

# Large Rooftop Units 12<sup>1</sup>/<sub>2</sub> to 25 Tons Accessory EconoMi\$er Package

Cancels: IIK 542J-150-6 IIK 551A-155-3  
2/1/01

## Installation, Start-Up, and Service Instructions

Part Number CRECOMZR008A00

### GENERAL

**IMPORTANT:** Read these instructions completely before attempting to install the accessory EconoMi\$er.

**IMPORTANT:** This accessory can only be installed on units produced after May, 1992 (serial no. 1892F and later).

The accessory EconoMi\$er package uses microprocessor-based controls to sequence mechanical cooling with cool outdoor air (free cooling) to satisfy the cooling load and minimize energy consumption. Free cooling can be used alone or in conjunction with mechanical cooling.

The standard EconoMi\$er uses an enthalpy sensor to sense Outdoor Air Enthalpy. This sensor provides two functions for the EconoMi\$er controller: it determines the availability of free cooling (EconoMi\$er changeover); and it disables compressors at low ambient temperatures (mechanical cooling lockout).

When free cooling is available, the EconoMi\$er sequences free cooling with up to two stages of mechanical cooling to maintain comfort in the space. When free cooling is not available, the EconoMi\$er modulates to an adjustable minimum position set point to maintain a supply of fresh air entering the building.

Optional barometric relief dampers provide natural building pressurization control. An optional power exhaust system is available for jobs requiring greater relief.

The microprocessor CO<sub>2</sub> input terminals allow the addition of an accessory CO<sub>2</sub> sensor in the space or in return air ductwork. When the EconoMi\$er recognizes the presence of the CO<sub>2</sub> sensor, a ventilation control strategy automatically begins to operate. The outdoor air damper modulates open past minimum position as the CO<sub>2</sub> level in the space increases over the adjustable set point.

### PACKAGE USAGE AND CONTENTS

UNIT SIZE	PACKAGE NO.	QTY	CONTENTS
12 <sup>1</sup> / <sub>2</sub> to 25 Ton	CRECOMZR 008A00	1	EconoMi\$er Assembly
		1	Frame Top
		14	Screws
		1	Wiring Assembly
		1	Discharge Air Thermistor
		1	Snap Bushing
		1	Wire Tie
		2	Seal Strip

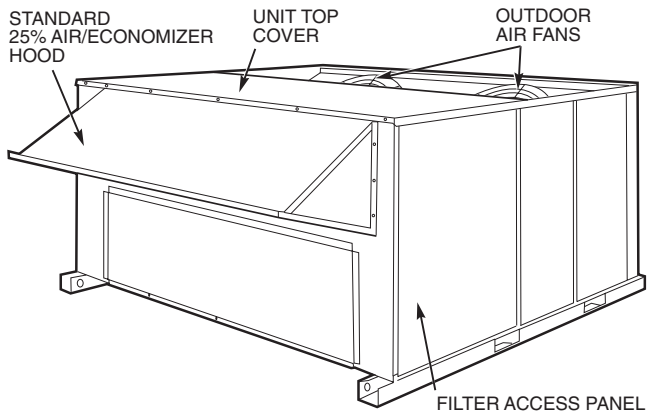
### INSTALLATION

#### **▲ WARNING**

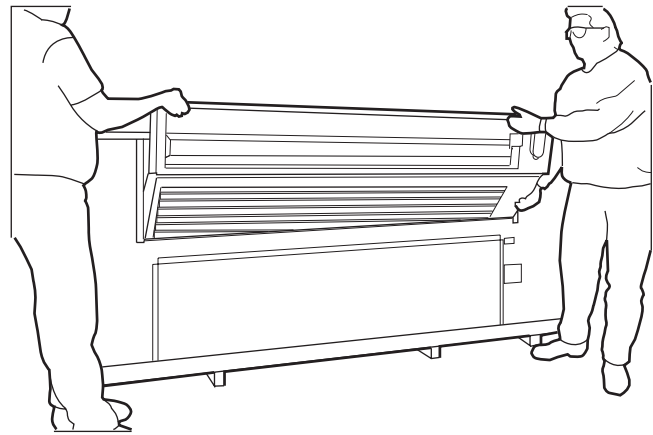
Turn off unit power. Electrical shock and personal injury could result.

