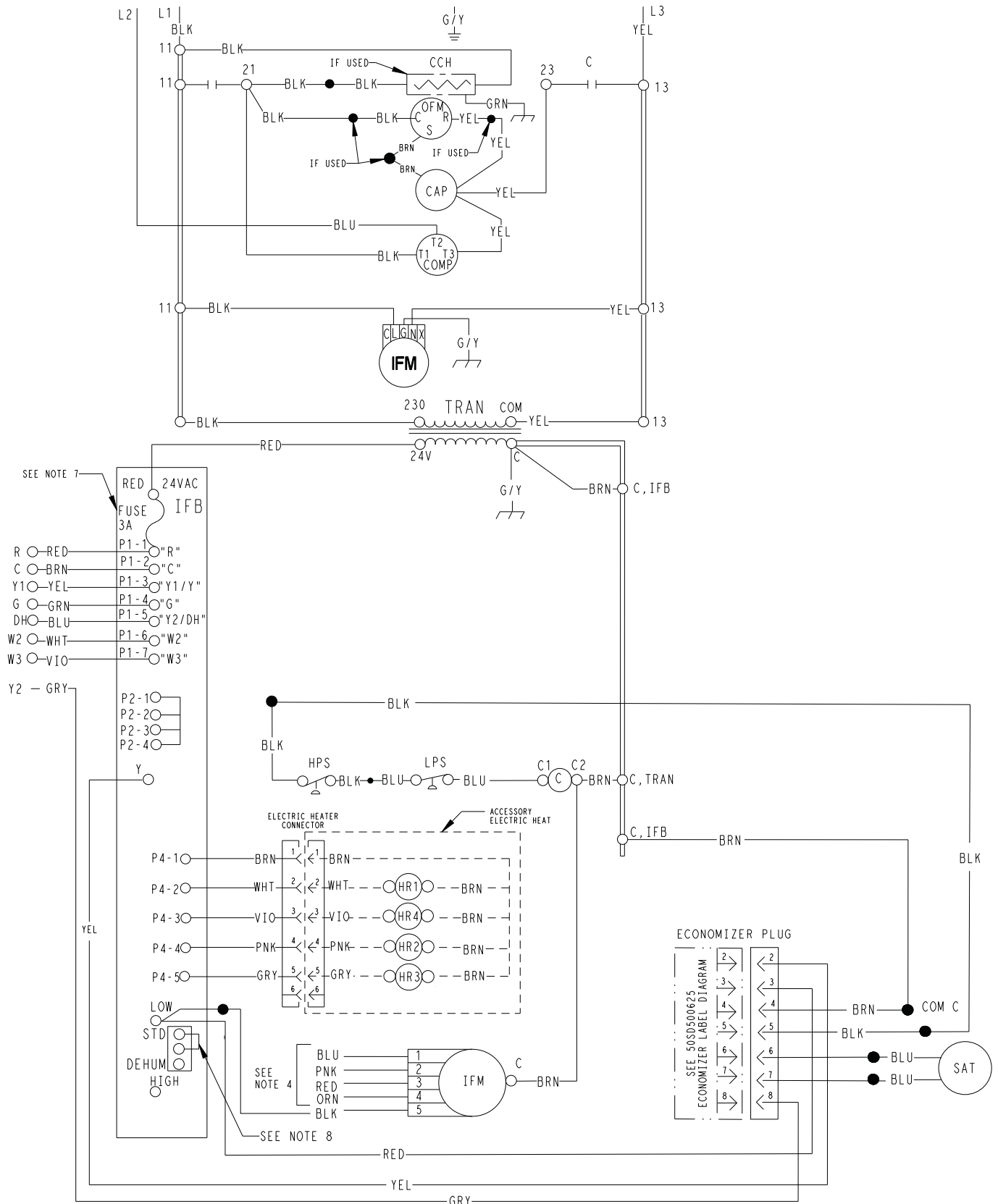
ECONOMIZER

Fig. 28 - Packaged Air Conditioner Units Connection Wiring Diagram 230-3

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

ECONOMIZER



50VL500378 B

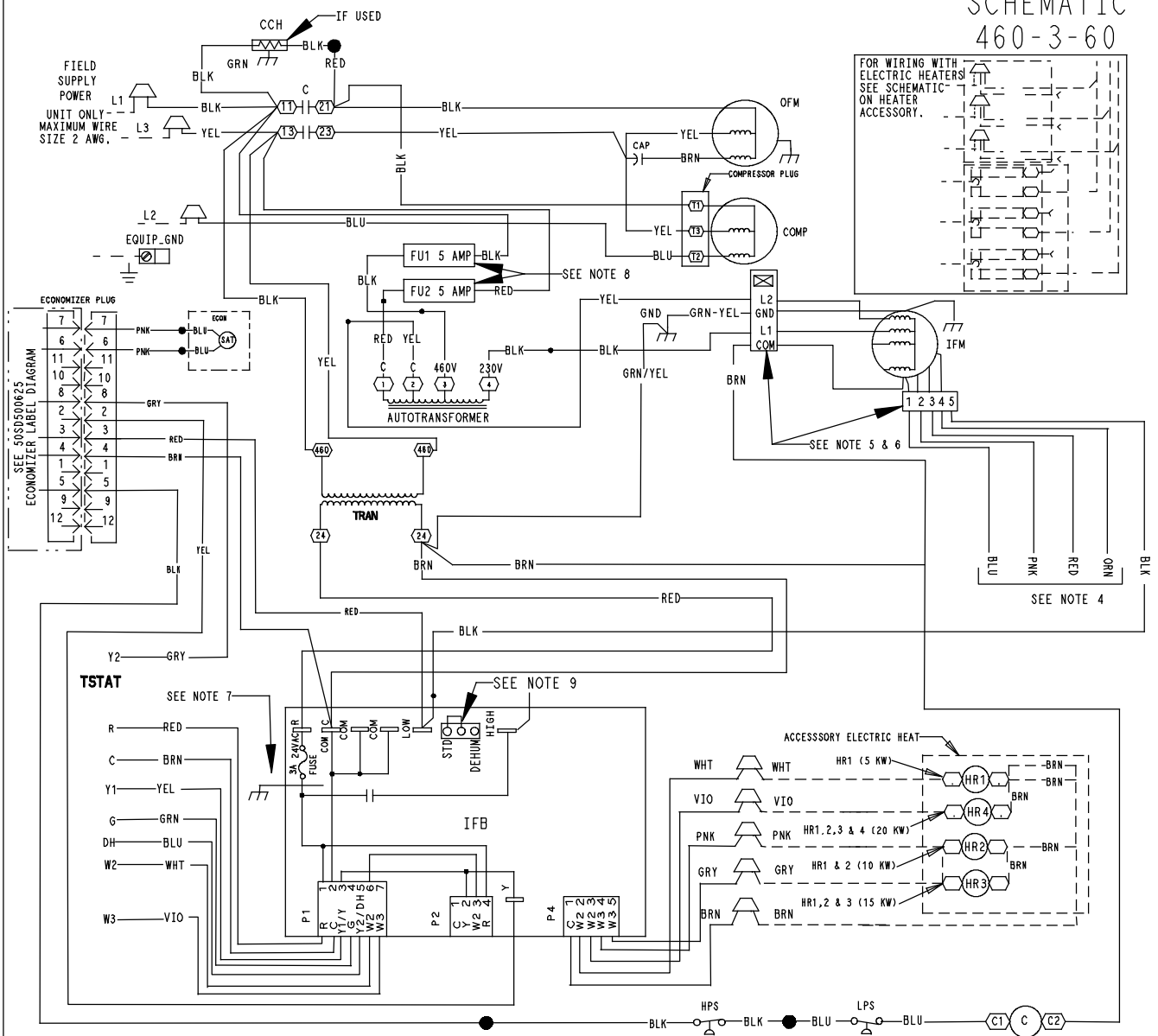
Fig. 28 Cont. - Packaged Air Conditioner Units Ladder Wiring Diagram 230-3

A11011

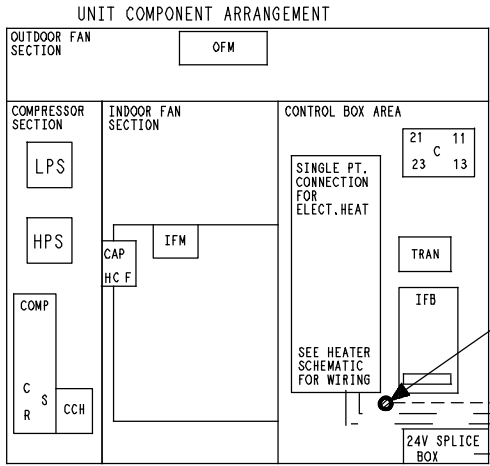
CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

SCHEMATIC
460-3-60



ECONOMIZER



LEGEND

△	FIELD SPLICE	C	CONTACTOR
□	TERMINAL (MARKED) ENERGIZED	CAP	CAPACITOR
○	TERMINAL (UNMARKED)	CCH	CRANK CASE HEATER
●	SPLICE (IF USED)	COMP	COMPRESSOR MOTOR
○	SPLICE (MARKED)	DH	DEHUMIDIFICATION MODE
—	FACTORY WIRING	DEHUM	DEHUMIDIFICATION MODE
---	FIELD CONTROL WIRING	ECON	ECONOMIZER
---	FIELD POWER WIRING	GND	GROUND
---	ACCESSORY OR OPTIONAL WIRING	HPS	HIGH PRESSURE SWITCH
---	TO INDICATE COMMON	HR	HEATER RELAY
---	POTENTIAL ONLY	IFB	INTERFACE FAN BOARD
---	NOT TO REPRESENT WIRING	IFM	INDOOR FAN MOTOR
		LPS	LOW PRESSURE SWITCH
		OFM	OUTDOOR FAN MOTOR
		STD	STANDARD MODE
		TRAN	TRANSFORMER

