Installation Instructions

Part No: CAECOMZR008A01, CAECOMZR010A01 and CAECOMZR012A01

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SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause 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 and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in USA, ANSI/NFPA70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

It is important to 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 the signal words DANGER, WARNING, CAUTION, and NOTE. 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.

⚠ WARNING

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 and servicing air conditioning equipment.

⚠ CAUTION

Failure to follow this caution may result in personal injury and damage to unit. Cover the duct opening as a precaution so objects cannot fall into the return duct opening. Be sure to remove the cover when installation is complete.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Unit may have more than one power switch.

GENERAL

The EconoMi$er X system utilizes the latest technology available for integrating the use of free cooling with mechanical cooling for packaged 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 control ventilation is supported. The EconoMi$er X system utilizes gear-drive technology with a direct mount spring return actuator that will close upon loss of power. The EconoMi$er X system comes standard with an outdoor air temperature sensor, mixed air (also called supply air) temperature sensor. See Fig. 1 for an example of the EconoMi$er X system. Outdoor and indoor enthalpy, indoor dry bulb temperature and CO_2 sensors are available for field installation.

The mixing box dampers are ultra low leak type and it is critical that they are installed perfectly square to achieve necessary damper seal.

See Table 1 for usage, Table 2 for package contents and weights, and Table 3 for sensor usage.
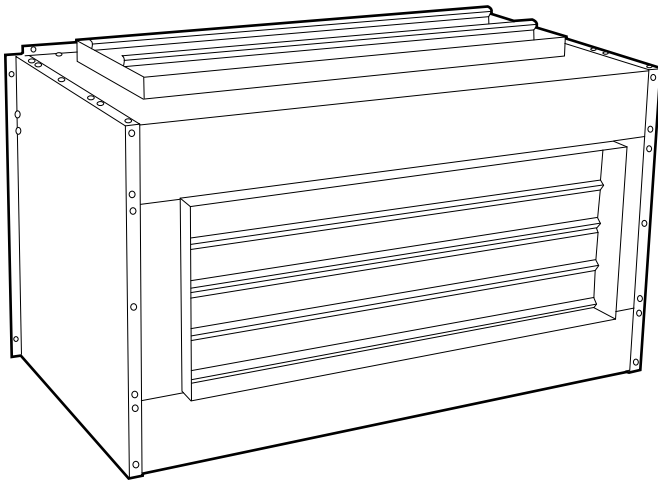

Fig. 1 — Economizer Accessory

Compliance

Economizers meet California Energy Commission Title 24-2013 / 2016 prescriptive section 140.4 (damper leakage etc.), and mandatory section 120.2.i for Fault Detection and Diagnostic controls (HJW10).

Economizers meet ASHRAE 90.1-2013 / 2016 damper leakage requirements as stated in Section 6.5.1.1.4 and Table 6.4.3.4.3, and meet 2016 Fault Detection and Diagnosis requirements in section 6.4.3.12.

Economizers meet IECC 2012 section C402.4.5.2 and, IECC 2015 sections C403.2.4.3 and C403.3.3.5 for outside air, and return air damper leakage requirements, and IECC 2015 section C403.2.4.7 for Fault Detection and Diagnostic requirements.

NOTE: IECC 2015 section C403.2.4.7.1 requires differential return air sensor, which must be ordered separately.

Outside air and return air (volume) dampers are AMCA rated.

Table 1 — Economizer Usage Chart

UNIT TYPE	ECONOMIZER ACCESSORY KIT NUMBER
Direct-Expansion Units 6 to 10 tons and Chilled Water Units 7.5 to 10 tons	CAECOMZR008A01
Direct-Expansion Units 12.5 to 20 tons and Chilled Water Units 12.5 to 20 tons	CAECOMZR010A01
Direct-Expansion Units 25 and 30 tons and Chilled Water Units 25 to 30 tons	CAECOMZR012A01

Table 2 — Package Contents and Weights

ECONOMIZER ACCESSORY KIT NUMBER	WEIGHT lb (kg)	QTY - DESCRIPTION
CAECOMZR008A01	185 (84.1)	1 - Economizer Assembly
CAECOMZR010A01	340 (154.5)	1 - Transformer 1 - HH79AH001 Outdoor-Air Temperature Sensor 1 - HH79AH001 Mixed-Air Temperature Sensor
CAECOMZR012A01	450 (204.5)	1 - W7220 Controller 1 - 48TMHSRSE--A20 Harness (Not Used on 3-Speed Units) 1 - Relay (Pilot Duty) 4 - 10 x 1/2 in. Self-Tapping Screws 4 - 8 x 1/2 in. Sheet Metal Screws 4 - P-Clamps

Table 3 — EconoMi$er® X Sensor Usage

APPLICATION	ECONOMI$ER X WITH OUTDOOR AIR DRY BULB SENSOR
	Accessories Required
Outdoor Air Dry Bulb	The HH79AH001 outdoor air dry bulb sensor.
Mixed Air Sensor	HH79AH001 provided with economizer and field-installed in blower compartment.
Single Enthalpy	HH57AC081
Differential Dry Bulb or Enthalpy	HH57AC081
CO$_2$ for DCV Control using a Wall-Mounted CO$_2$ Sensor	33ZCSENCO2 OR CGCDXSEN004A00
CO$_2$ for DCV Control using a Duct-Mounted CO$_2$ Sensor	33ZCSENCO2 or CGCDXSEN004A00* and 33ZCSENCO2 or CGCDXASP00100† OR CRCBDIOX005A00**

* 33ZCSENCO2 and GCDXSEN004A00 are accessory CO$_2$ sensors.
† 33ZCASPCO2 and CGCDXASP00100 are accessory aspirator boxes required for duct-mounted applications.
** CRCBDIOX005A00 is an accessory that contains both 33ZCSENCO2 and 33ZCASPCO2 accessories.

PRE-INSTALLATION

Complete Pre-Installation Checks

Remove accessory packaging and inspect shipment for damage. File claim with shipping company if accessory is damaged or incomplete.

Check Unit Clearance

Provide sufficient space for airflow clearance, wiring, and servicing accessory after it is mounted on unit. See Fig. 2-4 for accessory dimensions. Base unit service clearances of 2.5 ft (.76 m) from front and sides of unit and 3 in. (7.6 cm) from rear of unit also apply to the economizer.

FRONT

NOTE: Dimensions are in inches, ( ) are millimeters.

Fig. 2 — 6 to 10 Ton Economizer Mounted on Unit (Vertical Installation Shown)

RIGHT SIDE

FRONT

NOTE: Dimensions in inches, ( ) are millimeters.

