Small Rooftop Products
3 to 12½ Tons
Accessory Vertical EconoMi$er+
Large Rooftop Units
13 to 25 Tons
Accessory Vertical and Horizontal EconoMi$er+

Cancels: New IIK 548-36-59
4/15/03

Installation Instructions

Part Numbers: CRECOMZR020A01, CRECOMZR021A01 CRECOMZR008B00

Read these instructions completely before attempting to install the accessory EconoMi$er+. The EconoMi$er+ is used on the following units:

UNIT	SIZE
48HJ	004-017
50HJ	004-017
50HJQ	004-016
48TF	004-014
50TFF	004-014
50TFQ	004-012
48TJ	016-028
50TJ	016-028
48TM	004-028
50TM	004-028

UNIT	SIZE
542J	150,180
548F	036-120
549B	036-120
551A	155,180
551B	036-150
558F	036-300
559F	180-300
579F	180-300
580F	036-300
581A	155,180
581B	036-150

CONTENTS

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform the basic maintenance functions of replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

⚠ WARNING

Electrical shock can cause injury or death. Disconnect power supply and install lockout tag before attempting to install accessory.

GENERAL

The EconoMi$er+ system utilizes the latest technology available for integrating the use of free cooling with mechanical cooling for 3 through 25 ton rooftop units. The microprocessor-based 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 EconoMi$er+ system utilizes gear-drive technology with a direct-mount spring return actuator that will close upon loss of power. The EconoMi$er+ system comes standard with an outdoor air temperature sensor and a supply air temperature sensor. Return-air temperature, indoor humidity, and outdoor humidity sensors are available for field installation. Field-installed CO_2 sensors are available.

Standard (3 to 12½ tons) or optional (13 to 25 tons) barometric relief dampers provide natural building pressurization control. An optional power exhaust system is available for applications requiring even greater exhaust capabilities. Power exhaust is adjustable from the EconoMi$er+ controller. The yellow LED on the EconoMi$er+ controller flashes when the EconoMi$er+ is in free cooling. The EconoMi$er+ control includes an integrated display which allows the I/O values, switch input status, and relay outputs to be shown. Configuration and test modes are provided.

See Table 1 for Package Usage. See Table 2 for Package Contents. See Table 3 for sensor usage.

Table 1 — Package Usage

UNIT SIZE	PART NUMBER
3 to 6 Ton	CRECOMZR020A01
7½ to 12½ Ton	CRECOMZR021A01
13 to 25 Ton	CRECOMZR008B00

Table 2 — Package Contents

PACKAGE NO.	QTY	CONTENTS
CRECOMZR 020A01, CRECOMZR 021A01	1	Hood Top and Sides
	1	Hood Divider
	1	Aluminum Filter
	18	Screws
	1	EconoMi$er+ Assembly
	1	Outdoor Air Temperature Sensor
	1	Supply Air Temperature Sensor
CRECOMZR 008B00	1	EconoMi$er+ Assembly
	1	Frame Top
	14	Screws
	1	Wiring Assembly
	1	Supply Air Temperature Sensor
	1	Outdoor Air Temperature Sensor
	1	Snap Bushing
	1	Wire Tie
	2	Seal Strip

ACCESSORIES LIST

The EconoMi$er+ has several field-installed accessories available to optimize performance. Refer to Table 4 for authorized parts.

Table 4 — EconoMi$er+ Field-Installed Accessories

DESCRIPTION	PART NUMBER
3-6 Ton Power Exhaust 208-230 v 1 Ph	CRPWREXH030A00
3-6 Ton Power Exhaust 460 v 3 Ph	CRPWREXH021A00
7½-12½ Ton Power Exhaust 208-230 v 1 Ph	CRPWREXH022A00
7½-12½ Ton Power Exhaust 460 v 3 Ph	CRPWREXH023A00
13-25 Ton Power Exhaust (208/230, 460 v)	CRPWREXH008B00
13-25 Ton Power Exhaust (575 v)	CRPWREXH010B00
13-25 Ton Power Exhaust (220, 400 v - 50 Hz)	CRPWREXH009B00
Return Air Temperature Sensor with Harness	CRTEMPSN001A00
Outdoor Air Humidity Sensor with Harness	CRHUMDSN001B00*
Indoor Air Humidity Sensor w/Harness	CRHUMDSN001B00*
Return Air CO_2 Sensor	CRCBDIOX002A00
CO_2 Room Sensor	33ZCSENCO2
Aspiration Box for Duct Mount CO_2 Sensor	33ZCASPCO2
Space Temperature and CO_2 Room Sensor with Override	33ZCT55CO2
Space Temperature and CO_2 Room Sensor with Override and Set Point	33ZCT56CO2
5-Pin Sensor Wiring Plug	CRE+PLUG001A00*

*5-pin sensor wiring plug accessory (P/N CRE+PLUG001A00) is required to install IAQ sensor and remote potentiometer.