- NOTES:**
- IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, IT MUST BE REPLACED WITH TYPE 90 DEGREE C WIRE OR IT'S EQUIVALENT.
 - SEE PRICE PAGES FOR THERMOSTAT AND SUBBASES.
 - USE 75 DEGREE COPPER CONDUCTORS FOR FIELD INSTALLATION.
 - REFER TO INSTALLATION INSTRUCTIONS FOR CORRECT SPEED SELECTION OF IFM.
 - RELOCATION OF SPEED TAPS MAY BE REQUIRED WHEN USING FIELD INSTALLED ELECTRIC HEATERS, CONSULT INSTALLATION INSTRUCTIONS TO DETERMINE CORRECT SPEED TAP SETTING.
 - *DO NOT DISCONNECT PLUS UNDER LOAD.
 - THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003
 - THESE FUSES ARE MANUFACTURED BY COOPER BUSSMAN, P/N FNG-R-5
 - DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPPED IN STD MODE.

Fig. 29 - Packaged Air Conditioner Units Connection Wiring Diagram 460-3

A10203

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

ECONOMIZER

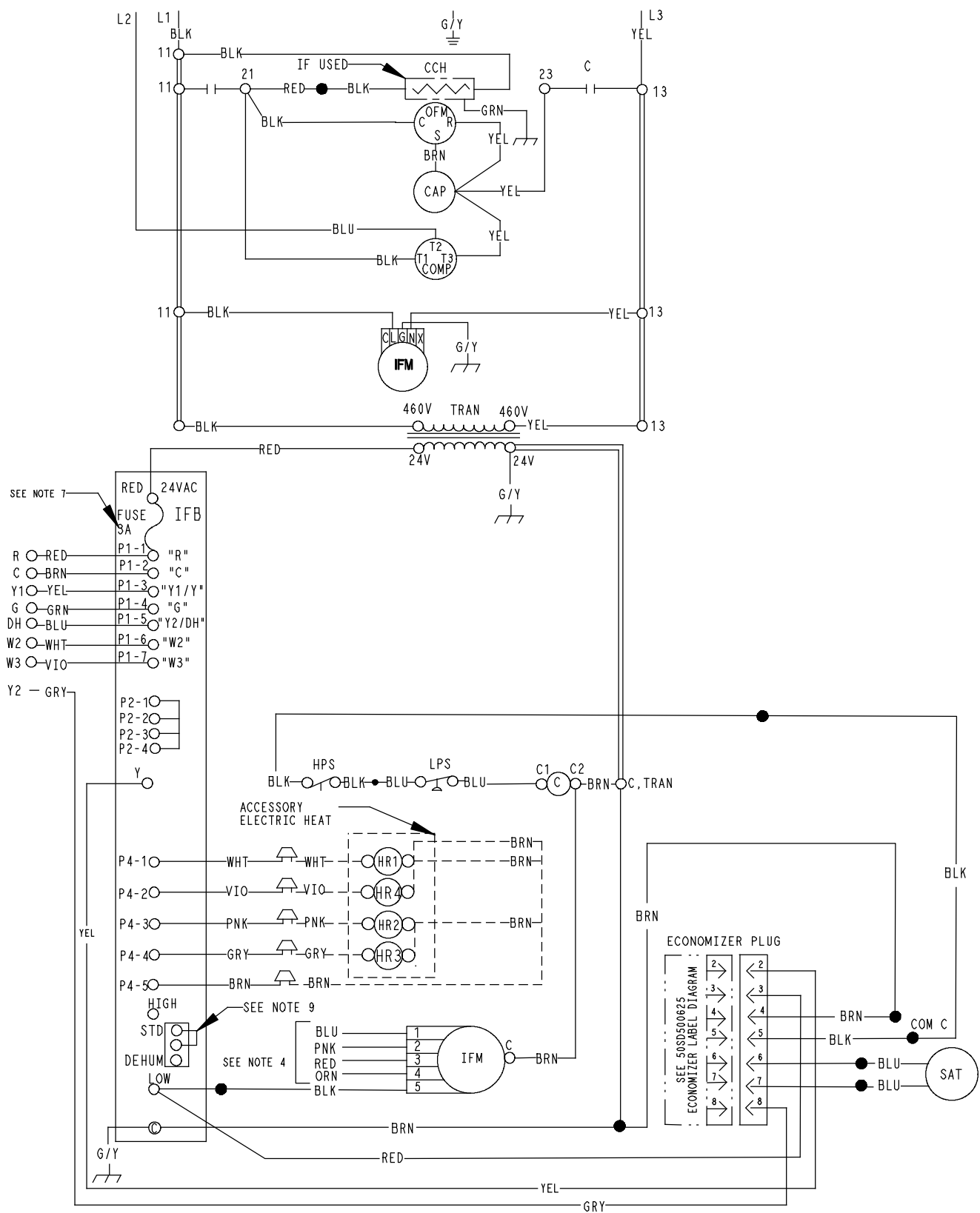


Fig. 29 Cont. - Packaged Air Conditioner Units Ladder Wiring Diagram 460-3

A10203

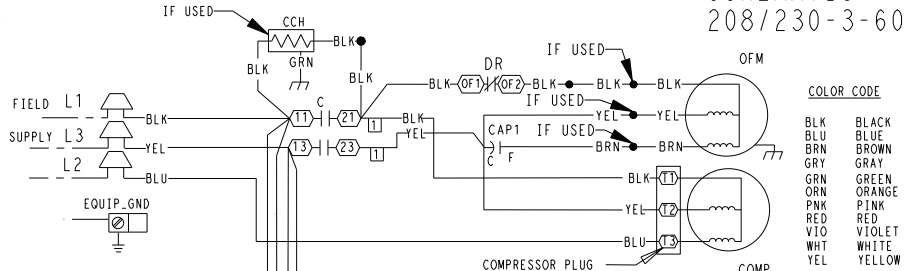
CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

SCHEMATIC
208/230-3-60

NOTES:

- IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
- SEE PRICE PAGES FOR THERMOSTATS.
- USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
- SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - "DO NOT DISCONNECT UNDER LOAD"
- THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
- DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPPED IN STD. MODE.



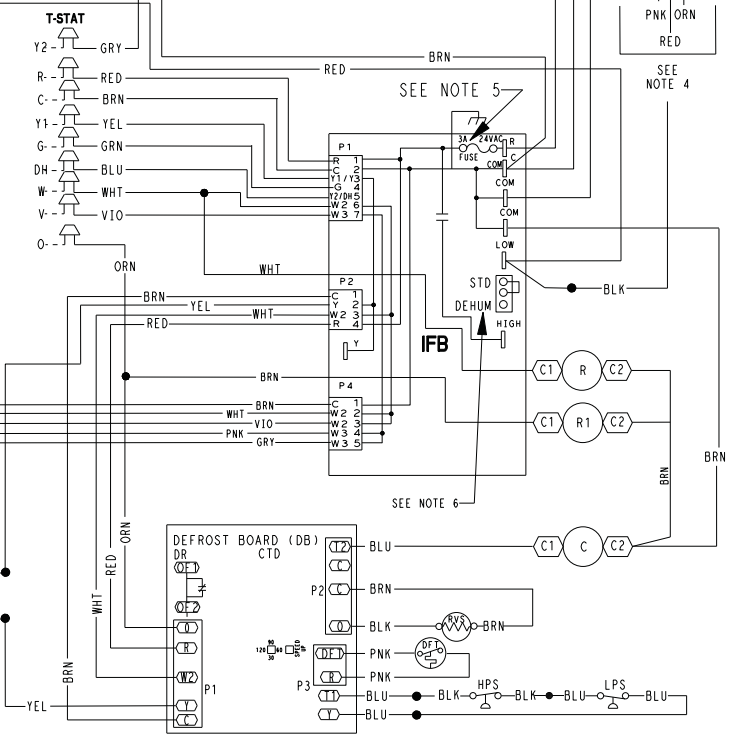
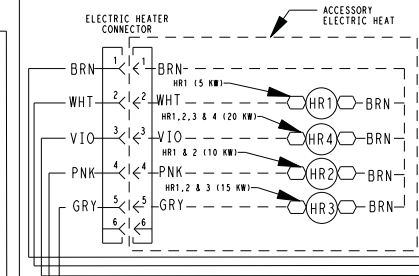
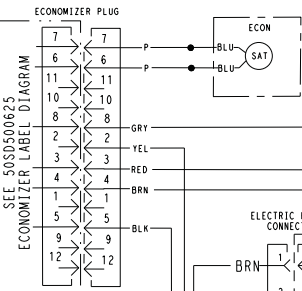
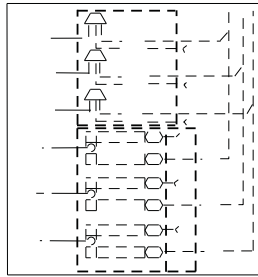
COLOR CODE