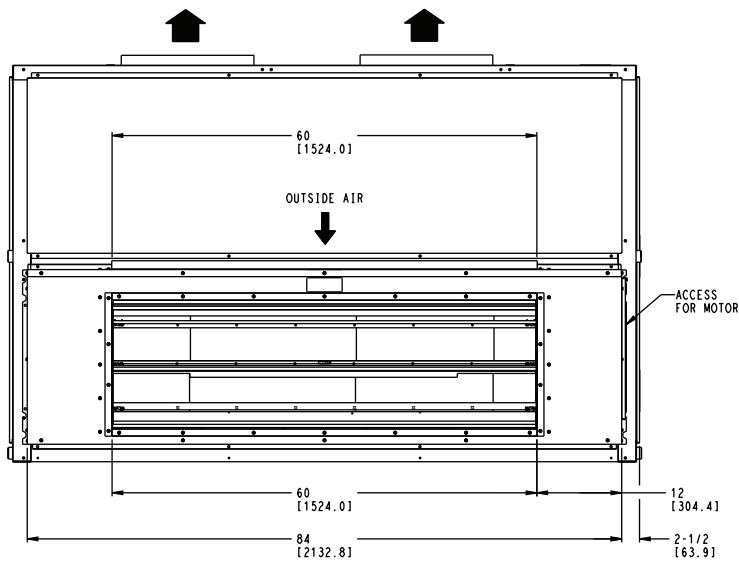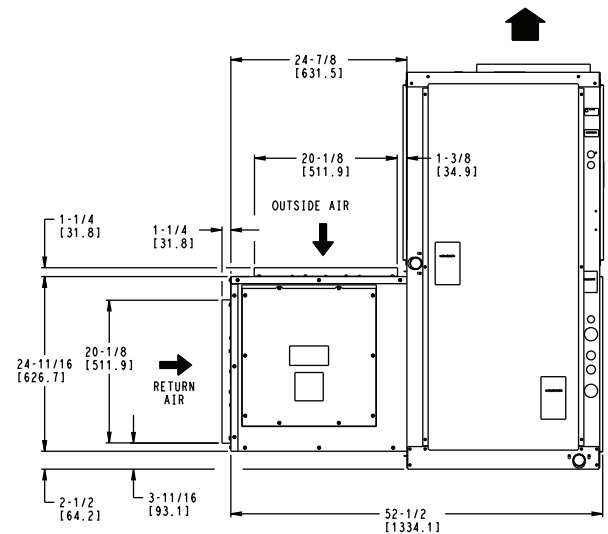**Fig. 3 — 12.5 to 20 Ton Economizer Mounted on Unit**
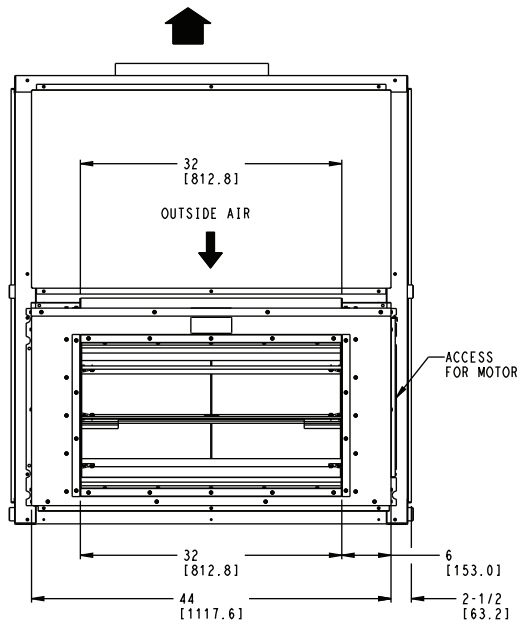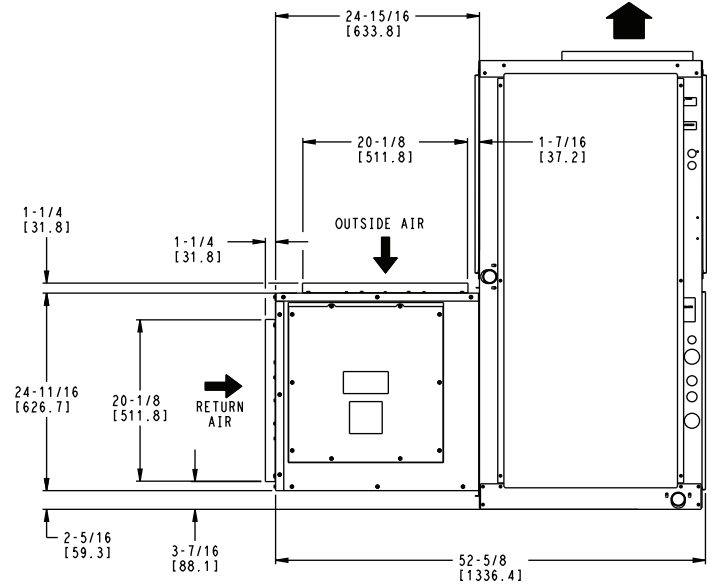
RIGHT SIDE

FRONT

RIGHT SIDE

NOTE: Dimensions in inches, ( ) are millimeters.

Fig. 4 — 25 and 30 Ton Economizer Mounted on Unit (Vertical Installation Shown)

INSTALLATION

IMPORTANT: These economizers meet all leakage requirements as laid out in ASHRAE 90.1-2016, California's Title 24, and IECC 2015. Economizer must be installed perfectly square to avoid damper leakage or damper binding. Squareness tolerance is ± 1/32 inches.

Mount Economizer on Unit

Refer to Fig. 5 and 6 and perform the following steps:

1. Orient the unit so that the desired return-air opening is accessible. For vertical installations, reposition the panel from the rear to the bottom of the unit using the same screws.
2. Remove the bag containing loose parts and fasteners from inside the economizer. These parts will be used later.
3. Install field-supplied gasket material over economizer flanges.
4. Place the economizer and gasket over the return-air opening so that the flanges and screw holes on the top and bottom of the economizer box are aligned with those surrounding the return-air opening.
5. Using field-supplied 1/4 in. x 3/4 in. (maximum length) sheet metal screws, fasten the long economizer flanges to the matching return-air opening flanges and tighten all screws.
6. Using the four 10 x 1/2 in. self-tapping screws supplied, fasten the short economizer flanges to the matching return air opening flanges and tighten all screws.
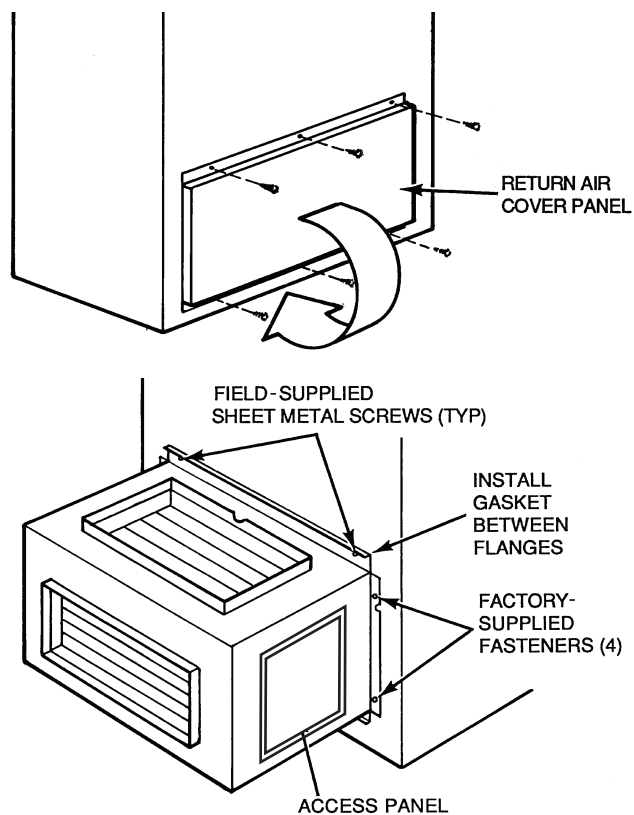

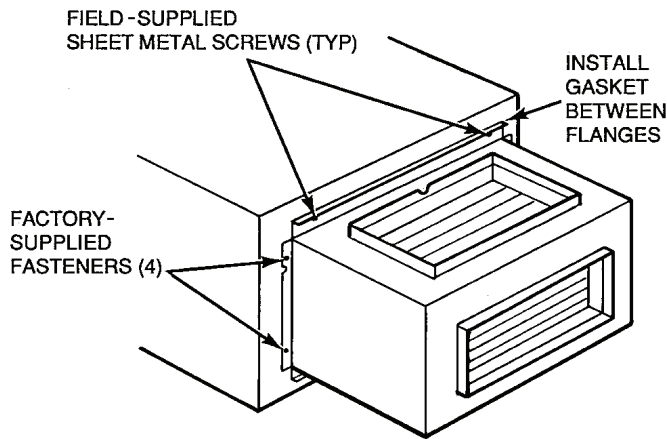**Fig. 5 — Economizer Installation on Vertical Unit**

Fig. 6 — Economizer Installation on Horizontal Unit

Install Transformer, Relay, and Mixed-Air Temperature Sensor

The transformer, relay, and mixed-air temperature (MAT) sensor are shipped with the economizer accessory for field installation as follows.