Install economizer damper assembly as follows:

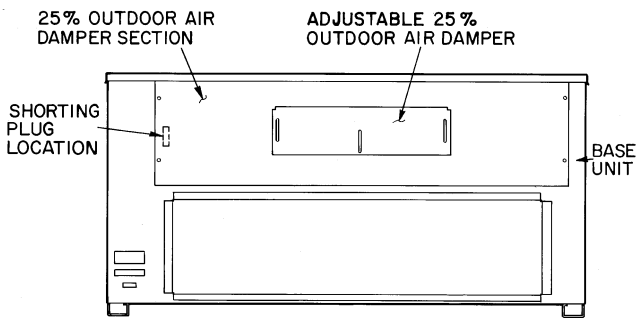
1. If base unit is installed and in operation, turn off all power to unit.
  2. Remove filter access panel. Remove 25% air/economizer hood. See Fig. 1.
  3. Remove 25% outdoor air damper section. Save screws. See Fig. 2.
  4. Remove shorting plug located in the left front of return air compartment at back of unit control box. See Fig. 2.
  5. Remove EconoMi\$er damper assembly from shipping carton. See Fig. 3.
  6. Install seal strip on left and right sides of EconoMi\$er opening.
  7. Slide EconoMi\$er assembly into unit opening as shown in Fig. 4.
  8. Complete assembly of damper section into unit (Fig. 5). For end view of installed EconoMi\$er, see Fig. 6. Ensure that EconoMi\$er bottom flange is positioned on basepan before installing 2 screws connecting bottom flange to unit basepan.
  9. Using 4 screws removed at Step 3, secure the damper assembly to the unit. See Fig. 5.
  10. Plug EconoMi\$er wiring assembly into the receptacle at the back of unit control box where shorting plug was removed. See Fig. 7.
- NOTE: If installing on a unit produced before February 12, 2001 (serial no. 0601F and earlier), an additional RED wire must be connected from TB R to PL/-2.
11. Install frame top above damper assembly. See Fig. 5.
  12. Install discharge air thermistor in fan section on two holes provided on fan housing. Route wiring to EconoMi\$er controller through knockout hole in panel. Use bushing provided. Use wire tie to keep wiring away from fan blades.
  13. Re-install 25% air/economizer hood. Refer to base unit installation instructions. See Fig. 8.



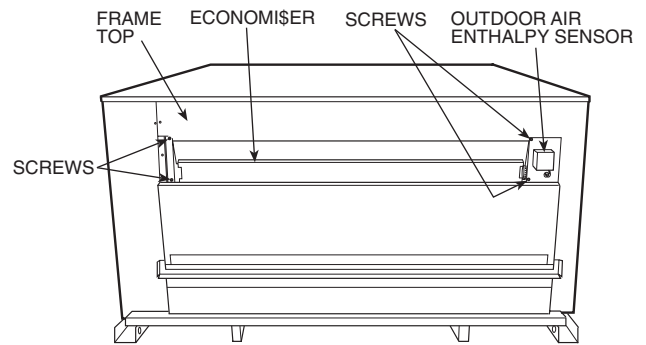
**Fig. 1 — Base Unit Details**



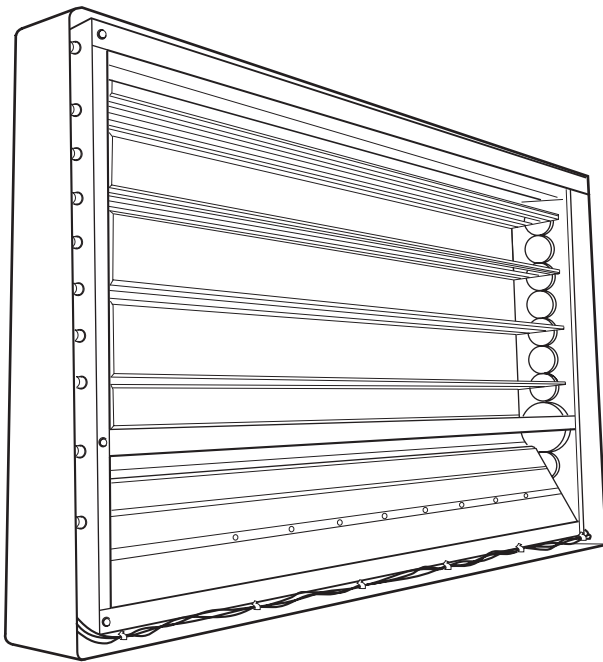
**Fig. 4 — Slide EconoMi\$er Assembly Into Unit**