BLK	BLACK
BLU	BLUE
BRN	BROWN
GRY	GRAY
GRN	GREEN
ORN	ORANGE
PNK	PINK
RED	RED
VIO	VIOLET
WHT	WHITE
YEL	YELLOW

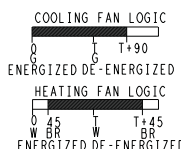
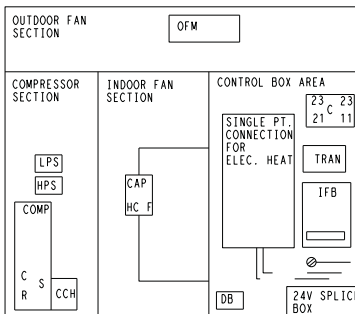
LEGEND

- | | | | |
|-------|------------------------------|--------|-----------------------|
| △ | FIELD SPlice | DH | DEHUMIDIFICATION MODE |
| ○ | TERMINAL (MARKED) | DR | DEHUMIDIFICATION MODE |
| ○ | TERMINAL (UNMARKED) | ECON | ECONOMIZER |
| ○ | SPLICE (IF REQ'D) | FU | EQUIPMENT FUSE |
| ○ | SPLICE (MARKED) | GND | GROUND |
| --- | FACTORY WIRING | HPS | HIGH PRESSURE SWITCH |
| --- | FIELD CONTROL WIRING | HR | HEATER RELAY |
| --- | FIELD POWER WIRING | IFB | INDOOR FAN BOARD |
| --- | ACCESSORY OR OPTIONAL WIRING | IFM | INDOOR FAN MOTOR |
| AT | AUTO TRANSFORMER 460V - 230V | LPS | LOW PRESSURE SWITCH |
| C | CONTACTOR | OFM | OUTDOOR FAN MOTOR |
| CAP 1 | CAPACITOR, COMP | OFR | OUTDOOR FAN RELAY |
| COMP | COMPRESSOR MOTOR | RVS | REVERSING VALVE |
| DB | DEFROST BOARD | TRAN | TRANSFORMER |
| DFT | DEFROST TEMPERATURE SWITCH | T-STAT | THERMOSTAT |
| | | R | ECON RELAY |
| | | R1 | ECON RELAY |
| | | STD | STANDARD MODE |

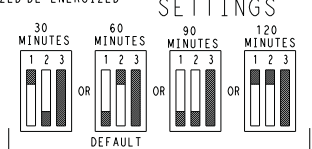
FOR WIRING WITH ELECTRIC HEATERS SEE SCHEMATIC ON HEATER ACCESSORY.



UNIT COMPONENT ARRANGEMENT



DIP SWITCH SETTINGS



FIELD SELECTABLE OPTIONS FOR TIME PERIOD BETWEEN DEFROST CYCLES (MINUTES)

- SPEED UP JUMPERED TEST PINS (USE METAL OBJECT) FIELD SPEED-UP CYCLE
- MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY.
 - SHORT FOR 5+ SEC. AND RELEASE FOR FORCED DEFROST.
 - PERMANENT SHORT WILL BE IGNORED.
- DEFROST WILL TERMINATE IN 30 SEC. IF DFT OPEN. DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.
- THE COMPRESSOR WILL SHUT OFF FOR 30 SEC. ON DEFROST INITIATION AND TERMINATION IN THE "QUIET SHIFT" ON POSITION

ECONOMIZER

Fig. 30 - Packaged Heat Pump Units Connection Wiring Diagram 230-3

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

ECONOMIZER

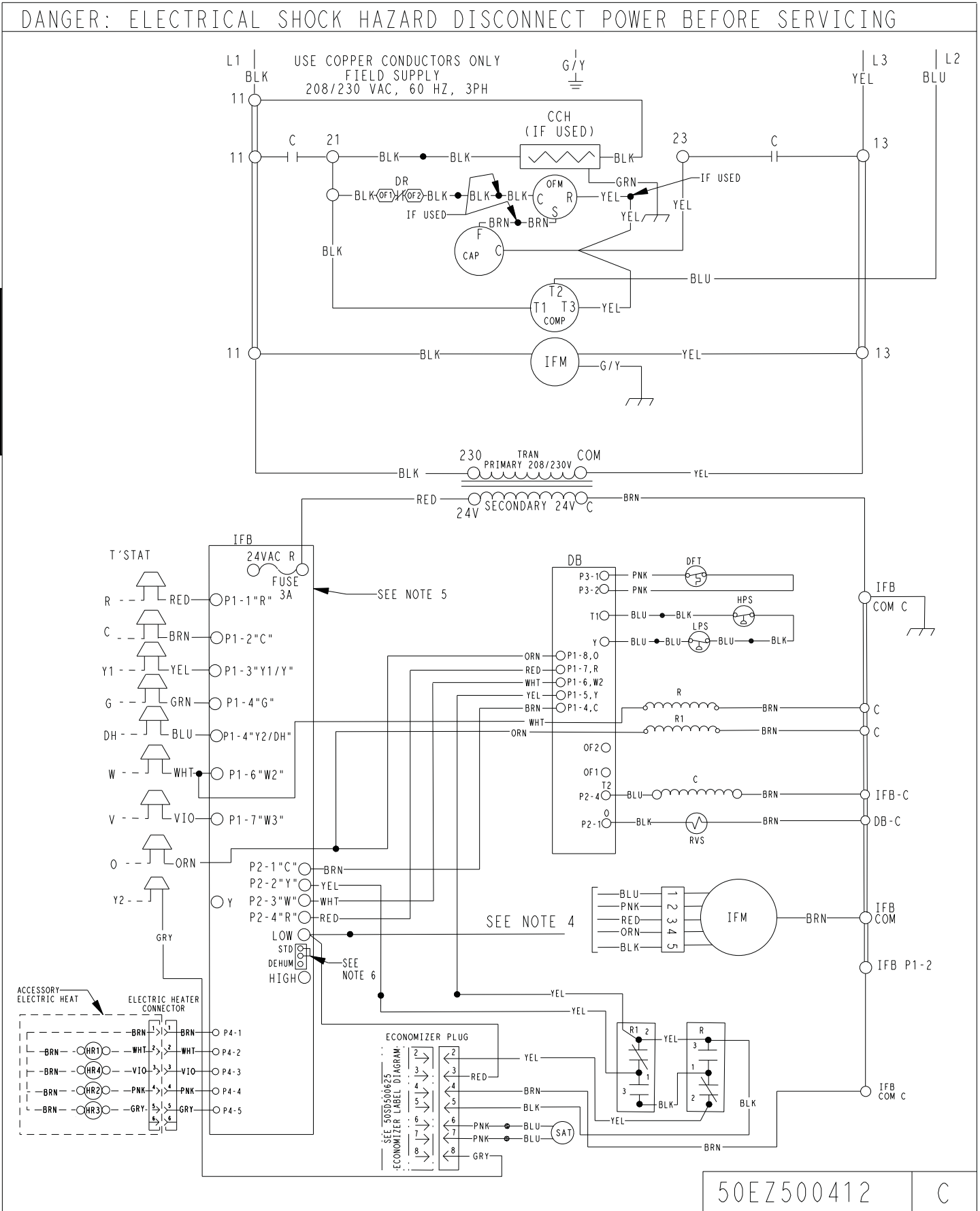


Fig. 30 Cont. - Packaged Heat Pump Units Ladder Wiring Diagram 230-3

A11007

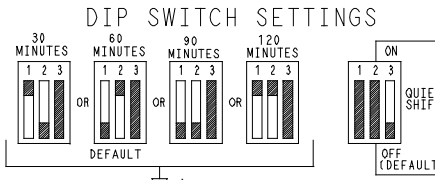
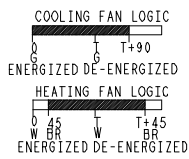
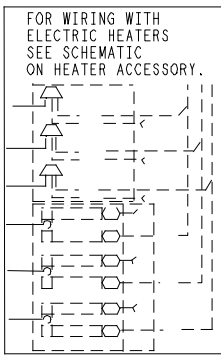
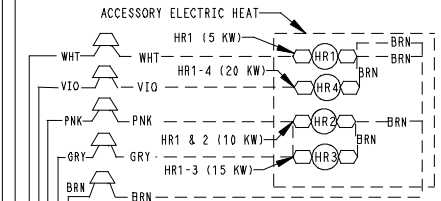
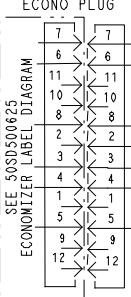
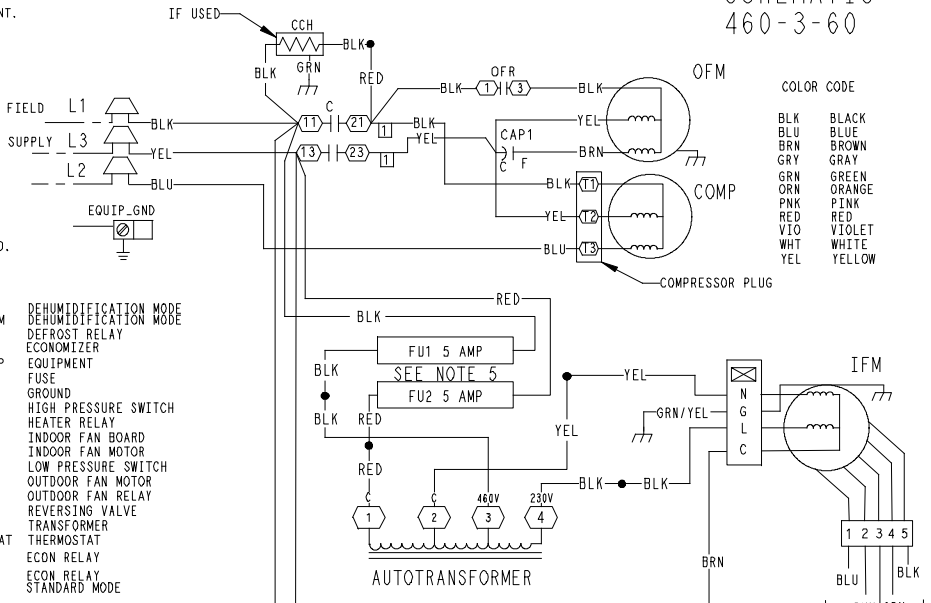
CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