Follow the steps below to install the mixed-air temperature sensor:

1. Remove the service panel from the control box end of the unit.
2. Mount the HH79AH001 mixed-air temperature sensor inside the air handler in the blower compartment as shown in Fig. 7. Sensor must be located in airflow.
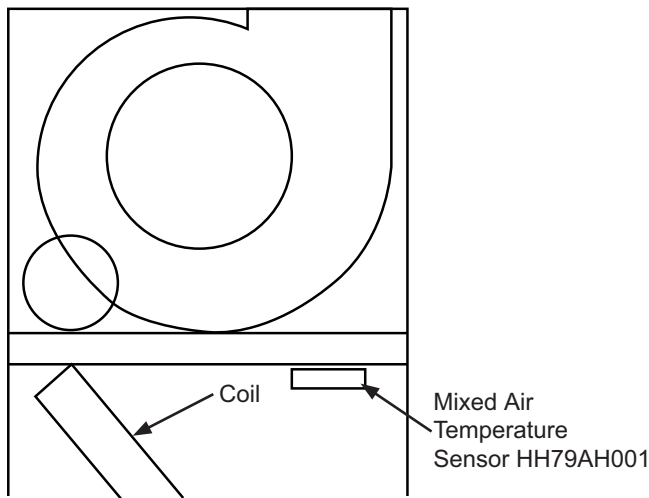

Fig. 7 — Installing HH79AH001 MAT Sensor

3. For air handlers without a circuit breaker in the control box (unit with fan motor sizes less than 5 hp [3.73 kW]) mount the transformer and relay inside the control box. Use the holes in the transformer base and relay base as guides to drill holes into the box and fasten components in place with supplied no. 8 x 1/2 in. sheet metal screws. See Fig. 8.
4. For air handlers with a circuit breaker in the control box (unit with fan motor sizes of 5 hp [3.73 kW] or greater), mount the supplied transformer and relay in a field-supplied and installed electrical box as shown in Fig. 8. Use the holes in the transformer base and relay base as guides to drill holes into the box and fasten components in place with supplied no. 8 x 1/2 in. sheet metal screws.
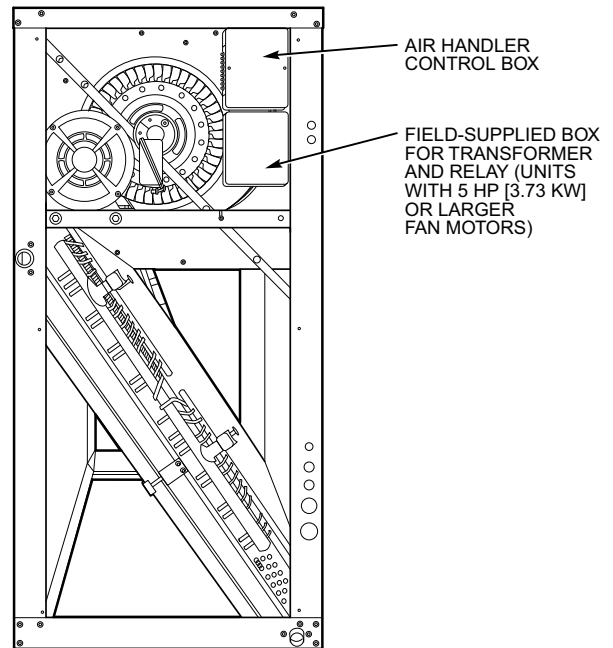

Fig. 8 — Installing Economizer Transformer and Relay

Follow the steps below to connect the economizer to the air handler control box (see Fig. 9):

1. Remove the economizer control access panel and locate the actuator wiring harness. See Fig. 9.
2. Separate the orange and green wires from the wiring harness. Run the remaining wires in the wiring harness through the unit's return air opening.
3. Connect the gray wires to the supply-air temperature sensor Fig. 7.
4. Remove the air handler control box cover and connect the yellow and blue wires to TB1 terminals Y1 and Y2.
5. Connect Y1 and Y2 from condensing unit or chiller to Y1 and Y2 on air handler terminal block TB1. Connections can be made using 1/4 in. female quick connections (inside box) or with screw terminals (outside box).

NOTE: If the unit has single-stage cooling, terminate the blue wire with a wire nut and secure.

6. Route brown and red wires through control wiring access hole in unit corner post and connect to Y1 and Y2 from thermostat.

NOTE: If the unit has a single-stage thermostat, terminate the brown wire with a wire nut and secure.

7. Connect black wire to transformer.
8. Using field-supplied wires, connect economizer relay (ER) coil to air handler terminals C and G. Connect white wire from transformer secondary to relay common contact. Connect white wire from harness to relay normally open contact.
9. Using field-supplied wire, connect line voltage power to transformer primary. There are taps for 200, 230, and 460-v power. (For 400-3-50 power, use the 460-v tap.) Connect power wire to correct tap and terminate any unused wires.
10. See wiring diagram and controller details for outside air temperature sensor wiring.
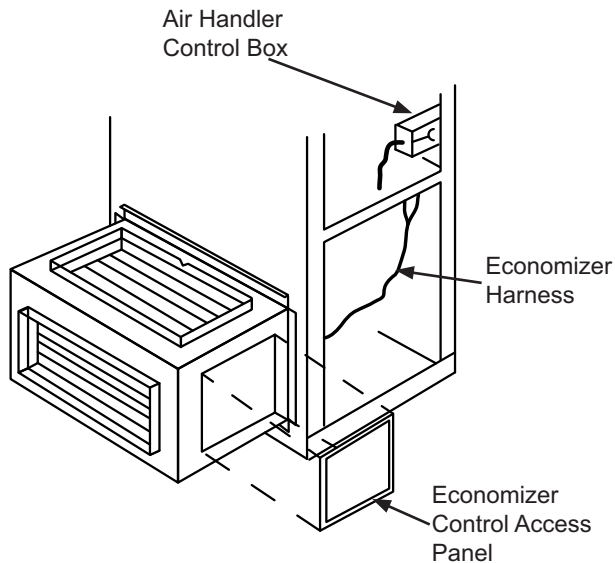
Fig. 9 — Economizer Wire Routing

EconoMi$er® X

The field-installed accessory consist of the following:

- Low leak economizer assembly
- HH79AH001 OA Dry Bulb Sensor
- HH79AH001 Mixed Air Sensor and Harness
- W7220 Controller
- 48TMHSRSE--A20 Harness (not used on 3 speed units)

W7220 ECONOMIZER CONTROLLER

The economizer controller used on electro mechanical units is a Honeywell W7220 which is to be located in the RTU base unit's control box. See Fig. 10 below for button description of the W7220 controller. See the Installation Instruction for the base unit for the location of the control box access panel.

The W7220 controller provides the following:

- 2-line LCD interface screen for setup, configuration, and troubleshooting.
- On-board fault detection and diagnostics
- Sensor failure loss of communications identification
- Automatic sensor detection
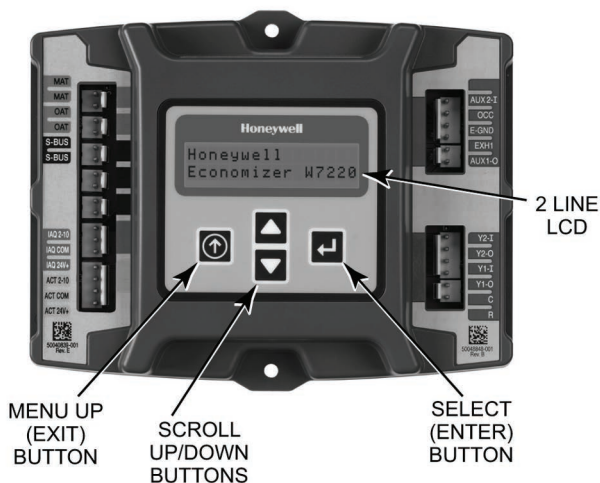- Capabilities for use with multiple-speed indoor fan systems

Fig. 10 — W7220 Controller

USER INTERFACE

The user interface consists of a LCD display and a 4-button keypad on the front of the economizer controller.