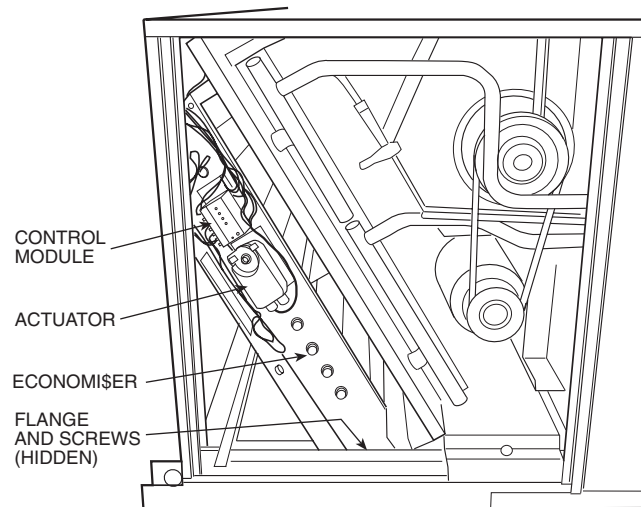
**Fig. 2 — Standard 25% Outdoor-Air Section Details**



**Fig. 5 — EconoMi\$er Assembled in Unit — End View**



**Fig. 3 — EconoMi\$er Shipping Packaging**



**Fig. 6 — EconoMi\$er Assembled in Unit — Side View**

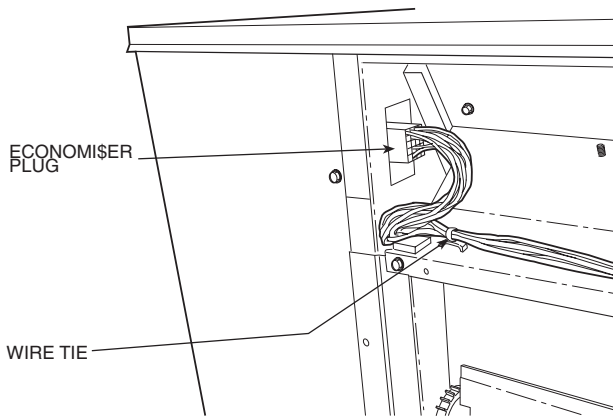


Fig. 7 — EconoMiSer Plug

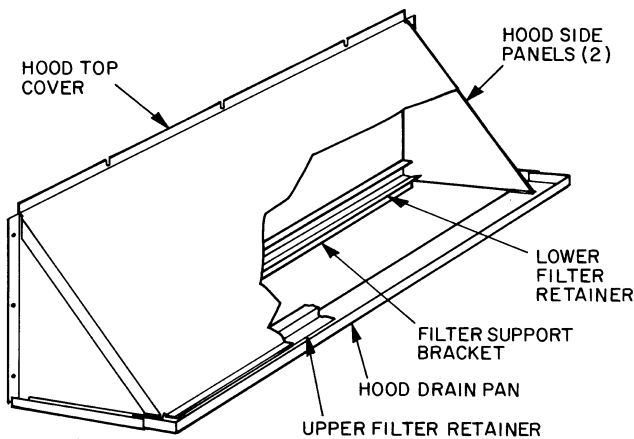


Fig. 8 — Outdoor-Air Hood Details

## OPERATION

**CO<sub>2</sub> Control Setup** — If a CO<sub>2</sub> sensor is not being used, proceed to the next section. If a CO<sub>2</sub> sensor is being used, perform the following:

1. Determine the value at which you want the minimum position of the dampers to begin opening to allow a greater amount of outdoor air to enter. The range is 800 to 1,400 ppm.
2. Locate the CO<sub>2</sub> SP (PPM) potentiometer and adjust to the desired set point. See Fig. 9.

**Mechanical Cooling Lockout** — Determine the outdoor-air temperature at which you want the mechanical cooling (compressors) to be disabled. Locate the mechanical cooling lockout (MECH CLG LOCKOUT) potentiometer. To disable this feature, turn the potentiometer counterclockwise (CCW) to the OFF position. Otherwise, set the value between 10 and 60 F. Mechanical cooling will not operate when the outdoor air temperature is below this value. See Fig. 9.

Recommended setting and factory default value is 50 F.

**Enthalpy, Dry Bulb, and Differential Changeover Set Up** — Determine the enthalpy changeover set point from Table 1. The settings are A, B, C and D. Locate the ECON SP potentiometer and set the enthalpy changeover set point. See Fig. 9. When the OAT is above this set point, the damper is limited to minimum position setting.