SCHEMATIC
460-3-60

NOTES:

1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
2. SEE PRICE PAGES FOR THERMOSTATS.
3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - *DO NOT DISCONNECT UNDER LOAD*
5. THESE FUSES ARE MANUFACTURED BY COOPER BUSSMANN, P/N FNO-R-5.
6. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
7. REMOVE YELLOW SPLICE WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED AND CONNECT TO RELAY R1 AS SHOWN.
8. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, CONNECT THE YELLOW AND BLACK WIRES TO RELAY "R" AS SHOWN. RELAY KIT REQUIRED WITH ECONOMIZER AND HEAT PUMP/DUAL FUEL UNITS.
9. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, INSTALL WIRES AS SHOWN ONTO THE COILS OF RELAY R AND RELAY R1.
10. DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPPED IN STD. MODE.



- SPEED UP** JUMPED TEST PINS (USE METAL OBJECT) FIELD SPEED-UP CYCLE
- 1) MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY.
 - 2) SHORT FOR 5+ SEC. AND RELEASE FOR FORCED DEFROST.
 - 3) PERMANENT SHORT WILL BE IGNORED.
- DEFROST WILL TERMINATE IN 30 SEC. IF DFT OPEN. DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.
- THE COMPRESSOR WILL SHUT OFF FOR 30 SEC. ON DEFROST INITIATION AND TERMINATION IN THE "QUIET SHIFT" ON POSITION

ECONOMIZER

Fig. 31 - Packaged Heat Pump Units Connection Wiring Diagram 460-3

A10199

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

ECONOMIZER

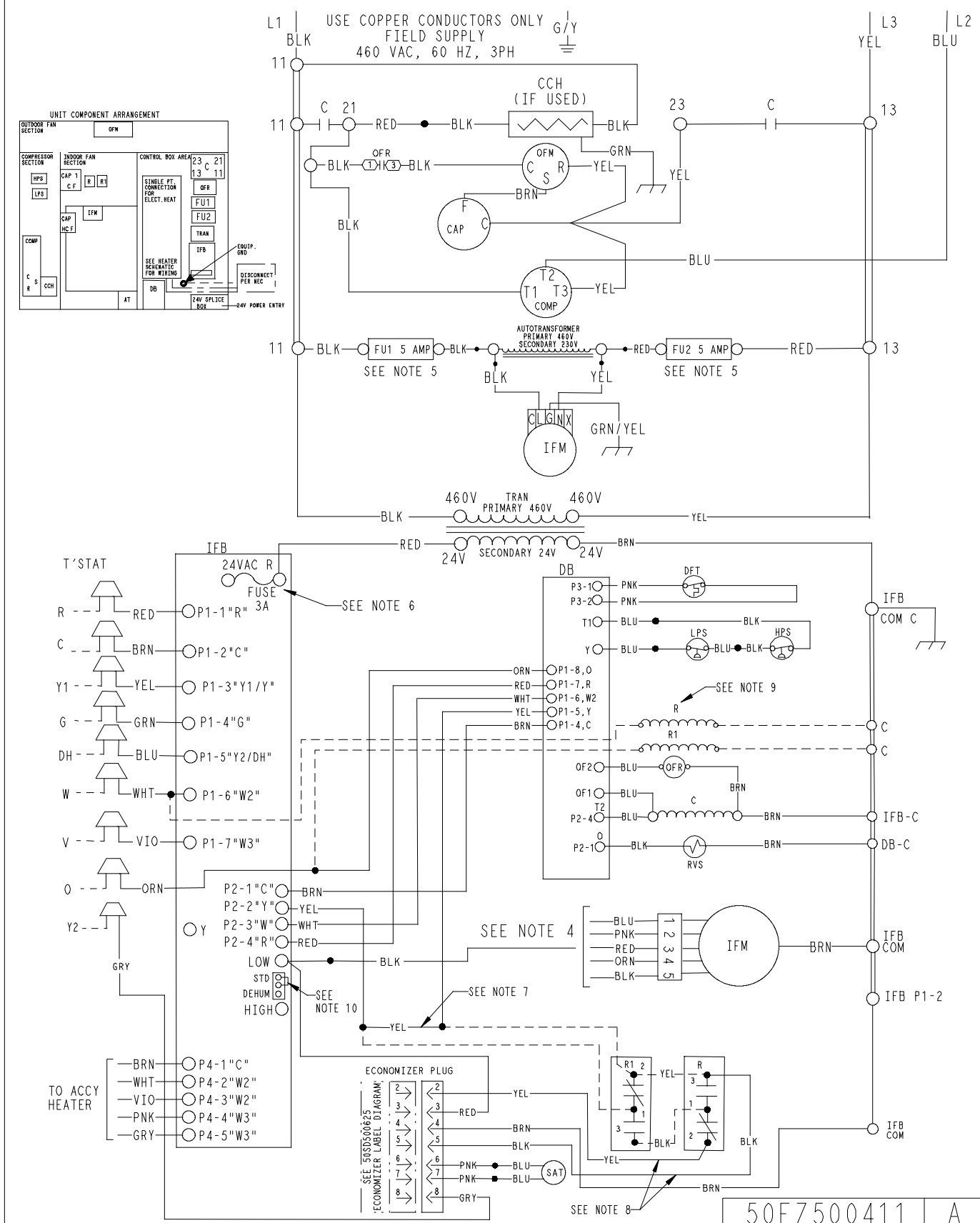


Fig. 31 Cont. - Packaged Heat Pump Units Ladder Wiring Diagram 460-3

A10199

Table 8 – CO₂ Sensor Standard Settings

SETTING	EQUIPMENT	OUTPUT	VENTILATION RATE (CFM/PERSON)	ANALOG OUTPUT	CO ₂ CONTROL RANGE (PPM)	OPTIONAL RELAY SETPOINT (PPM)	RELAY HYSTERESIS (PPM)
1		Proportional	Any	0–10V 4–20mA	0–2000	1000	50
2	Interface w/Standard Building Control System	Proportional	Any	2–10V 7–20mA	0–2000	1000	50
3		Exponential	Any	0–10V 4–20mA	0–2000	1100	50
4		Proportional	15	0–10V 4–20mA	0–1100	1100	50
5	Economizer	Proportional	20	0–10V 4–20mA	0–900	900	50
6		Exponential	15	0–10V 4–20mA	1–1100	1100	50
7		Exponential	20	0–10V 4–20mA	0–900	900	50
8	Health & Safety	Proportional	–	0–10V 4–20mA	0–9999	5000	500
9	Parking/Air Intakes/Loading Docks	Proportional	–	0–10V 4–20mA	0–2000	700	50

Table 9 – CO₂ Sensor Standard Settings Economizer Input/Output Logic

DEMAND CONTROL VENTILATION (DCV)	INPUTS				OUTPUTS			
	ENTHALPY		Y1	Y2	COMPRESSOR		N TERMINAL	
	OUTDOOR	RETURN			STAGE 1	STAGE 2	OCCUPIED	UNOCCUPIED
			DAMPER					
Below set (DCV LED Off)	High (Free Cooling LED off)	Low	On	On	On	On	Minimum position	Closed
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED on)	High	On	On	On	Off	Modulating** (between min. position and full–open)	Modulating** (between closed and full–open)
			On	Off	Off	Off		
			Off	Off	Off	Off	Minimum position	Closed
Above set (DCV LED On)	High (Free Cooling LED off)	Low	On	On	On	On	Modulating†† (between min. position and DCV maximum)	Modulating†† (between closed and DCV maximum)
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED on)	High	On	On	On	Off	Modulating***	Modulating†††
			On	Off	Off	Off		
			Off	Off	Off	Off		

* For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.

† Power at N terminal determines Occupied/Unoccupied setting: 24 vac (Occupied), now power (Unoccupied).

**Modulating is based on the supply–air sensor signal.

††Modulation is based on the DCV signal.

***Modulation is based on the greater of DCV and supply–air sensor signals, between minimum position and either maximum position (DCV) or fully open (supply–air signal).

†††Modulating is based on the greater of DCV and supply–air sensor signals, between closed and wither maximum position (DCV) or fully open (supply–air signal).

OPERATION

Sequence of Operation—When free cooling is not available, the compressor will be controlled by the thermostat. When free cooling is available, the outdoor–air damper is modulated by the Economizer control to provide a 50° to 55°F (10° to 12.8°C) supply–air temperature into the zone. As the supply–air temperature fluctuates above 55° (12.8°C) or below 50°F (10°C), the dampers will be modulated (open or close) to bring the supply–air temperature back within the set points. For Economizer operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position during the occupied mode.