KEYPAD

The four navigation button (see Fig. 10) are used to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

USING THE KEYPAD WITH MENUS

To use the keypad when working with menus:

- Press the ▲ (Up arrow) button to move to the previous menu.
- Press the ▼ (Down arrow) button to move to the next menu.
- Press the ↵ (Enter) button to display the first item in the currently displayed menu.
- Press the ⬆ (Menu Up/Exit) button to exit a menu's item and return to the list of menus.

USING THE KEYPAD WITH SETTINGS AND PARAMETERS

To use the keypad when working with Setpoints, System and Advanced Settings, Checkout tests and Alarms:

1. Navigate to the desired menu.
2. Press the ↵ (Enter) button to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.
4. Press the ↵ (Enter) button to display the value of the currently displayed item.
5. Press the ▲ button to increase (change) the displayed parameter value.
6. Press the ▼ button to decrease (change) the displayed parameter value.

NOTE: When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

7. Press the ↵ (Enter) button to accept the displayed value and store it in nonvolatile RAM.
8. "CHANGE STORED" displays.
9. Press the ↵ (Enter) button to return to the current menu parameter.
10. Press the ⬆ (Menu Up/Exit) button to return to the previous menu.

MENU STRUCTURE

Table 4 illustrates the complete hierarchy of menus and parameters for the EconoMi$er X system.

The Menus in display order are:

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

> IMPORTANT: The default setting on the W7220 controller is for a "Fan Type" with 2 speed, which is correct for 2 or 3 speed units (48/50LC 07-12). If the unit is 1 (single) speed, the setting under SYSTEM SETUP > FAN TYPE must be changed to 1 speed.

See Fig. 11 for wiring the W7220 controller for exhaust and fault alarm.

6

WIRING W7220 FOR EXHAUST AND FAULT ALARM
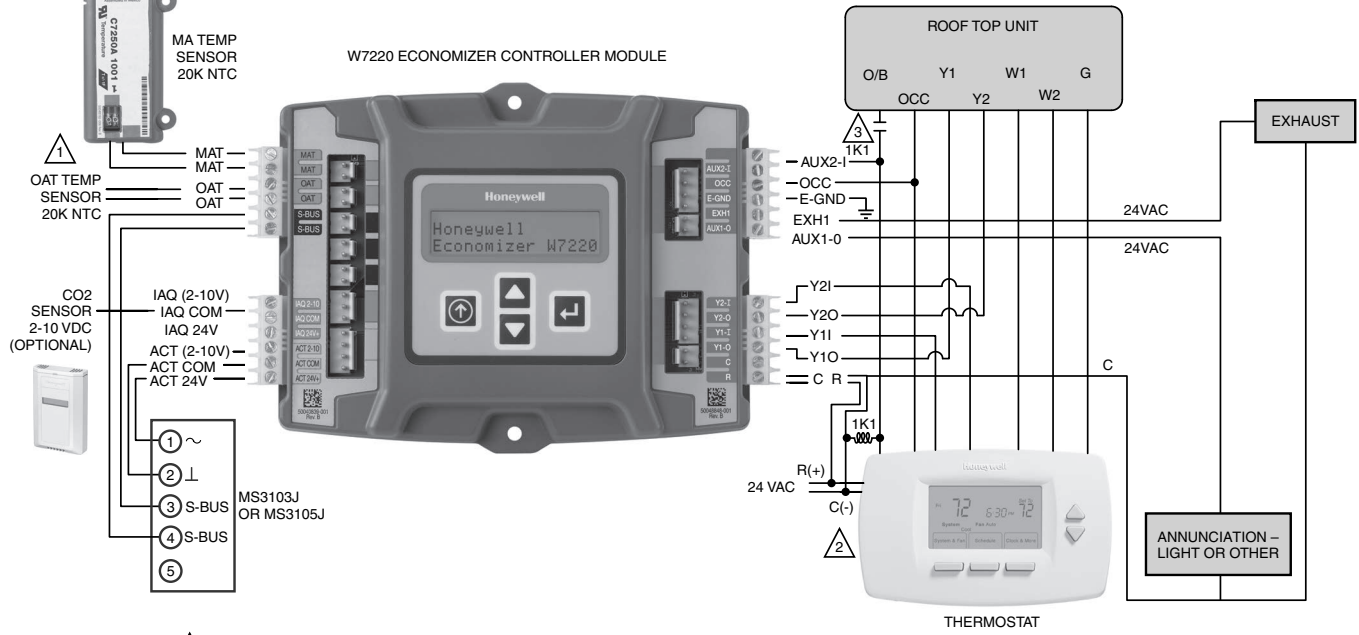
△1 NOTE THAT THE 20K NTC SENSOR CAN BE MOUNTED IN THE OAT TERMINALS ONLY IN THIS CONFIGURATION.

△2 WHEN USING A HEAT PUMP THERMOSTAT, THERMOSTAT TERMINALS MAY DIFFER: W1 MAY BE LABELED O OR B AND W2 MAY BE LABELED W.

△3 WHEN USING A HEAT PUMP WITH DEFROST FEEDBACK, ADD AN ISOLATION RELAY BETWEEN O AND C.

Fig. 11 — Wiring W7220 Controller for Exhaust and Fault Alarm

Table 4 — Menu Structure

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
STATUS	ECONO AVAIL	NO	YES/NO	YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	YES = outside air being used for 1 stage cooling
	OCCUPIED	NO	YES/NO	YES = OCC signal received from space thermostat or unitary controller YES = 24 Vac on terminal OCC. NO = 0 Vac on terminal OCC.
	HEAT PUMP	N/A	COOL HEAT	Displays COOL or HEAT when system is set to heat pump (Non-conventional)
	COOL Y1—IN	OFF	ON/OFF	Y1—I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 Vac on terminal Y1—I OFF = 0 Vac on terminal Y1—I
	COOL Y1—OUT	OFF	ON/OFF	Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1—OUT terminal)
	COOL Y2—IN	OFF	ON/OFF	Y2—I signal from space thermostat our unitary controller for second stage cooling. ON = 24 Vac on terminal Y2—I OFF = 0 Vac on terminal Y2—I
	COOL Y2—OUT	OFF	ON/OFF	Cool Stage 2 Relay Output to mechanical cooling (Y2—OUT terminal)
	MA TEMP	_ _ . _ F	0 to 140°F	Displays value of measured mixed air from MAT sensor. Displays _ _ . _ F if not connected, short or out-of-range.
	DA TEMP	_ _ . _ F	0 to 140°F	Displays when discharge air sensor is connected and displays measured discharge temperature. Displays _ _ . _F if sensor sends invalid value, if not connected, short or out-of-range.
	OA TEMP	_ _ . _ F	-40 to 140°F	Displays measured value of outdoor air temperature. Displays _ _ . _F if sensor sends invalid value, short or out-of-range.
	OA HUM	_ _ %	0 to 100%	Displays measured value of outdoor humidity from OA sensor. Displays _ _% if not connected short, or out-of-range.
	RA TEMP	_ _ . _ F	0 to 140°F	Displays measured value of return air temperature from RAT sensor. Displays _ _ . _ F if sensor sends invalid value, if not connected, short or out-of-range
	RA HUM	_ _ %	0 to 100%	Displays measured value of return air humidity from RA sensor. Displays _ _% if sensor sends invalid value, if not connected, short or out-of-range
	IN CO_2	_ _ _ ppm	0 to 2000 ppm	Displays value of measured CO_2 from CO_2 sensor. Invalid if not connected, short or out-of-range
	DCV STATUS	N/A	ON/OFF	Displays ON if above setpoint and OFF if below setpoint, and ONLY if a CO_2 sensor is connected.
	DAMPER OUT	2.0v	2.0 to 10.0v	Displays voltage output to the damper actuator.
	EXH1 OUT	OFF	ON/OFF	Output of EXH1 terminal: ON = relay closed OFF = relay open
	EXH2 OUT	OFF	ON/OFF	Output of AUX terminal; displays only if AUX = EXH2
	ERV	OFF	ON/OFF	Output of AUX terminal; displays only if AUX = ERV
	MECH COOL ON	0	0, 1, or 2	Displays stage of mechanical cooling that is active.