Table 1 — Changeover Set Points

SETTINGS	A	B	C	D
Dry Bulb (°F)*	73	69	66	63
Single Enthalpy (Btu/lb)	27	25	24	22
Differential Temperature* (°F, Not Adjustable)	2	2	2	2
Differential Enthalpy* (Btu/lb, Not Adjustable)	1	1	1	1

\*Field-installed accessory.

If a potentiometer fails, its setting will default to the values in Table 2.

Table 2 — Default Potentiometer Settings

POTENTIOMETER	DEFAULT SETTING
CO <sub>2</sub> SP (PPM)	1,000
MECH CLG LOCKOUT	50 F
ECON SP	D
MIN POS (%)	20

**Ventilation Air (Minimum Position Set Up)** — If ventilation air is not required, proceed to Step 5. If ventilation air is required, perform the following:

1. The indoor fan must be on to set the ventilation air. Either put the thermostat in the continuous fan mode or jumper the R and G terminals at the rooftop unit connection board.
2. Locate the minimum position (MIN POS) potentiometer. Turn the potentiometer full CCW to fully close the outdoor air dampers. Turn the potentiometer gradually clockwise (CW) to the desired position. See Fig. 9.
3. Replace the filter access panel. See Fig. 1. Ensure the filter access panel is securely engaged.
4. Calculate the minimum airflow across the EconoMiSer.
  - a. Calculate % of outside air using the following formula.
 
$$\% \text{ Outdoor air} = \frac{\text{Mixture Temp} - \text{Return Air Temp}}{\text{Outdoor Temp} - \text{Return Air Temp}}$$
  - b. Multiply total CFM by percentage outdoor air, this gives outdoor air volume in CFM.
5. Turn on base unit power.

## ⚠ WARNING

**Personal Injury Hazard.** Avoid possible injury by keeping fingers away from damper blades.

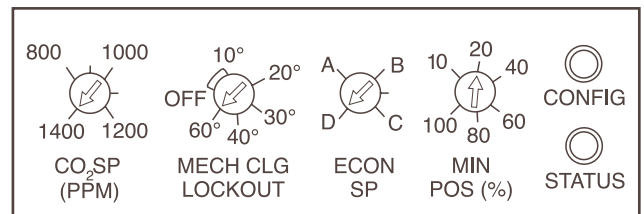


Fig. 9 — EconoMiSer Control Adjustment Potentiometers

## START-UP

### Operating Sequence

**COOLING** — When the Outdoor Air Enthalpy (OAH) is above the ECON SP set point and the room thermostat calls for Stage 1 cooling (R to G + Y1), the indoor-fan motor (IFM) is energized and the EconoMi\$er damper modulates to minimum position. The compressor contactor is energized starting the compressor and outdoor-fan motors (OFM). After the thermostat is satisfied, the damper modulates to the fully closed position when the IFM is deenergized.

When the OAH is below the ECON SP setting and the room thermostat calls for Stage 1 cooling (R to G + Y1), the EconoMi\$er modulates to the minimum position when the IFM is energized. The EconoMi\$er provides Stage 1 of cooling by modulating the return and outdoor air dampers to maintain a 55 F supply air set point. If the supply-air temperature (SAT) is greater than 57 F, the EconoMi\$er modulates open, allowing a greater amount of outdoor air to enter the unit. If the SAT drops below 53 F, the outdoor-air damper modulates closed to reduce the amount of outdoor air. When the SAT is between 53 and 57 F, the EconoMi\$er maintains its position.

If outdoor air alone cannot satisfy the cooling requirements of the conditioned space, and the Outdoor Air Temperature (OAT) is above the MECH CLG LOCKOUT set point, the EconoMi\$er integrates free cooling with mechanical cooling. This is accomplished by the strategies below.

**NOTE:** Compressors have a two-minute Minimum On and Minimum Off. Interstage delay is 1 minute.

1. If Y1 is energized, and the room thermostat calls for Y2 (2-stage thermostat), the compressor number 1 and OFMs are energized. The position of the EconoMi\$er damper is maintained at its current value.
2. If Y1 is energized for more than 20 minutes, and Y2 is not energized (whether or not a 2-stage thermostat is used), compressor no. 1 and OFM are energized. The position of the EconoMi\$er damper is maintained at its current value.
3. If Y1 is energized, and compressor no. 1 is already energized and the room thermostat calls for Y2, compressor no. 1 continues to operate. If Y2 remains energized for more than 20 minutes, compressor no. 2 (or unloader) is energized.