NOTE: The DCV Max potentiometer must be closed (CCW) when not using CO₂ sensor.

Above 50°F (10°C) supply–air temperature, the dampers will modulate from 100% open to the minimum open position. From 50°F to 45°F (10° to 7.2°C) supply–air temperature, the dampers will maintain at the minimum open position. Below 45°F (7.2°C), the dampers will be completely shut. As the supply–air temperature rises, the dampers will come back open to the minimum open position once the supply–air temperature rises to 48°F (8.9°C). If power

exhaust is installed, as the outdoor–air damper opens and closes, the power exhaust fans will be energized and deenergized. If field–installed accessory CO₂ sensors are connected to the Economizer control, a demand controlled ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ set point, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor–air damper will be proportionally closed. Damper position will follow the higher demand condition from DCV mode or free cooling mode. Damper movement from full closed to full open (or vice versa) will take between 1 1/2 and 2 1/2 minutes. If free cooling can be used as determined from the appropriate changeover command (dry bulb, enthalpy curve, or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the control to modulate the dampers open to maintain the supply air temperature set point at 50° to 55°F (10° to 12.8°C). As the supply air temperature drops below the set point range of 50° to 55°F (10° to 12.8°C), the control will modulate the outdoor–air dampers closed to maintain the proper supply–air temperature.

ECONOMIZER

TROUBLESHOOTING

See Table 9 for Economizer logic. An Economizer simulator program is available to help with Economizer training and troubleshooting.

Economizer Preparation —This procedure is used to prepare the Economizer for troubleshooting. No troubleshooting or testing is done by performing the following procedure.

NOTE: This procedure requires a 9-v battery, 1.2 kilo-ohm resistor, and a 5.6 kilo-ohm resistor which are not supplied with the Economizer.

1. Disconnect power at TR and TR1. All LEDs should be off. Exhaust fan contacts should be open.
2. Disconnect device at P and P1.
3. Jumper P to P1.
4. Disconnect wires at T and T1. Place 5.6 kilo-ohm resistor across T and T1.
5. Jumper TR to 1.
6. Jumper TR to N.
7. If connected, remove sensor from terminals S_0 and +. Connect 1.2 kilo-ohm 4074EJM checkout resistor across terminals S_0 and +.
8. Put 620-ohm resistor across terminals SR and +.
9. Set minimum position, DCV set point, and exhaust potentiometers fully CCW (counterclockwise).
10. Set DCV maximum position potentiometer fully CW (clockwise).
11. Set enthalpy potentiometer to D.
12. Apply power (24 vac) to terminals TR and TR1.

Differential Enthalpy — To check differential enthalpy:

1. Make sure Economizer preparation procedure has been performed.
2. Place 620-ohm resistor across S_0 and +.
3. Place 1.2 kilo-ohm resistor across SR and +. The Free Cool LED should be lit.
4. Remove 620-ohm resistor across S_0 and +. The Free Cool LED should turn off.
5. Return Economizer settings and wiring to normal after completing troubleshooting.

Single Enthalpy—To check single enthalpy:

1. Make sure Economizer preparation procedure has been performed.
2. Set the enthalpy potentiometer to A (fully CCW). The Free Cool LED should be lit.
3. Set the enthalpy potentiometer to D (fully CW). The Free Cool LED should turn off.
4. Return Economizer settings and wiring to normal after completing troubleshooting.

DCV (Demand Controlled Ventilation) and Power

Exhaust—To check DCV and Power Exhaust:

1. Make sure Economizer IV preparation procedure has been performed.
2. Ensure terminals AQ and AQ1 are open. The LED for both DCV and Exhaust should be off. The actuator should be fully closed.
3. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The LED for both DCV and Exhaust should turn on. The actuator should drive to between 90 and 95% open.
4. Turn the Exhaust potentiometer CW until the Exhaust LED turns off. The LED should turn off when the potentiometer is approximately 90%. The actuator should remain in position.

5. Turn the DCV set point potentiometer CW until the DCV LED turns off. The DCV LED should turn off when the potentiometer is approximately 9-v. The actuator should drive fully closed.
6. Turn the DCV and Exhaust potentiometers CCW until the Exhaust LED turns on. The exhaust contacts will close 30 to 120 seconds after the Exhaust LED turns on.
7. Return Economizer settings and wiring to normal after completing troubleshooting.

DCV Minimum and Maximum Position —To check the DCV minimum and maximum position:

1. Make sure Economizer preparation procedure has been performed.
2. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The DCV LED should turn on. The actuator should drive to between 90 and 95% open.
3. Turn the DCV maximum position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
4. Turn the DCV maximum position potentiometer to fully CCW. The actuator should drive fully closed.
5. Turn the Minimum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
6. Turn the Minimum Position Potentiometer fully CW. The actuator should drive fully open.
7. Remove the jumper from TR and N. The actuator should drive fully closed.
8. Return Economizer settings and wiring to normal after completing troubleshooting.

Supply-Air Input—To check supply-air input:

1. Make sure Economizer preparation procedure has been performed.
2. Set the Enthalpy potentiometer to A. The Free Cool LED turns on. The actuator should drive to between 20 and 80% open.
3. Remove the 5.6 kilo-ohm resistor and jumper T to T1. The actuator should drive fully open.
4. Remove the jumper across T and T1. The actuator should drive fully closed.
5. Return Economizer settings and wiring to normal after completing troubleshooting.

Economizer Troubleshooting Completion —This procedure is used to return the Economizer to operation. No troubleshooting or testing is done by performing the following procedure.

1. Disconnect power at TR and TR1.
2. Set enthalpy potentiometer to previous setting.
3. Set DCV maximum position potentiometer to previous setting. Set DVC max potentiometer to fully closed (CCW) when not using a CO_2 sensor.
4. Set minimum position, DCV set point, and exhaust potentiometers to previous settings.
5. Remove 620-ohm resistor from terminals SR and +.
6. Remove 1.2 kilo-ohm checkout resistor from terminals S_0 and +. If used, reconnect sensor from terminals S_0 and +.
7. Remove jumper from TR to N.
8. Remove jumper from TR to 1.
9. Remove 5.6 kilo-ohm resistor from T and T1. Reconnect wires at T and T1.
10. Remove jumper from P to P1. Reconnect device at P and P1.
11. Apply power (24 vac) to terminals TR and TR1.

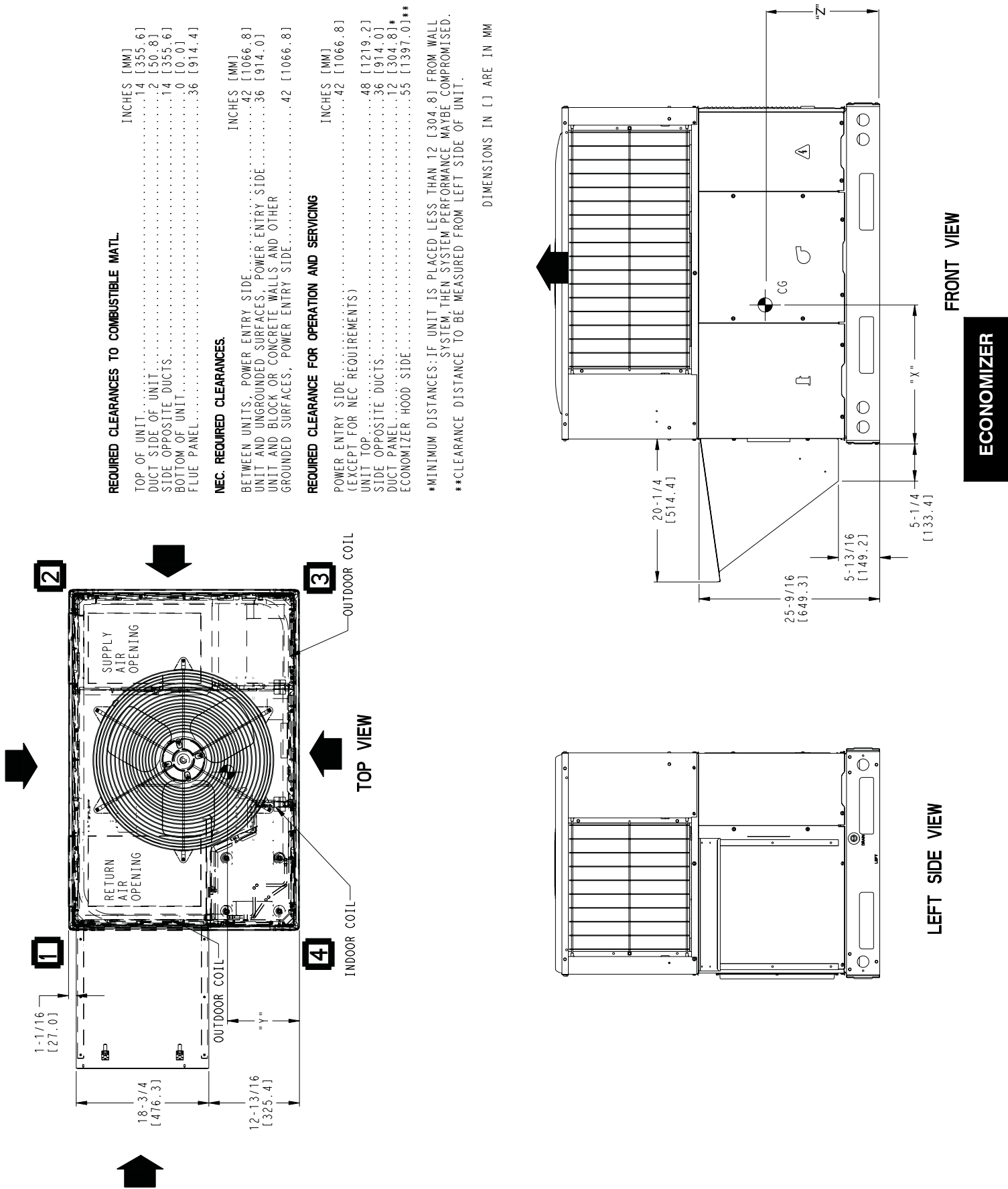
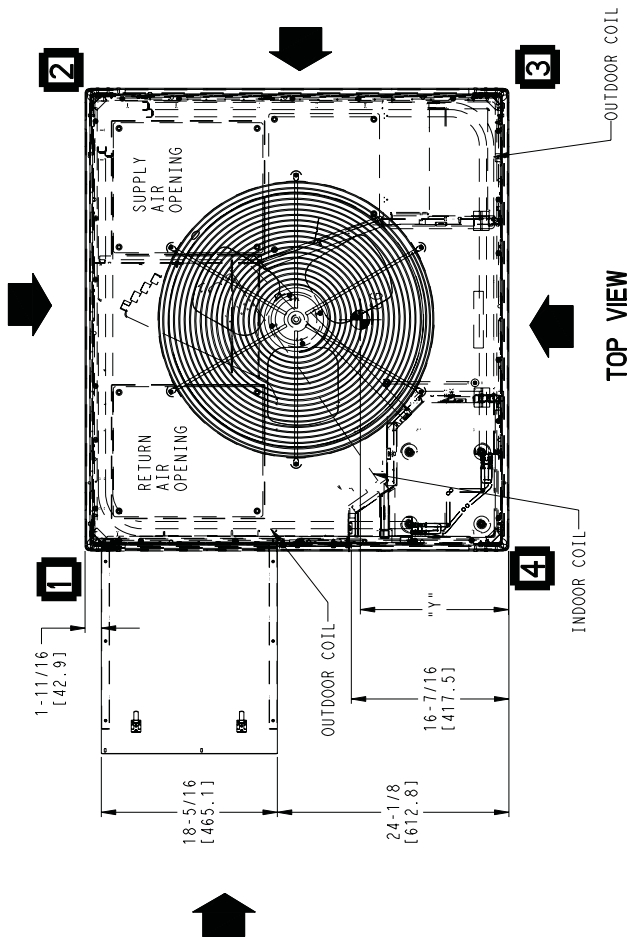