Table 4 — Menu Structure (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
SETPOINTS	MAT SET	53°F	38 to 65°F; increment by 1	Setpoint determines where the economizer will modulate the OA damper to maintain the mixed air temperature.
	LOW T LOCK	32°F	-45 to 80°F; increment by 1	Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout.
	DRYBLB SET	63°F	48 to 80°F; increment by 1	Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63°F unit will economize at 62°F and below and not economize at 64°F and above. There is a 2°F deadband.
	ENTH CURVE	ES3	ES1,ES2,ES3,ES4, or ES5	Enthalpy boundary "curves" for economizing using single enthalpy.
	DCV SET	1100ppm	500 to 2000ppm; increment by 100	Displays only if CO_2 sensor is connected. Setpoint for Demand Controlled Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS	4.4 V	2 to 10 Vdc	Displays ONLY if a CO_2 sensor is NOT connected
	VENTMAX With 2-speed fan units VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required	4.4 V	2 to 10 Vdc or 100 to 9990 cfm; increment by 10	Displays only if a CO_2 sensor is connected. Used for Vbz (ventilation max cfm) setpoint. Displays 2 to 10 V if <3 sensors (RA,OA, and MA). In AUTO mode dampers controlled by CFM
	VENTMAX L	6 V	N/A	N/A
	VENTMAX H	4.4 V	N/A	N/A
	VENTMIN With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) set	2.8 V	2 to 10 Vdc or 100 to 9990 cfm increment by 10	Displays only if a CO_2 sensor is connected. Used for Ba (ventilation min cfm) setpoint. Displays 2 to 10 V if <3 sensors (RA, OA, and MA). Va is only set if DCV is used. This is the ventilation for less than maximum occupancy of the space. In AUTO mode dampers controlled by CFM.
	VENTMIN L	3.7 V	N/A	N/A
	VENTMIN H	2.8 V	N/A	N/A
	ERV OAT SP	32°F	0 to 50°F; increment by 1	Only when AUX1 O = ERV
	EXH1 SET With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required	50%	0 to 100%;increment by 1	Setpoint for OA damper position when exhaust fan 1 is powered by the economizer.
	Exh1 L	65%	N/A	N/A
	Exh1 H	50%	N/A	N/A
	EXH2 SET With 2-speed fan units Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required	75%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX is set to EHX2.
	Exh2 L	80%	N/A	N/A
	Exh2 H	75%	N/A	N/A

Table 4 — Menu Structure (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
SYSTEM SETUP	INSTALL	01/01/10	N/A	Display order = MM/DD/YY Setting order = DD, MM, then YY.
	UNITS DEG	F	F or C	Sets economizer controller in degrees Fahrenheit or Celsius
	EQUIPMENT	CONV	Conventional or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller.
	AUX2 I	W	SD/W or HP(O)/HP(B)	In CONV mode: SD + Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat.
	FAN TYPE	2 speed	1 speed/2 speed	Sets the economizer controller for operation of 1 speed or 2 speed supply fan. (NOTE: for 3 speed units, setpoint is a 2 speed.)
	FAN CFM	5000cfm	100 to 15000 cfm; increment by 100	This is the capacity. The value is found in the Project Submittal documents.
	AUX OUT	NONE	NONE ERV EXH2 SYS	• NONE = not configured (output is not used) • ERV = Energy Recovery Ventilator • EXH2 = second damper position relay closure for second exhaust fan • SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	When using a setback thermostat with occupancy out (24 vac), the 24 vac is input "INPUT" to the OCC terminal. If no occupancy output from the thermostat then change program to "ALWAYS" OR add a jumper from terminal R to OCC terminal.
	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to the factory default values.
ADVANCED SETUP	MA LO SET	45°F	35 to 55°F; Incremented by 10	Temperature to achieve freeze protection (close damper and alarm if temperature falls below setup value).
	FREEZE POS	CLO	CLO or MIN	Damper position when freeze protection is active (closed or MIN POS).
	CO$_2$ ZERO	0ppm	0 to 500 ppm; Increment by 10	CO$_2$ ppm level to match CO$_2$ sensor start level.
	CO$_2$ SPAN	2000ppm	1000 to 3000 ppm; Increment by 10	CO$_2$ ppm span to match CO$_2$ sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 h or OFF	Delay after stage 2 cool has been active. Turns on second stage of cooling when economizer is first stage and mechanical cooling is second stage. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling
	SD DMPR POS	CLO	CLO or OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 Vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., fans, etc. will shut off.
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all 3 RA, OA, and MA sensors.
	MAT T CAL	0.0°F	±2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
	OA T CAL	0.0°F	±2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
	OA H CAL	0% RH	±10% RH	Allows for operator to adjust for an out of calibration humidity sensor.
	RA T CAL	0.0°F	±2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
	RA H CAL	0% RH	±10% RH	Allows for operator to adjust for an out of calibration humidity sensor.
	DA T CAL	0.0°F	±2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.

Table 4 — Menu Structure (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
CHECKOUT	DAMPER VMIN—HS	N/A	N/A	Positions damper to VMIN position.
	DAMPER VMAX—HS	N/A	N/A	Positions damper to VMAX position.
	DAMPER OPEN	N/A	N/A	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure to pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	N/A	N/A	Positions damper to the fully closed position.
	CONNECT Y1—O	N/A	N/A	Closes the Y1—O relay (Y1—O)
	CONNECT Y2—O	N/A	N/A	Closes the Y2—O relay (Y2—O)
	CONNECT AUX	N/A	N/A	Energizes the AUX output. If Aux setting is: • NONE — not action taken • ERV — 24 Vac out. Turns on or signals an ERV that the conditions are not good for economizing but are for ERV operation. • SYS — 24 Vac out. Issues a system alarm
ALARMS				Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis ( ). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen
	MA T SENS ERR	N/A	N/A	Mixed air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	CO$_2$ SENS ERR	N/A	N/A	CO$_2$ sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK T ERR	N/A	N/A	Outdoor air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK H ERR	N/A	N/A	
	RA SYLK T ERR	N/A	N/A	Return air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	RA SYLK H ERR	N/A	N/A	
	DA SYLK T ERR	N/A	N/A	Discharge air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SENS T ERR	N/A	N/A	Outdoor air temperature sensor has failed or become disconnected - check wiring then replace if the alarm continues.
	ACT ERROR	N/A	N/A	Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is movable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu.
	FREEZE ALARM	N/A	N/A	Check if outdoor temperature is below the LOW Temp Lockout on setpoint menu. Check if mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced menu. When conditions are back in normal range then the alarm will go away.
	SHUTDOWN ACTIVE	N/A	N/A	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX 2IN terminal.
	DMP CAL RUNNING	N/A	N/A	If DCV Auto enable has been programmed, when the W7220 is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up in the Advanced setup menu.
	DA SENS ALM	N/A	N/A	Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.
	SYS ALARM	N/A	N/A	When AUX1-O is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-O terminal has 24 Vac out.
	ACT UNDER V	N/A	N/A	Voltage received by actuator is above expected range.
	ACT OVER V	N/A	N/A	Voltage received by actuator is below expected range.
	ACT STALLED	N/A	N/A	Actuator stopped before achieving commanded position.

LEGEND

LCD — Liquid Crystal Display
MA — Mixed Air
MAT — Mixed Air Temperature
OA — Outdoor Air
OAT — Outdoor Air Temperature
OCC — Occupied
RA — Return Air
RAT — Return Air Temperature
RTU — Rooftop Unit

* Table 4 illustrates the complete hierarchy. The menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO$_2$) sensor, then none of the DCV parameters appear.
† When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.
** N/A = Not Applicable.
†† ERV Operation: When in cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode, the ERV terminal will be energized when the OA is below the ERV OAT setpoint in the setpoint menu.

CHECKOUT TESTS

Use the Checkout menu to test the damper operation and any configured outputs. See Table 4 for parameters. Only items that are configured are shown in the Checkout menu.