**NOTE:** Compressor no. 2 cannot be energized unless there is a signal for Y2 from the space thermostat.

4. If compressor no. 2 is energized, and the Y2 signal from the thermostat is satisfied, compressor no. 1 and 2 (or unloader) are deenergized. If the thermostat reenergizes Y2 will start compressor no. 1 and (after a 20-minute interstage delay) compressor no. 2 (or unloader).
5. If compressor no. 1 is energized and the thermostat is satisfied, compressor no. 1, the OFMs, and IFM are deenergized and the EconoMi\$er modulates closed.

When the OAT is below the MECH CLG LOCKOUT set point, the compressors remain off.

**HEATING** — When the room thermostat calls for heat, the heating controls are energized as described in the rooftop unit Installation, Start-Up and Service Instructions. The IFM is energized and the EconoMi\$er damper modulates to the minimum position. When the thermostat is satisfied, the damper modulates closed.

**VENTILATION (CONTINUOUS FAN)** — When the room thermostat is set for continuous fan, the EconoMi\$er damper

remains at minimum position as long as the IFM is energized. When the IFM cycles off, the damper modulates closed.

**VENTILATION CONTROL** — If a CO<sub>2</sub> sensor is connected to the EconoMi\$er controller and the IFM is energized, the EconoMi\$er minimum position increases if the CO<sub>2</sub> level is greater than the CO<sub>2</sub> set point. The set point is adjustable between 800 and 1,400 ppm through the CO<sub>2</sub> SP potentiometer located on the EconoMi\$er control. The greater the difference between the actual CO<sub>2</sub> level and the set point, the greater amount the damper modulates open. The CO<sub>2</sub> control modulates the damper, except when the Supply Air Low Limit strategy overrides the control.

**SUPPLY AIR LOW LIMIT** — The Supply Air Low Limit (SALL) control strategy is used to protect the mechanical equipment. The SALL will override the minimum position set point and the damper command from the ventilation control strategy if SAT drops below 45 F. The outdoor-air damper is completely closed when the SAT reaches 35 F. If mechanical cooling is energized, it will stay energized.

## ACCESSORIES

The EconoMi\$er has several field-installed accessories available to optimize performance. The outdoor air enthalpy sensor (part no. CROUTENT001A00) is standard. The accessory options include:

- return air temperature sensor
- enthalpy sensor for outdoor and return air differential enthalpy
- CO<sub>2</sub> sensors

Refer to Table 3 for authorized parts and Table 3 for settings.

**Table 3 — EconoMi\$er Field-Installed Accessories**

PART NUMBER	DESCRIPTION
CRRETTMP001A00	Return Air Temperature Sensor/Wiring Harness
CRRETTENT001A00	Return Air Enthalpy Sensor/Wiring Harness
33ZCSENCO2	CO <sub>2</sub> Sensor (wall mount or duct mount, aspirator box required for duct mount)
33ZCASPCO2	Aspirator Box (used with CO <sub>2</sub> sensor for duct mounting)

## TROUBLESHOOTING

Refer to Fig. 10 and 11 for EconoMi\$er wiring.

**LED Indication** — The EconoMi\$er controller features an onboard diagnostic LED (light-emitting diode) that flashes to indicate its status. See Table 4 for flash codes. The controller also has terminal connections (REM LED) for remotely mounting an LED, if desired. The flash code priorities are as follows:

1. On/Off or continuous flash
2. Critical fault
3. Non-critical fault

If any sensors are opened, shorted, or removed, the EconoMi\$er determines whether the failure is critical or non-critical and flashes the appropriate code. See Table 5 for procedures. If a non-critical sensor fault occurs (i.e., outdoor air humidity), the EconoMi\$er automatically reconfigures its control strategy to a more appropriate mode. If a critical sensor fault occurs (i.e., discharge air thermistor), the EconoMi\$er reverts to a safe mode of operation until the sensor problem is resolved. See Table 5.

**Manual Configuration Pushbutton** — The EconoMi\$er controller also features an onboard button (CONFIG) to help troubleshoot the system. See Fig. 9. The button has 3 functions.