Fig. 32 - 3-Phase, Small Chassis with Economizer Dimensional Drawing

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ECONOMIZER



REQUIRED CLEARANCES TO COMBUSTIBLE MATL.

	INCHES [MM]
TOP OF UNIT.....	14 [355.6]
DUCT SIDE OF UNIT.....	2 [50.8]
SIDE OPPOSITE DUCTS.....	14 [355.6]
BOTTOM OF UNIT.....	0 [0.0]
FLUE PANEL.....	36 [914.4]

NEC. REQUIRED CLEARANCES.

	INCHES [MM]
BETWEEN UNITS, POWER ENTRY SIDE.....	42 [1066.8]
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE.....	36 [914.0]
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE.....	42 [1066.8]

REQUIRED CLEARANCE FOR OPERATION AND SERVICING

	INCHES [MM]
POWER ENTRY SIDE.....	42 [1066.8]
(EXCEPT FOR NEC REQUIREMENTS)	
UNIT TOP.....	48 [1219.2]
SIDE OPPOSITE DUCTS.....	36 [914.0]
DUCT PANEL.....	12 [304.8]*
ECONOMIZER HOOD SIDE.....	55 [1397.0]**

*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISED.
 **CLEARANCE DISTANCE TO BE MEASURED FROM LEFT SIDE OF UNIT.
 DIMENSIONS IN [] ARE IN MM