NOTE: See User Interface for information about menu navigation and use of the keypad.

1. To perform a Checkout test:
2. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
3. Press the ↵ button to select the item.
4. RUN? appears.
5. Press the ↵ button to start the test.
6. The unit pauses and then displays IN PROGRESS.
7. When the test is complete, DONE appears.
8. When all desired parameters have been tested, press the ⬆ (Menu Up/Exit) button to end the test.

Checkout test can be performed at any time during the operation of the system as a test that the system is operable.

⚠ CAUTION

Failure to follow this caution may result in damage to equipment. Be sure to allow enough time for compressor startup and shutdown between checkout tests so that the compressors do not short-cycle.

W7220 Economizer Module Wiring

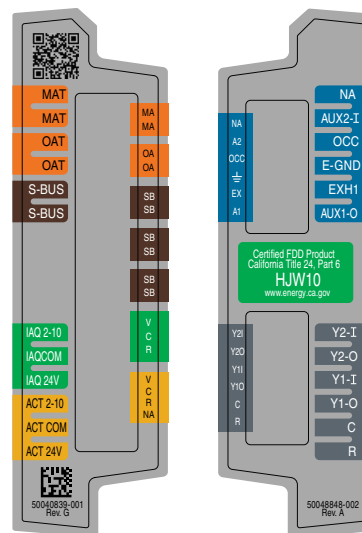Use Fig. 12 and 13 and Tables 5 and 6 to locate the wiring terminals for the economizer module.

Fig. 12 — W7220 Economizer Module Terminal Connection Labels

NOTE: The four terminal blocks are removable. You can slide out each terminal block, wire it, and then slide it back into place.
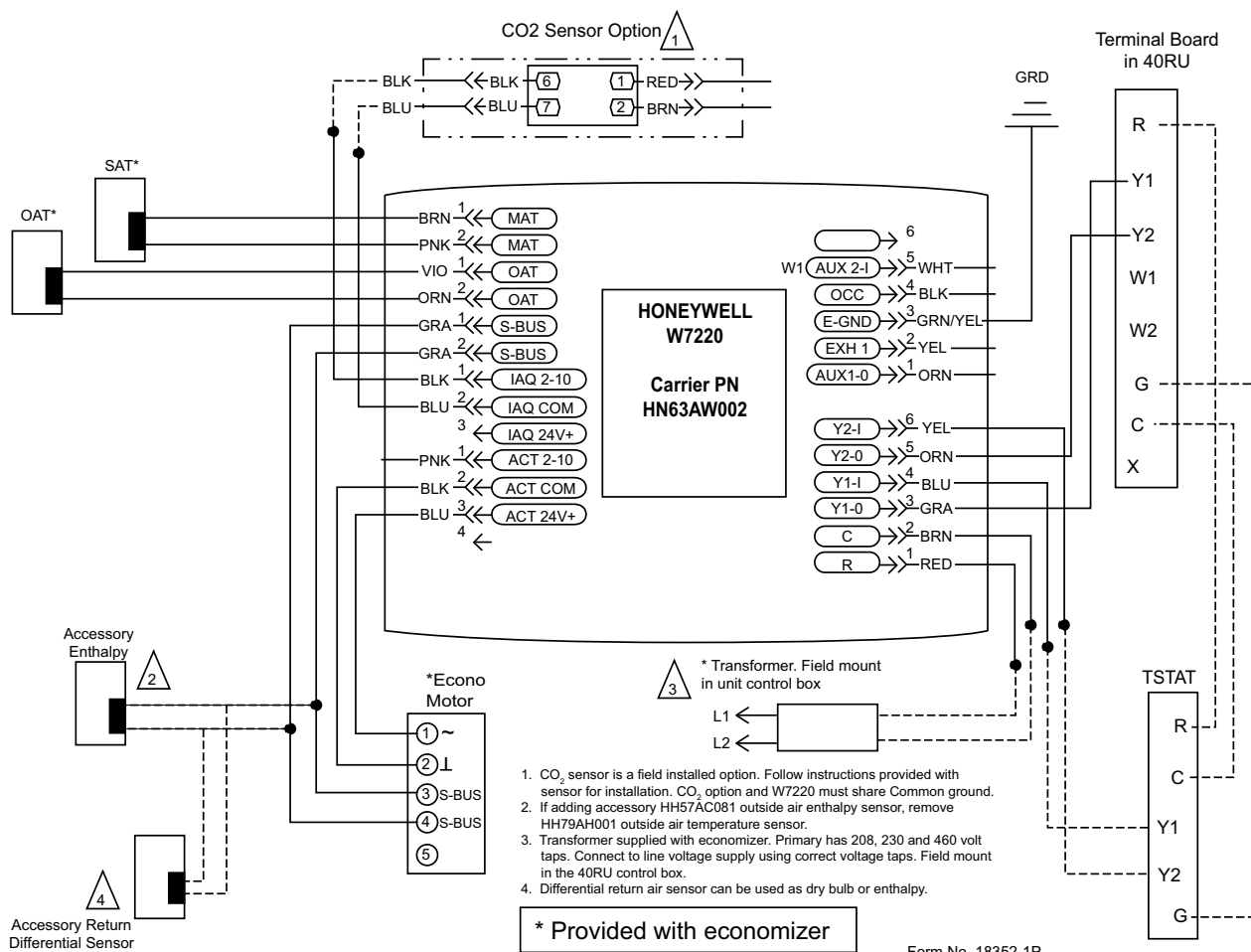
Fig. 13 — W7220 Controller Typical Wiring Diagram

1. CO₂ sensor is a field installed option. Follow instructions provided with sensor for installation. CO2 option and W7220 must share Common ground.
2. If adding accessory HH57AC081 outside air enthalpy sensor, remove HH79AH001 outside air temperature sensor.
3. Transformer supplied with economizer. Primary has 208, 230 and 460 volt taps. Connect to line voltage supply using correct voltage taps. Field mount in the 40RU control box.
4. Differential return air sensor can be used as dry bulb or enthalpy.

* Provided with economizer

Form No. 18352-1P

Table 5 — Economizer Module - Left Hand Terminal Blocks

LABEL	TYPE	DESCRIPTION
Top Left Terminal Block		
MAT MAT	20k NTC and COM	Mixed Air Temperature Sensor (Polarity Insensitive Connection)
OAT OAT	20k NTC and COM	Outdoor Air Temperature Sensor (Polarity Insensitive Connection)
S-BUS S-BUS	S-BUS (Sylk Bus)	Enthalpy Control Sensor (Polarity Insensitive Connection)
Bottom Left Terminal Block		
IAQ 2-10	2-10 vdc	Air Quality Sensor Input (e.g. CO_2 sensor)
IAQ COM	COM	Air Quality Sensor Common
IAQ 24V	24 vac	Air Quality Sensor 24 vac Source
ACT 2-10	2-10 vdc	Damper Actuator Output (2-10 vdc)
ACT COM	COM	Damper Actuator Output Common
ACT 24v	24 vac	Damper Actuator 24 vac Source

Table 6 — Economizer Module - Right Hand Terminal Blocks

LABEL	TYPE	DESCRIPTION
Top Right Terminal Blocks		
AUX2 I	24 vac IN	The first terminal is not used.
OCC	24 vac IN	Shut Down (SD) or HEAT (W) Conventional only and Heat Pump Changeover (O-B) in Heat Pump mode
E-GND	E-GND	Occupied/Unoccupied Input
EXH1	24 vac OUT	Exhaust Fan 1 Output
AUX1 O	24 vac OUT	Programmable: Exhaust fan 2 output or ERV or System alarm output
Bottom Right Terminal Blocks		
Y2-I	24 vac IN	Y2 in - Cooling Stage 2 Input from space thermostat
Y2-O	24 vac OUT	Y2 out - Cooling Stage 2 Output to stage 2 mechanical cooling
Y1-I	24 vac IN	Y1 in - Cooling Stage 2 Input from space thermostat
Y1-O	24 vac OUT	Y1 out - Cooling Stage 2 Output to stage 2 mechanical cooling
C	COM	24 vac Common
R	24 vac	24 vac Power (hot)

Time-out and Screen Saver

When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each status item displays in turn and cycles to the next item after 5 seconds.