Table 3 — Sensor Usage

APPLICATION	STANDARD OUTDOOR AIR TEMPERATURE SENSOR	ACCESSORY RETURN AIR TEMPERATURE SENSOR	ACCESSORY OUTDOOR AIR HUMIDITY SENSOR	ACCESSORY INDOOR RETURN AIR HUMIDITY SENSOR
Standard Unit	Included — HH79NZ039	—	—	—
Differential Dry Bulb	Included — HH79NZ039	Required — CRTEMPSN001A00	—	—
Outdoor Air Enthalpy	Included — HH79NZ039	—	Required — CRHUMDSN001B00	—
Differential Enthalpy	Included — HH79NZ039	Required — CRTEMPSN001A00	Required — CRHUMDSN001B00	Required — CRHUMDSN001B00

NOTES:
1. CO_2 Sensors (Optional, 5-Pin sensor wiring plug CRE+PLUG001A00 required for installation.).
   33ZCSENCO2 — Room sensor (adjustable). Aspirator box is required for duct mounting of the sensor.
   33ZCASPCO2 — Aspirator box used for duct-mounted CO_2 room sensor.
   33ZCT55CO2 — Space temperature and CO_2 room sensor with override.
   33ZCT56CO2 — Space temperature and CO_2 room sensor with override and set point.
   CRCBDIOX002A00 — Return air CO_2 sensor.
2. All units include the following Standard Sensors:
   Outdoor-Air Sensor — set point adjustable from 45 F to 70 F, factory set at 65 F.
   Supply-Air Sensor — set point adjustable from 40 F to 65 F. Factory set at 55 F.
   All temperature adjustments are made at the EconoMi$er+ controller.

INSTALLATION

**EconoMi$er+ (3 to 12½ Ton Units) —** See Fig. 1 and 2 for EconoMi$er+ component locations. To install the vertical EconoMi$er+, perform the following procedure:

1. Turn off unit power supply and install lockout tag.

⚠ WARNING

Electrical shock can cause injury or death. Disconnect power supply and install lockout tag before attempting to install accessory.

2. Remove the existing unit filter access panel. Raise the panel and swing the bottom outward. The panel is now disengaged from the track and can be removed. See Fig. 3.
3. Remove the indoor coil access panel and discard. See Fig 3.
4. The box with the EconoMi$er+ hood components is shipped with the EconoMi$er+. Remove hood from packaging. The hood top and sides are shipped factory assembled.

IMPORTANT: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and may be discarded. Save the aluminum filter for use in the power exhaust.

5. Insert the hood divider between the hood sides. See Fig. 4. Secure hood divider with 2 screws (provided) on each hood side. Screws should go through the hood sides into the divider. The hood divider is also used as the bottom filter rack for the aluminum filter.
6. Open the filter clips which are located underneath the hood top. Insert the aluminum filter into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place. See Fig. 5.
7. Slide the EconoMi$er+ assembly into the rooftop unit. See Fig. 6. Remove the shipping tape holding the EconoMi$er+ barometric relief dampers in place. Be sure to engage the rear EconoMi$er+ flange under the tabs in the return-air opening of the unit base. See Fig. 7.
8. Secure the EconoMi$er+ to unit along side and bottom flanges using the screws provided.
9. Remove and save the 12-pin jumper plug from the unit wiring harness (located in the upper left corner of the unit). Insert the EconoMi$er+ plug into the unit wiring harness. See Fig. 8 for wiring diagram.

   NOTE: The 12-pin jumper plug should be saved for future use in the event that the EconoMi$er+ is removed from the unit. The jumper plug is not needed as long as the EconoMi$er+ is installed.
10. Remove the indoor-fan motor access panel. See Fig. 9.