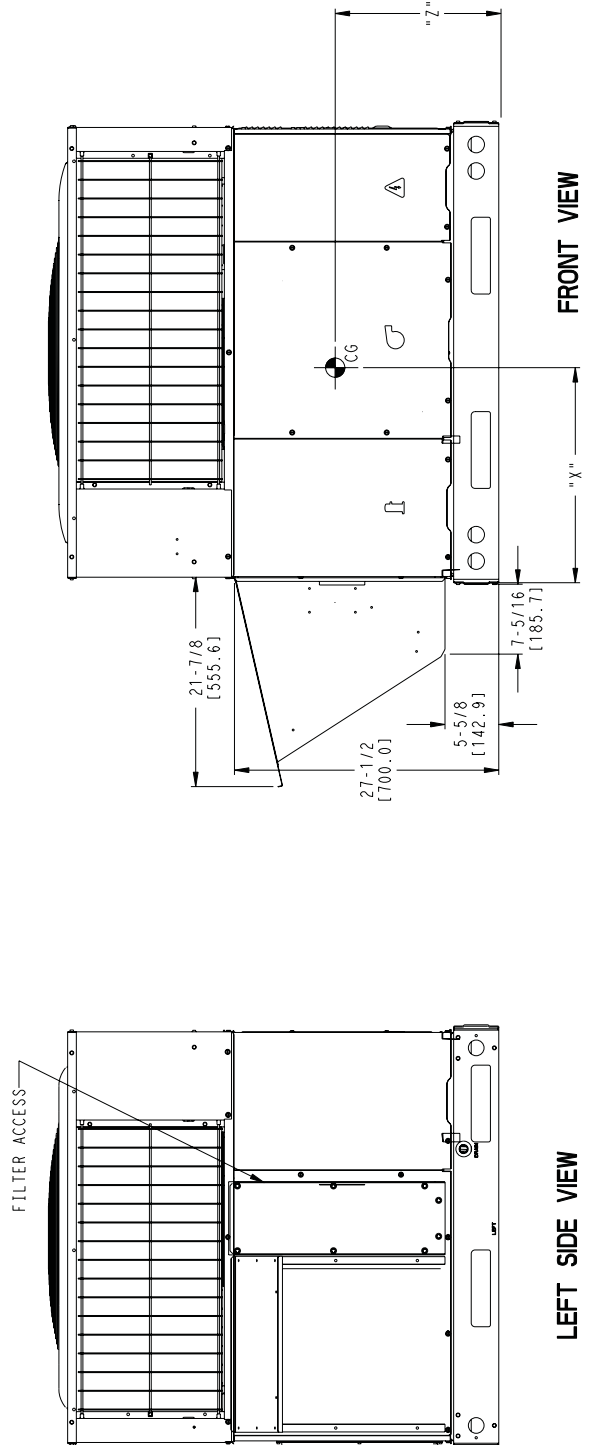


Fig. 33 - 3-Phase, Large Chassis with Economizer Dimensional Drawing

Table 10 – Physical Data

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		UNIT HEIGHT IN./MM	CENTER OF GRAVITY IN./MM						
		LB	KG		A	X		Y		Z	
48ES(-/N)A30(040/060)50	208/230-3-60	337	152.9	42-1/8	1070.0	20-7/8	530.9	15-7/8	403.9	15-11/16	398.8
48ES(-/N)A36(040/060)50	208/230-3-60	347	157.4	46-1/8	1172.0	21	533.4	15-7/8	403.9	16-3/8	416.6
48ES(-/N)A36(040/060)60	460-3-60	367	163.7	46-1/8	1172.0	21	533.4	15-7/8	403.9	16-1/2	419.1
48ES(-/N)A42(060/090)50	208/230-3-60	445	201.9	44-3/4	1137.0	21-1/8	535.9	19-5/16	490.2	16-13/16	426.7
48ES(-/N)A42(060/090)60	460-3-60	459	208.2	44-3/4	1137.0	21-1/8	535.9	19-3/16	487.7	16-13/16	426.7
48ES(-/N)A48(090/115/130)50	208/230-3-60	453	205.5	46-3/4	1187.0	21-1/8	535.9	19-3/16	487.7	17	431.8
48ES(-/N)A48(090/115/130)60	460-3-60	467	211.8	46-3/4	1187.0	21-3/16	538.5	19-3/16	487.7	17	431.8
48ES(-/N)A60(090/115/130)50	208/230-3-60	475	215.5	46-3/4	1187.0	21-3/16	538.5	19-3/16	487.7	17-1/8	434.3
48ES(-/N)A60(090/115/130)60	460-3-60	489	221.8	46-3/4	1187.0	21-3/16	538.5	19-1/8	485.1	17-1/8	434.3
48EZ(-/N)A30(040/060)50	208/230-3-60	395	179.2	42-1/8	1070.0	20-1/2	520.7	14-7/8	378.5	15-7/8	403.9
48EZ(-/N)A36(060/090)50	208/230-3-60	402	182.3	42-1/8	1070.0	20-1/2	520.7	14-7/8	378.5	15-7/8	403.9
48EZ(-/N)A42(060/090)50	208/230-3-60	489	221.8	44-3/4	1137.0	20-1/2	520.7	18-3/16	462.3	16-11/16	424.2
48EZ(-/N)A48(090/115/130)50	208/230-3-60	510	231.3	44-3/4	1137.0	20-5/8	523.2	18-3/16	462.3	16-11/16	424.2
48EZ(-/N)A60(090/115/130)50	208/230-3-60	534	242.2	48-3/4	1238.0	20-11/16	525.8	18-1/8	459.7	17-11/16	449.6
48VL(-/N)A30(040/060)50	208/230-3-60	370	167.8	44-1/8	1121.0	21-1/8	535.9	15-7/8	403.9	15-11/16	398.8
48VL(-/N)A36(060/090)50	208/230-3-60	404	183.3	46-1/8	1172.0	21-3/16	538.5	15-13/16	401.3	16-1/2	419.1
48VL(-/N)A36(060/090)60	460-3-60	418	189.6	46-1/8	1172.0	21-5/16	541.0	15-13-16	401.3	16-1/2	419.1
48VL(-/N)A42(060/090)50	208/230-3-60	497	225.4	44-3/4	1137.0	21-5/16	541.0	19-1/8	485.1	16-13/16	426.7
48VL(-/N)A42(060/090)60	460-3-60	511	231.8	44-3/4	1137.0	21-5/16	541.0	19-1/8	485.1	16-13/16	426.7
48VL(-/N)A48(090/115/130)50	208/230-3-60	515	233.6	48-3/4	1238.0	21-5/16	541.0	19-1/8	485.1	17-1/8	434.3
48VL(-/N)A48(090/115/130)60	460-3-60	529	240.0	48-3/4	1238.0	21-3/8	543.6	19-1/8	485.1	17-1/8	434.3
48VL(-/N)A60(090/115/130)50	208/230-3-60	543	246.3	52-3/4	1340.0	21-3/8	543.6	19	482.6	17-1/8	434.3
48VL(-/N)A60(090/115/130)60	460-3-60	557	252.7	52-3/4	1340.0	21-3/8	543.6	19	482.6	17-1/8	434.3
48VT(-/N)A30(040/060)51	208/230-3-60	390	176.9	45-7/8	1165.2	21-1/8	535.9	16	406.4	16-1/8	408.9
48VT(-/N)A36(060/090)51	208/230-3-60	476	215.9	44-3/4	1137.0	21-1/8	535.9	19-3/16	487.7	16-13/16	426.7
48VT(-/N)A42(060/090)51	208/230-3-60	522	236.8	48-3/4	1238.0	21-5/16	541.0	19-1/8	485.1	17-1/8	434.3
48VT(-/N)A48(090/115/130)51	208/230-3-60	542	245.9	48-3/4	1238.0	21-5/16	541.0	19	482.6	17-1/8	434.3
48VT(-/N)A60(090/115/130)51	208/230-3-60	576	261.3	54-3/4	1391.0	21-3/8	543.6	19	482.6	17-1/2	444.5
50ES-A30--50	704DPXA30000AA	305	138.3	42-1/8	1170.0	18-5/8	472.4	16-3/8	416.6	16-5/8	421.6
50ES-A36--50	704DPXA36000AA	311	141.1	46-1/8	1172.0	18-11/16	475.0	16-3/8	416.6	16-13/16	426.7
50ES-A36--60	704DEXA36000AA	325	147.4	46-1/8	1172.0	18-11/16	475.0	16-5/16	414.0	16-13/16	426.7
50ES-A42--50	704DPXA42000AA	403	182.8	44-3/4	1137.0	18-11/16	475.0	18-7/8	480.1	16-13/16	426.7
50ES-A42--60	704DEXA42000AA	417	189.2	44-3/4	1137.0	18-11/16	475.0	18-7/8	480.1	16-13/16	426.7
50ES-A48--50	704DPXA48000AA	409	185.5	46-3/4	1187.0	18-5/8	472.4	18-7/8	480.1	17	431.8
50ES-A48--60	704DEXA48000AA	423	191.9	46-3/4	1187.0	18-5/8	472.4	18-7/8	480.1	17	431.8
50ES-A60--50	704DPXA60000AA	431	195.5	46-3/4	1187.0	18-11/16	475.0	18-7/8	480.1	17-3/16	436.9
50ES-A60--60	704DEXA60000AA	445	201.9	46-3/4	1187.0	18-11/16	475.0	18-7/8	480.1	17-3/16	436.9
50EZ-A30--50	604DPXA30000AA	362	164.2	42-1/8	1070.0	18-3/16	462.3	15-3/8	391.2	15-7/8	403.9
50EZ-A36--50	604DPXA36000AA	366	166.0	42-1/8	1070.0	18-3/16	462.3	15-3/8	391.2	15-7/8	403.9

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Table 10 Cont. - Physical Data

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		UNIT HEIGHT IN./MM	CENTER OF GRAVITY IN./MM						
		LB	KG		A	X		Y		Z	
50EZ-A36--60	604DEXA36000AA	380	172.4	42-1/8	1070.0	18-5/16	464.8	15-5/16	388.6	15-7/8	403.9
50EZ-A42--50	604DPXA42000AA	447	202.8	44-3/4	1137.0	18	457.2	17-7/8	454.7	16-11/16	424.2
50EZ-A42--60	604DEXA42000AA	461	209.1	44-3/4	1137.0	18-1/8	459.7	17-13/16	452.1	16-11/16	424.2
50EZ-A48--50	604DPXA48000AA	465	210.9	44-3/4	1137.0	18-1/8	459.7	17-13/16	452.1	16-11/16	424.2
50EZ-A48--60	604DEXA48000AA	479	217.3	44-3/4	1137.0	18-1/8	459.7	17-13/16	452.1	16-11/16	424.2
50EZ-A60--50	604DPXA60000AA	490	222.3	48-3/4	1238.0	18-1/8	459.7	17-13/16	452.1	16-11/16	424.2
50EZ-A60--60	604DEXA60000AA	504	228.6	48-3/4	1238.0	18-3/16	462.3	17-11/16	449.6	16-11/16	424.2
50VL-A30--50	707CPXA30000AA	328	148.8	44-1/8	1121.0	18-13/16	477.5	16-5/16	414.0	16-3/8	416.6
50VL-A36--50	707CPXA36000AA	386	175.1	46-1/8	1172.0	19	482.6	16-5/16	414.0	17-3/16	436.9
50VL-A36--60	707CEXA36000AA	438	198.7	46-1/8	1172.0	19-3/16	487.7	16-3/16	411.5	17-3/16	436.9
50VL-A42--50	707CPXA42000AA	446	202.3	44-3/4	1137.0	18-11/16	475.0	18-13/16	477.5	17-5/16	439.4
50VL-A42--60	707CEXA42000AA	516	234.1	44-3/4	1137.0	18-7/8	480.1	18-5/8	472.4	17-5/16	439.4
50VL-A48--50	707CPXA48000AA	464	210.5	48-3/4	1238.0	18-13/16	477.5	18-11/16	475.0	17-5/16	439.4
50VL-A48--60	707CEXA48000AA	539	244.5	48-3/4	1238.0	19	482.6	18-5/8	472.4	17-5/16	439.4
50VL-A60--50	707CPXA60000AA	492	223.2	52-3/4	1340.0	18-7/8	480.1	18-11/16	475.0	17-5/8	447.0
50VL-A60--60	707CEXA60000AA	575	260.8	52-3/4	1340.0	19-1/8	485.1	18-1/2	469.9	17-11/16	449.6
50VT-A30--51	607CPXA30000AB	370	167.8	44-1/8	1121.0	18-7/8	480.1	16	406.4	16-5/16	414.0
50VT-A36--51	607CPX036000AB	454	205.9	44-3/4	1137.0	19	482.6	18-13/16	477.5	17	431.8
50VT-A36--61	607CEXA36000AB	468	212.3	44-3/4	1137.0	19	482.6	18-11/16	475.0	17	431.8
50VT-A42--51	607CPXA42000AB	500	226.8	48-3/4	1238.0	19-1/8	485.1	18-11/16	475.0	17-1/8	434.3
50VT-A42--61	607CEXA42000AB	512	232.2	48-3/4	1238.0	19-1/8	485.1	18-5/8	472.4	17-1/8	434.3
50VT-A48--51	607CPXA48000AB	488	221.4	48-3/4	1238.0	19-1/8	485.1	18-11/16	475.0	17-1/8	434.3
50VT-A48--61	607CEXA48000AB	502	227.7	48-3/4	1238.0	19-1/8	485.1	18-11/16	475.0	17-1/8	434.3
50VT-A60--51	607CPXA60000AB	542	245.9	54-3/4	1391.0	19-3/16	487.7	18-5/8	472.4	17-11/16	449.6
50VT-A60--61	607CEXA60000AB	556	252.2	54-3/4	1391.0	19-3/16	487.7	18-1/2	469.9	17-11/16	449.6