Pressing the CONFIG button for more than three seconds, but less than ten seconds and then releasing will start the automatic test procedure. The damper will modulate fully open, wait, and modulate closed. This process takes three minutes to complete. Use this feature to determine if the actuator can be commanded.

If the CONFIG button is pressed and held for more than ten seconds, but less than 30 seconds, then released, the EconoMi\$er controller reconfigures its mode of operation based on the sensors that are connected and functioning normally, and cancels the automatic test procedure.

If the EconoMi\$er controller recognized a non-critical sensor fault, and flashed a code (i.e., FLASH 6, outdoor air humidity sensor fault) the FLASH CODE will be cleared, and normal operation begins. Ensure any faulty sensor is removed before clearing faults.

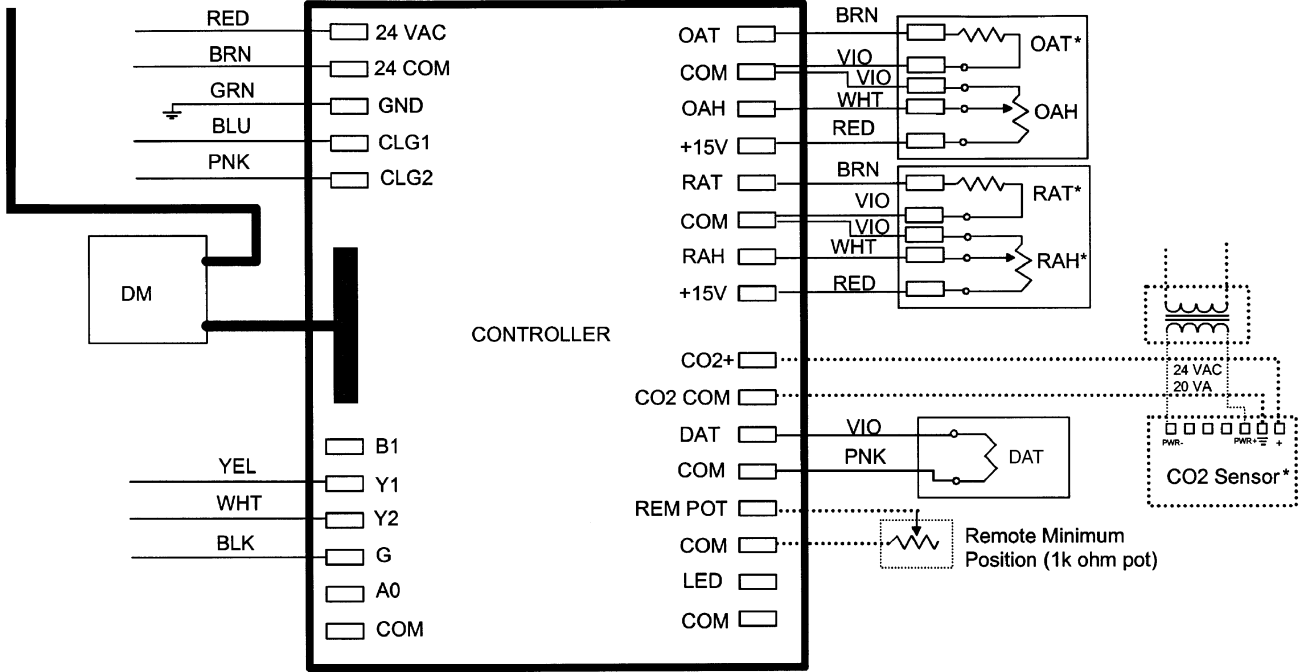
If the EconoMi\$er controller recognizes a critical sensor fault, and flashes a code (i.e., FLASH 4, supply air sensor fault) the FLASH code will not be cleared, and the EconoMi\$er will remain in the safe operation mode. The sensor fault must be corrected to enable EconoMi\$er to revert to normal operation.

If the CONFIG button is pressed and held for more than 30 seconds and then released, the EconoMi\$er controller will enable the enthalpy comparison strategy (with outdoor air and return air enthalpy sensors installed).