HH79AH001 Dry Bulb Sensor

Economizers are shipped standard with an HH79AH001 outside air dry bulb sensor (see Fig. 14). System default setting (high temp limit) is 63°F (17°C), and has a range of 48°F to 80°F (9°C to 27°C). Sensor is factory installed on economizer.

NOTE: A second HH79AH001 sensor is provided for mixed air temperature.

NOTE: California high temperature setting requirements by region are shown below in Table 7.

Enthalpy Settings (Enthalpy Optional)

If installing the optional HH57AC081 enthalpy sensor the HH79AH001 dry bulb outside air sensor must first be removed. Wire enthalpy to S-BUS connections on W7220 controller through (2) gray wires.

When the OA temperature, enthalpy and dew point are below the respective setpoints, the outdoor air can be used for economizing. Figure 15 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (setpoints ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

See Table 8 for ENTH CURVE setpoint values for each boundary limit.

To use enthalpy the W7220 must have a HH57AC081 enthalpy control sensor for OA. The W7220 calculates the enthalpy and dew point using the OA temperature and humidity input from the OA sensor. When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available. When all of the OA conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.

If using OA enthalpy sensor option, remove and discard the dry bulb sensor shipped with the economizer. System default setting is ES3 enthalpy curve.

See Table 7 for California Title 24 high limit dry bulb temperature settings.

Figure 15 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized. Table 8 provides the values for each boundary limit.

Fig. 14 — HH79AH001 Dry Bulb and Mixed Air Sensor

Table 7 — California Title 24 Regional High Limit Dry Bulb Temperature Settings

DEVICE TYPE*	CLIMATE ZONES	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN): DESCRIPTION
FIXED DRY BULB	1, 3, 5, 11-16	OAT exceeds 75°F (24°C)
	2, 4, 10	OAT exceeds 73°F (23°C)
	6, 8, 9	OAT exceeds 71°F (22°C)
	7	OAT exceeds 69°F (21°C)
DIFFERENTIAL DRY BULB	1, 3, 5, 11-16	OAT exceeds RA Temp.
	2, 4, 10	OAT exceeds -2°F (–19°C)
	6, 8, 9	OAT exceeds -4°F (–20°C)
	7	OAT exceeds -4°F (–20°C)
FIXED ENTHALPY† FIXED DRY BULB	ALL	OAT exceeds 28 Btu/lb of dry air or OAT exceeds 75°F (24°C)

LEGEND

OAT — Outdoor Air Temperature

RA — Return-Air Temperature

* Only the high limit control devices listed are allowed to be used and at the setpoints listed. Others such as Dew Point, Fixed Enthalpy, Electronic Enthalpy, and Differential Enthalpy Controls, may not be used in any climate zone for compliance with Section 140.4(e)1 unless approval for use is provided by the Energy Commission Executive Director.

† At altitudes substantially different than sea level, the Fixed Enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at approximately 6,000 foot elevation, the fixed enthalpy limit is approximately 30.7 Btu/lb.
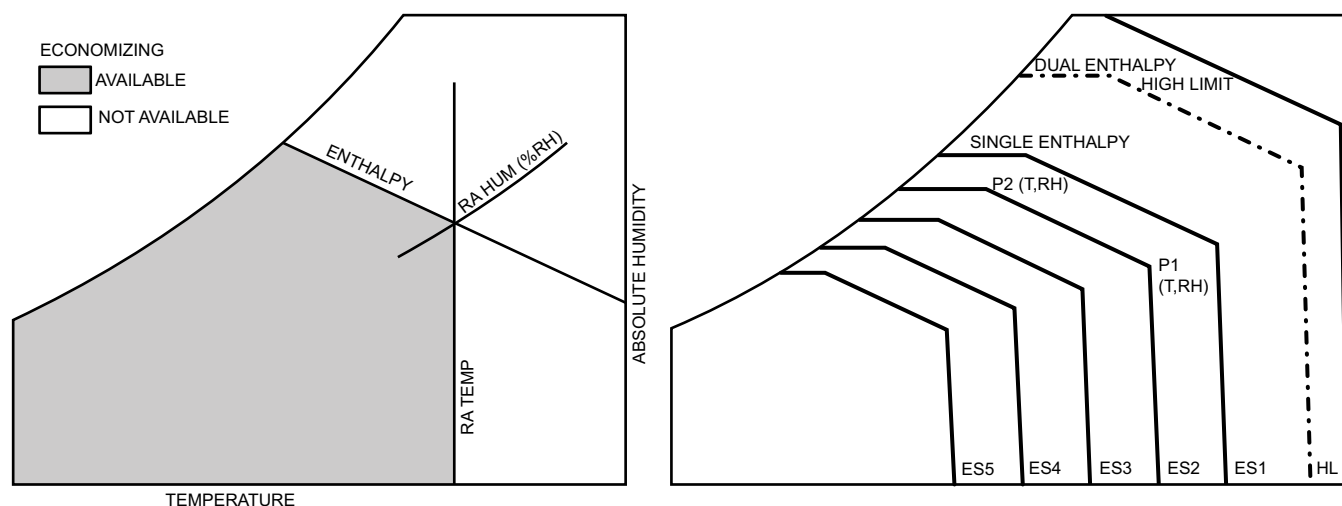
Fig. 15 — Single Enthalpy Curve Boundaries

Table 8 — Single Enthalpy and Dual Enthalpy High Limit Curves

ENTHALPY CURVE	TEMP. DRY BULB (F) (C)	TEMP. DEWPOINT (F) (C)	ENTHALPY (btu/lb/da)	POINT P1		POINT P2	
				TEMP. (F) (C)	HUMIDITY (%RH)	TEMP. (F) (C)	HUMIDITY (%RH)
ES1	80 (27)	60 (16)	28.0	80 (27)	36.8	66.3 (19.1)	80.1
ES2	75 (24)	57 (14)	26.0	75 (24)	39.6	63.3 (17.3)	80.0
ES3	70 (21)	54 (12)	24.0	70 (21)	42.3	59.7 (15.3)	81.4
ES4	65 (18)	51 (11)	22.0	65 (18)	44.8	55.7 (13.1)	84.2
ES5	60 (16)	48 (9)	20.0	60 (16)	46.9	51.3 (10.7)	88.5
HL	86 (30)	66(19)	32.4	86 (30)	38.9	72.4 (22.4)	80.3

Enthalpy Control Sensor Configuration

The optional enthalpy control sensor (Part Number: HH57AC081) communicates with the W7220 economizer controller on the two-wire communications bus and can either be wired using a two pin header or using a side connector. The HH57AC081 sensor can be used as a single outside air enthalpy, a differential return enthalpy, or a differential return temperature sensor depending on dip-switch setting.

Use Fig. 16 and Table 9 to locate the wiring terminals for each enthalpy control sensor.
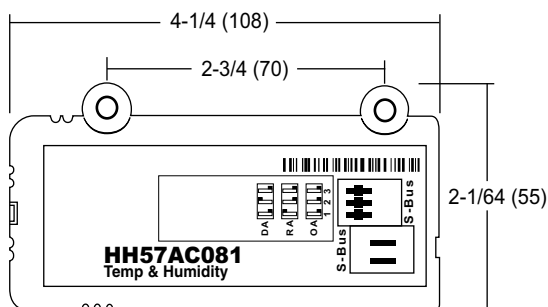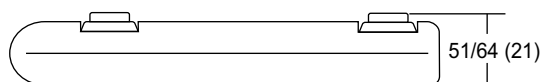
NOTE: Dimensions are in inches (mm)

Fig. 16 — HH57AC081 Sensor (Used as OA Enthalpy, Return Air Dry Bulb, or Return Air Enthalpy)

Table 9 — HH57AC081 Sensor Wiring Terminations

TERMINAL		TYPE	DESCRIPTION
NUMBER	LABEL		
1	S-BUS	S-BUS	S-BUS Communications (Enthalpy Control Sensor Bus)
2	S-BUS	S-BUS	S-BUS Communications (Enthalpy Control Sensor Bus)

Use Fig. 16 and Table 10 to set the DIP switches for the desired use of the sensor.