Table 11 - Corner Weights

UNIT	ELECTRICAL CHARACTERISTICS	CORNER WEIGHT LB/KG							
		"1"		"2"		"3"		"4"	
48ES(-/N/A)30(040/060)(A/N/A)	574DPWA30(040/060)(A/N/A)	50.6	22.9	67.4	30.6	101.1	45.9	118.0	53.5
48ES(-/N/A)36(040/060)(A/N/A)	574DPWA36(060/090)(A/N/A)	52.1	23.6	69.4	31.5	104.1	47.2	121.5	55.1
48ES(-/N/A)36(040/060)(A/N/A)	574DEWA36(060/090)(A/N/A)	52.1	23.6	69.4	31.5	113.1	51.3	126.5	57.4
48ES(-/N/A)42(060/090)(A/N/A)	574DPWA42(060/090)(A/N/A)	66.8	30.3	89.0	40.4	133.5	60.6	155.8	70.7
48ES(-/N/A)42(060/090)(A/N/A)	574DEWA42(060/090)(A/N/A)	66.8	30.3	89.0	40.4	142.5	64.6	160.8	72.9
48ES(-/N/A)48(090/115/130)(A/N/A)	574DPWA48(090/115/130)(A/N/A)	68.0	30.8	90.6	41.1	135.9	61.6	158.6	71.9
48ES(-/N/A)48(090/115/130)(A/N/A)	574DEWA48(090/115/130)(A/N/A)	68.0	30.8	90.6	41.1	144.9	65.7	163.6	74.2
48ES(-/N/A)60(090/115/130)(A/N/A)	574DPWA60(090/115/130)(A/N/A)	71.3	32.3	95.0	43.1	142.5	64.6	166.3	75.4
48ES(-/N/A)60(090/115/130)(A/N/A)	574DEWA60(090/115/130)(A/N/A)	71.3	32.3	95.0	43.1	151.5	68.7	171.3	77.7
48EZ(-/N/A)30(040/060)(A/N/A)	674DPWA30(040/060)(A/N/A)	59.3	26.9	79.0	35.8	118.5	53.8	138.3	62.7
48EZ(-/N/A)36(060/090)(A/N/A)	674DPWA36(060/090)(A/N/A)	60.3	27.4	80.4	36.5	120.6	54.7	140.7	63.8
48EZ(-/N/A)42(060/090)(A/N/A)	674DPWA42(060/090)(A/N/A)	73.4	33.3	97.8	44.4	146.7	66.5	171.2	77.6

Table 11 Cont. - Corner Weights

UNIT	ELECTRICAL CHARACTERISTICS	CORNER WEIGHT LB/KG							
		"1"	"2"	"3"	"4"				
48EZ(-)A48(090/115/130/50)	674DPWA48(090/115/130)(A/N)A	76.5	34.7	102.0	46.3	153.0	69.4	178.5	81.0
48EZ(-)A60(090/115/130/50)	674DPWA60(090/115/130)(A/N)A	80.1	36.3	106.8	48.4	160.2	72.7	186.9	84.8
48VL(-)A30(040/060/50)	577CPWA30(040/060)(A/N)A	55.5	25.2	74.0	33.6	111.0	50.3	129.5	58.7
48VL(-)A36(060/090/50)	577CPWA36(060/090)(A/N)A	60.6	27.5	80.8	36.7	121.2	55.0	141.4	64.1
48VL(-)A36(060/090/60)	577CEWA36(060/090)(A/N)A	60.6	27.5	80.8	36.7	130.2	59.1	146.4	66.4
48VL(-)A42(060/090/50)	577CPWA42(060/090)(A/N)A	74.6	33.8	99.4	45.1	149.1	67.6	174.0	78.9
48VL(-)A42(060/090/60)	577CEWA42(060/090)(A/N)A	74.6	33.8	99.4	45.1	158.1	71.7	179.0	81.2
48VL(-)A48(090/115/130/50)	577CPWA48(090/115/130)(A/N)A	77.3	35.0	103	46.7	154.5	70.1	180.3	81.8
48VL(-)A48(090/115/130/60)	577CEWA48(090/115/130)(A/N)A	77.3	35.0	103	46.7	163.5	74.2	185.3	84.0
48VL(-)A60(090/115/130/50)	577CPWA60(090/115/130)(A/N)A	81.5	36.9	108.6	49.3	162.9	73.9	190.1	86.2
48VL(-)A60(090/115/130/60)	577CEWA60(090/115/130)(A/N)A	81.5	36.9	108.6	49.3	171.9	78	195.1	88.5
48VT(-)A30(040/060/51)	677CPWA30(040/060)(A/N)B	58.5	26.5	78.0	35.4	117.0	53.1	136.5	61.9
48VT(-)A36(060/090/51)	677CPWA36(060/090)(A/N)B	71.4	32.4	95.2	43.2	142.8	64.8	166.6	75.6
48VT(-)A42(060/090/51)	677CPWA42(060/090)(A/N)B	78.3	35.5	104.4	47.4	156.6	71.0	182.7	82.9
48VT(-)A48(090/115/130/51)	677CPWA48(090/115/130)(A/N)B	81.3	36.9	108.4	49.2	162.6	73.8	189.7	86.0
48VT(-)A60(090/115/130/51)	677CPWA60(090/115/130)(A/N)B	86.4	39.2	115.2	52.3	172.8	78.4	201.6	91.4
50ES-A30--50	704DPXA30000AA	61.0	27.7	48.8	22.1	73.2	33.2	122.0	55.3
50ES-A36--50	704DPXA36000AA	62.2	28.2	49.8	22.6	74.6	33.9	124.4	56.4
50ES-A36--60	704DEXA36000AA	62.2	28.2	49.8	22.6	83.6	37.9	129.4	58.7
50ES-A42--50	704DPXA42000AA	80.6	36.6	64.5	29.2	96.7	43.9	161.2	73.1
50ES-A42--60	704DEXA42000AA	80.6	36.6	64.5	29.2	105.7	48.0	166.2	75.4
50ES-A48--50	704DPXA48000AA	81.8	37.1	65.4	29.7	98.2	44.5	163.6	74.2
50ES-A48--60	704DEXA48000AA	81.8	37.1	65.4	29.7	107.2	48.6	168.6	76.5
50ES-A60--50	704DPXA60000AA	86.2	39.1	69.0	31.3	103.4	46.9	172.4	78.2
50ES-A60--60	704DEXA60000AA	86.2	39.1	69.0	31.3	112.4	51.0	177.4	80.5
50EZ-A30--50	604DPXA30000AA	72.4	32.9	57.9	26.3	86.9	39.4	144.8	65.7
50EZ-A36--50	604DPXA36000AA	73.2	33.2	58.6	26.6	87.8	39.8	146.4	66.4
50EZ-A36--60	604DEXA36000AA	73.2	33.2	58.6	26.6	96.8	43.9	151.4	68.7
50EZ-A42--50	604DPXA42000AA	89.4	40.6	71.5	32.4	107.3	48.7	178.8	81.1
50EZ-A42--60	604DEXA42000AA	89.4	40.6	71.5	32.4	116.3	52.7	183.8	83.4
50EZ-A48--50	604DPXA48000AA	93.0	42.2	74.4	33.7	111.6	50.6	186.0	84.4
50EZ-A48--60	604DEXA48000AA	93.0	42.2	74.4	33.7	120.6	54.7	191.0	86.6
50EZ-A60--50	604DPXA60000AA	98.0	44.5	78.4	35.6	117.6	53.3	196.0	88.9
50EZ-A60--60	604DEXA60000AA	98.0	44.5	78.4	35.6	126.6	57.4	201.0	91.2
50VL-A30--50	707CPXA30000AA	65.6	29.8	52.5	23.8	78.7	35.7	131.2	59.5
50VL-A36--50	707CPXA36000AA	77.2	35.0	61.8	28.0	92.6	42.0	154.4	70.0
50VL-A36--60	707CEXA36000AA	77.2	35.0	61.8	28.0	101.6	46.1	159.4	72.3
50VL-A42--50	707CPXA42000AA	89.2	40.5	71.4	32.4	107.0	48.6	178.4	80.9
50VL-A42--60	707CEXA42000AA	89.2	40.5	71.4	32.4	116.0	52.6	183.4	83.2
50VL-A48--50	707CPXA48000AA	92.8	42.1	74.2	33.7	111.4	50.5	185.6	84.2
50VL-A48--60	707CEXA48000AA	92.8	42.1	74.2	33.7	120.4	54.6	190.6	86.5



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Table 11 Cont. - Corner Weights

UNIT	ELECTRICAL CHARACTERISTICS	CORNER WEIGHT LB/KG							
		"1"	"2"	"3"	"4"	"1"	"2"	"3"	"4"
50VL-A60--50	707CPXA60000AA0	98.4	44.6	78.7	35.7	118.1	53.6	196.8	89.3
50VL-A60--60	707CEXA60000AA0	98.4	44.6	78.7	35.7	127.1	57.7	201.8	91.5
50VT-A30--51	607CPXA30000AB	74.0	33.6	59.2	26.9	88.8	40.3	148.0	67.1
50VT-A36--51	607CPXA30000AB	90.8	41.2	72.	32.9	109.0	649.4	181.6	82.4
50VT-A36--61	607CEXA36000AB	90.8	41.2	72.6	32.9	118.0	53.5	186.6	84.6
50VT-A42--51	607CPXA42000AB	100.0	45.4	80.0	36.3	120.0	54.4	200.0	90.7
50VT-A42--61	607CEXA42000AB	100.0	45.4	80.0	36.3	129.0	58.5	205.0	93.0
50VT-A48--51	607CPXA48000AB	97.6	44.3	78.1	35.4	117.1	53.1	195.2	88.5
50VT-A48--61	607CEXA48000AB	97.6	44.3	78.1	35.4	126.1	57.2	200.2	90.8
50VT-A60--51	607CPXA60000AB	108.4	49.2	86.7	39.3	130.1	59.0	216.8	98.3
50VT-A60--61	607CEXA60000AB	108.4	49.2	86.7	39.3	139.1	63.1	221.8	100.6