**Table 4 — EconoMi\$er Controller Flash Code Identification**

	FLASH CODE	CAUSE	ACTION TAKEN BY ECONOMI\$ER
Critical Fault	Constant On	Normal operation	Normal operation.
	Constant Off	No power	No operation.
	Continuous Flash	CONFIG button pushed and held between 3 and 9 seconds	Outdoor air damper is stroked fully open, then closed (automatic test procedure takes 3 minutes to complete).
	Flash One	Control board fault	System shutdown.
	Flash Two	Thermostat fault (i.e., Y2 without Y1)	System shutdown until corrected.
	Flash Three	Actuator fault	Revert to mechanical cooling only.
	Flash Four	Discharge Air Thermistor fault	Continue operation with damper at minimum position. Revert to mechanical cooling only.
	Flash Five	Outdoor air temperature sensor fault	Continue operation with damper at minimum position. Disable mechanical cooling lockout.
	Flash Six	Outdoor air humidity sensor fault	Continue operation with dry bulb or dry bulb differential switchover.
	Flash Seven	Return air temperature sensor fault	Continue operation with single enthalpy EconoMi\$er switchover or dry bulb EconoMi\$er switchover (without humidity sensor).
Non-Critical Fault	Flash Eight	Return air humidity sensor fault	Continue operation with single enthalpy, differential dry bulb, or dry bulb EconoMi\$er switchover.
	Flash Nine	Carbon Dioxide (CO <sub>2</sub> ) sensor fault	Continue operation without ventilation control.
	Flash Ten	Onboard adjustment potentiometer fault	Continue operation with default potentiometer settings.