Table 10 — HH57AC081 Sensor DIP Switch

USE	DIP SWITCH POSITIONS FOR SWITCHES 1, 2, AND 3		
	1	2	3
DA	OFF	ON	OFF
RA	ON	OFF	OFF
OA	OFF	OFF	OFF

LEGEND
DA — Discharge Air or Supply Air
OA — Return Air
RA — Outside Air

If using differential (return) enthalpy or temperature option, see Table 7 for California Title 24 setting requirements by region.

START-UP

Cooling with EconoMi$er® X System

For Occupied mode operation of EconoMi$er X system, there must be a 24-v signal at terminals R and OCC (provided through PL6-3 from the unit's IFC coil). Removing the signal at OCC places the EconoMi$er X control in Unoccupied mode. See Table 11 for damper position control.

During Occupied mode operation, indoor fan operation will be accompanied by economizer dampers moving to Minimum Position setpoint for ventilation. If indoor fan is off, dampers will close. During Unoccupied mode operation, dampers will remain closed unless a Cooling (by free cooling) or DCV demand is received.

When free cooling using outside air is not available, the unit cooling sequence will be controlled directly by the space thermostat. Outside air damper position will be closed or Minimum Position as determined by Occupancy mode and fan signal.

When free cooling is available as determined by the appropriate changeover command (dry bulb, outdoor enthalpy, differential dry bulb or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the economizer control to modulate the dampers open and closed to maintain the unit supply air temperature. Default supply temperature is 53°F (12°C), with a range of 38°F to 70°F (3.3°C to 21.1°C). Compressor will not run.

Should 100% outside air not be capable of satisfying the space temperature, space temperature will rise until Y2 is closed. The economizer control will call for compressor operation. Dampers will modulate to maintain SAT at set point concurrent with Compressor 1 operation. The "Low T Temp" setting [default 32°F (0°C)] will lock out compressor operation.

When space temperature demand is satisfied (thermostat Y1 opens), the dampers will return to Minimum Damper position if indoor fan is running or fully closed if fan is off.

If accessory power exhaust is installed, the power exhaust fan motors will be energized by the economizer control as the dampers open above the EXH1 SET setpoint and will be energized as the dampers close below the EXH1 SET setpoint.

Damper movement from full closed to full open (or vice versa) will take between 1 1/2 and 2 1/2 minutes.

Heating with EconoMi$er® X System

During Occupied mode operation, indoor fan operation will be accompanied by economizer dampers moving to Minimum Position setpoint for ventilation. If indoor fan is off, dampers will close. During Unoccupied mode operation, dampers will remain closed unless a DCV demand is received.

When the room temperature calls for heat (W1 closes), the heating controls are energized.

Demand Controlled Ventilation (DCV)

If a field-installed CO_2 sensor is connected to the EconoMi$er X control, a Demand Controlled Ventilation strategy will operate automatically. As the CO_2 level in the space increases above the setpoint (on the EconoMi$er X controller), the minimum position of the dampers will be increased proportionally, until the Maximum Ventilation setting is reached. As the space CO_2 level decreases because of the increase in fresh air, the outdoor damper will follow the higher demand condition from the DCV mode or from the free cooling mode.

DCV operation is available in Occupied and Unoccupied periods with EconoMi$er X system. However, a control modification will be required on the unit system to implement the Unoccupied period function.

TROUBLESHOOTING

For a list of common operating issues and concerns see Table 12.

Power Loss (Outage or Brownout)

All setpoints and advanced settings are restored after any power loss or interruption, as all settings are stored in the economizer controller's non-volatile flash memory.

NOTE: If the power goes below 18 Vac, the W7220 controller module assumes a power loss and the 5 minute power up delay will become functional when power returns above 18 Vac.

Alarms

The economizer module provides alarm messages that display on the 2-line LCD.

NOTE: Upon power up, the module waits several seconds before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational.

If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.

The Alarms menu can be navigated at any time. See Table 4 for the Alarms menu.

Clearing Alarms

Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor) the alarm can be cleared from the display.

To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the ↵ button.
3. ERASE? displays.
4. Press the ↵ button.
5. ALARM ERASED displays.
6. Press the ↑ (Menu up/Exit) button to complete the action and return to the previous menu.

NOTE: If the alarm still exists after it is cleared it, it is redisplayed within 5 seconds.

Table 11 — Damper Position Control, 2-Speed Fan Motor, Economizer Cooling Not Available

INPUT VOLTAGE				SUPPLY FAN MOTOR SPEED	DAMPER POSITION	
OCC	Y1	Y2	W1		WITHOUT CO_2 SENSOR	WITH CO_2 SENSOR
0-V	0-V	0-V	0-V	OFF	CLOSED	CLOSED
24-V	0-V	0-V	0-V	LOW	MIN. POSITION	From VENTMIN L to VENTMAX L
24-V	24-V	0-V	0-V	LOW	MIN. POSITION	From VENTMIN L to VENTMAX L
24-V	24-V	24-V	0-V	HIGH	MIN. POSITION	From VENTMIN H to VENTMAX H
24-V	0-V	0-V	24-V	HIGH	MIN. POSITION	From VENTMIN H to VENTMAX H

Table 12 — Operating Issues and Concerns

ISSUE OR CONCERN	POSSIBLE CAUSE AND REMEDY
My outdoor temperature reading on the STATUS menu is not accurate	Check the sensor wiring: • Enthalpy sensors are to be wired to the S-Bus terminals. • Temperature sensors are to be wired to the OAT and MAT terminals.
If my enthalpy sensor drifts in accuracy over time, can I re-calibrate it?	The sensor is not able to be re-calibrated in the field. However there is a menu item under the ADVANCED menu to input a limited off set in temperature and humidity for each sensor connected to the economizer.
Can I go back to factory defaults and start over?	Under the SYSTEM SETUP menu you can change the setpoints to the factory defaults.
Will I be able to see the LCD screen when it is in the unit?	The LCD screen has a back light that is always illuminated.
What is a good setpoint for the Mixed Air Temperature (MAT)?	The mixed air temperature is the temperature of air that you want to supply to the space. In a commercial building, this is between 50 and 55°F (10 and 13°C). The mixed air is the mixing of the return air and the outdoor air.
I am using enthalpy sensors. Why did the control ask me to input a dry bulb changeover temperature?	In the event the humidity sensor in the enthalpy sensors fails, the backup algorithm in the control is to default to the temperature sensor in the enthalpy sensor.
In checkout, the outdoor damper closes when I command it to open.	Check the actuator linkage or rotation. In the CHECKOUT mode, the outdoor damper should drive open or closed with the return air damper having the opposite effect.
How do I set my minimum position?	The minimum position is set using the VENTMIN and VENTMAX setup in the SETPOINTS menu. VENTMIN is the minimum ventilation required when using an occupancy sensor and VENTMAX is the minimum ventilation when not using an occupancy sensor for Demand Controlled Ventilation. The VENTMAX position is set the same as with the potentiometer on the analog economizers and is the output voltage to the damper actuator. The range is 2 Vdc closed OA damper and 10 Vdc open OA damper.
What if my damper does not go completely closed in the checkout operation?	Check the damper linkage or hub to make sure the damper is able to close completely.
How do I set the OCC?	There are two settings for the OCC setting: INPUT and ALWAYS. INPUT is from the space thermostat, if it has an occupancy output. ALWAYS is the unit in the occupied mode, if the economizer is powered (fan on).
Does the economizer save my program values if the unit loses power?	Yes, once the changes are stored in the controller they will be stored until they are changed by the operator.
If the unit is left in checkout, how long will the unit stay in checkout mode without input?	The unit will remain in checkout for 10 minutes, then return to normal operation.