TO ACCESSORY  
POWER EXHAUST

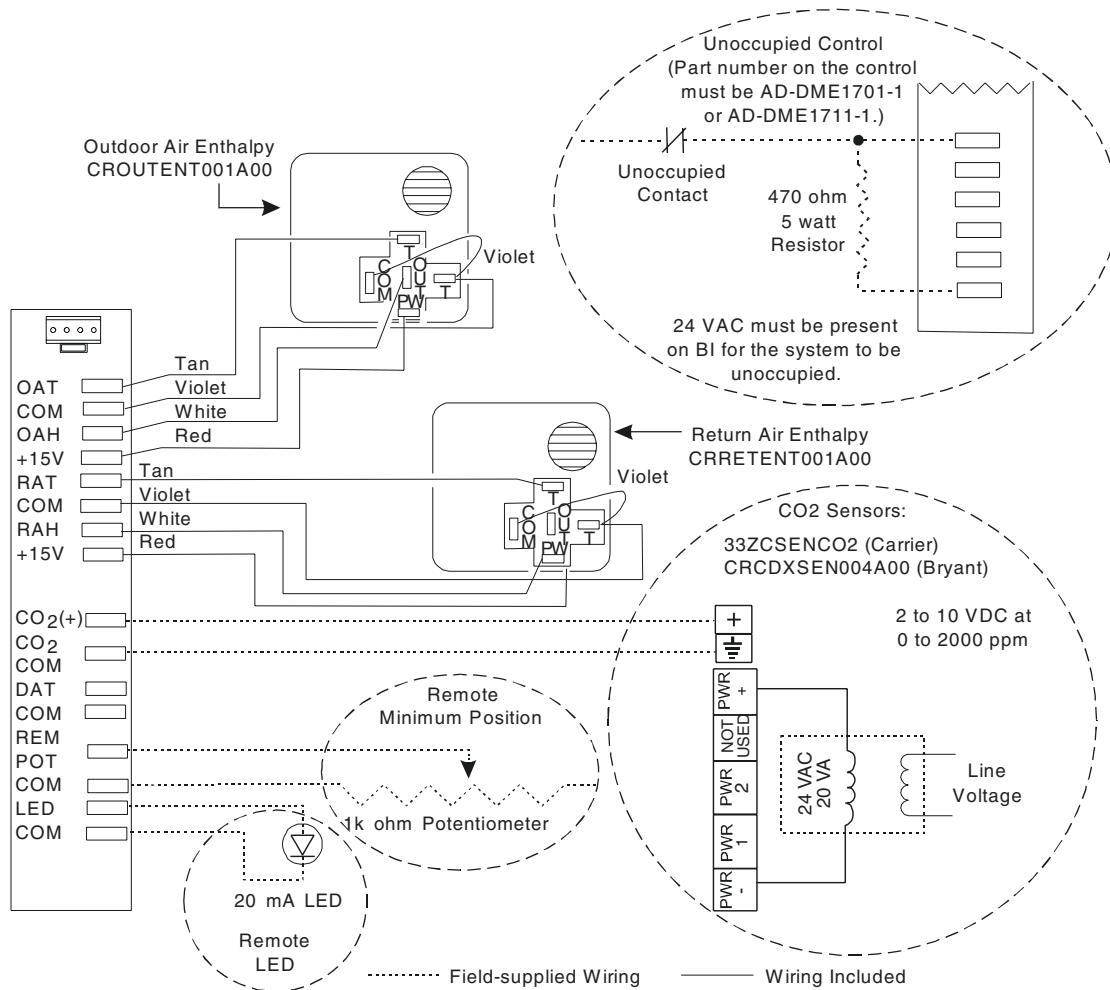


LEGEND

- COM — Common
- DAT — Discharge Air Thermistor
- DM — Damper Motor
- GND — Ground
- OAH — Outdoor-Air Enthalpy Sensor (Thermistor)
- OAT — Outdoor-Air Temperature Sensor (Thermistor)
- POT — Potentiometer
- RAH — Return-Air Enthalpy Sensor (Thermistor)
- RAT — Return-Air Temperature Sensor (Thermistor)
- REM — Remote

\*OAH sensor shipped with economizer. OAT, RAT, RAH and CO<sub>2</sub> are field-installed accessories.

Fig. 10 — Economi\$er Wiring



**Fig. 11 — Wiring Diagram for Field-Installed Sensors**

**Table 5 — Troubleshooting**

<b>PROBLEM</b>	<b>POTENTIAL CAUSE</b>	<b>REMEDY</b>
<b>Damper Does Not Open</b>	Indoor (Evaporator) Fan is Off	Check to ensure that 24 vac is present at Terminal C1 (Common Power) on the IFC (Indoor [Evaporator] Fan Contactor) or that 24 vac is present at the IFO (Indoor [Evaporator] Fan On) terminal. Check whether 24 vac is present at PL6-1 (red wire) and/or PL6-3 (black wire). If 24 vac is not present, check wiring (see unit label diagram). Check proper thermostat connection to G on the connection board.
	No Power to EconoMi\$er Controller	Check to ensure that 24 vac is present across Terminals 24 VAC and 24 V COM on the EconoMi\$er control. If 24 vac is not present, check wiring (see unit label diagram). If 24 vac is present, STATUS light should be on constantly.
	No Power to G Terminal	If IFM is on, check to ensure 24 vac is present on G Terminal of the EconoMi\$er controller. If 24 vac is not present, check wiring (see unit label diagram).
	Controller Fault	If STATUS light is flashing one flash, the EconoMi\$er controller is experiencing a fault condition. Cycle power to the controller. If condition continues, replace the EconoMi\$er controller.
	Thermostat Fault	If STATUS light is flashing two flashes, the EconoMi\$er controller senses that the thermostat is wired incorrectly. Check wiring between the thermostat and the connection board in the electrical panel. The fault condition is caused by Y2 being energized before Y1.
	Actuator Fault	Check the wiring between the EconoMi\$er controller and the actuator. Hold CONFIG button between 3 and 10 seconds to verify the actuator's operation. (This process takes 3 minutes to complete.)
<b>EconoMi\$er Operation Limited to Minimum Position</b>	Minimum Position Set Incorrectly	Verify that the MIN POS (%) is set greater than zero. Adjust MIN POS (%) to 100% to verify operation, and then set to correct setting.
	EconoMi\$er Changeover Set Point Set Too High or Too Low	Set at correct value. See Table 1.
	Discharge Air Thermistor Faulty	If STATUS light is flashing 4 flashes, Discharge Air Thermistor is faulty. Check wiring or replace sensor.
	Outdoor Air Temperature Sensor Faulty	If STATUS light is flashing 5 flashes, Outdoor Air Temperature Sensor is faulty. Check wiring or replace sensor.
<b>Damper Position Less than Minimum Position Set Point</b>	Supply Air Low Limit Strategy Controlling	The Discharge Air Thermistor temperature is less than 45 F, causing the minimum position to be decreased. Refer to the Start-Up instructions. Verify correct setting of MIN POS (%). If correct, EconoMi\$er is operating correctly.
<b>Damper Does Not Return to Minimum Position</b>	CO <sub>2</sub> Ventilation Strategy Controlling	If a CO <sub>2</sub> sensor is being used, and the damper position is greater than minimum position, the ventilation control strategy is controlling. Refer to the Start-Up instructions. EconoMi\$er is operating correctly.
<b>Damper Does Not Close on Power Loss</b>	Damper Travel is Restricted	Check to ensure the damper is not blocked.

LEGEND

IFM — Indoor Fan Motor  
PL — Plug