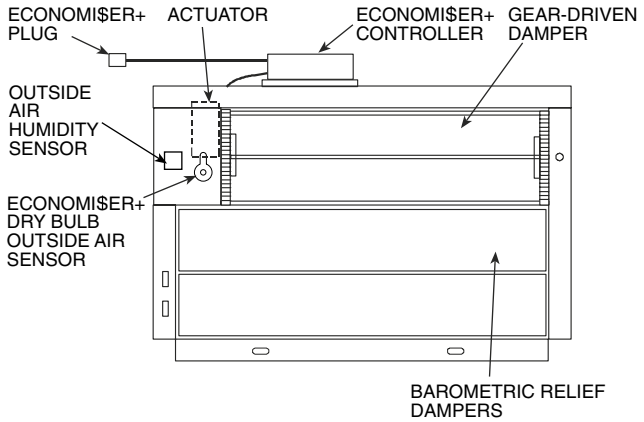


Fig. 1 — EconoMi$er+ Component Locations — 3 to 6 Ton Units

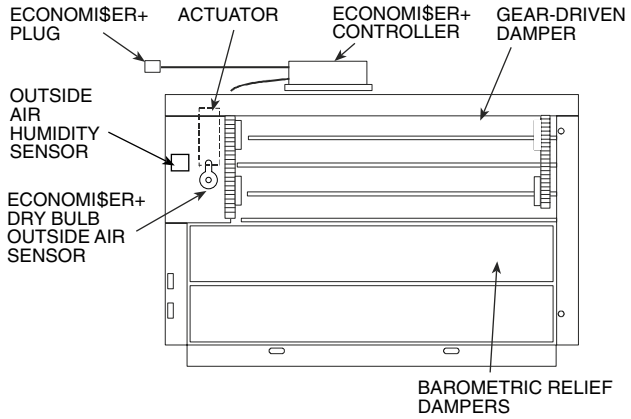


Fig. 2 — EconoMi$er+ Component Locations — 7½ to 12½ Ton Units

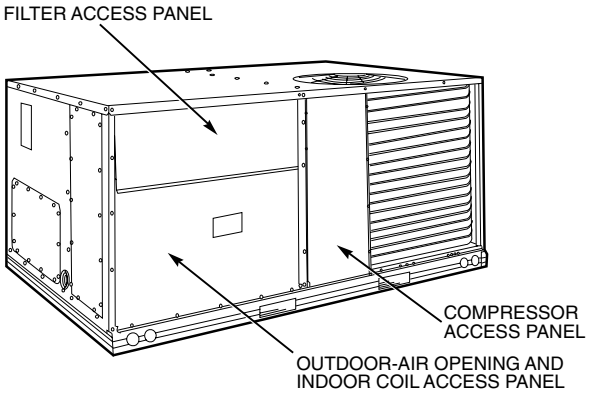
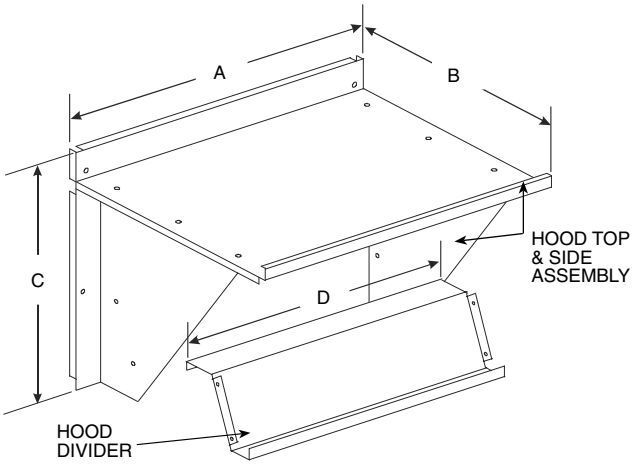


Fig. 3 — Typical Access Panel Locations (3 to 12½ Ton Units)



ECONOMIZER P/N	A	B	C	D	SHIP WT.
CRECOMZR020A01	33.37″	17.43″	19.05″	29.5″	55 lb
CRECOMZR021A01	40.37″	22.28″	24.48″	36.27″	80 lb

Fig. 4 — Hood Assembly (3 to 12½ Ton Units)

11. Mount the supply air temperature sensor (provided) to the lower left section of the indoor fan blower housing. See Fig. 10. Use the screw provided and use the existing hole in the blower housing. Connect the violet and pink wires to the corresponding connections on the supply air temperature sensor. See Fig. 8.
12. Replace the indoor fan motor access panel.
13. Install the EconoMi$er+ hood over the EconoMi$er+. Use screws provided. See Fig. 11.
14. Review the controller setting options in the Operation section.
    a. The standard EconoMi$er+ controller has a factory setting of 65 F for the outdoor air temperature changeover and 55 F for the supply air temperature sensor. The temperature settings can be adjusted at the EconoMi$er+ controller.
    b. The factory setting for the compressor lockout is 45 F. The compressor lockout can be adjusted from 1 to 65 F at the EconoMi$er+ controller.
    c. The unoccupied minimum position and occupied minimum position for the outside damper can be configured at the controller. The factory setting for the unoccupied minimum position is 5%. The factory setting for the occupied minimum position is 15%.
    d. Settings for the optional return air temperature sensor, outdoor humidity sensor, indoor humidity sensor, and CO_2 sensor can also be configured at the controller.
15. Replace the filter access panel. Slide top of panel into track and lift. Push bottom of panel into place.
16. Install all EconoMi$er+ accessories.

EconoMi$er+ (13 to 25 Ton Units)

⚠ WARNING

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

Install EconoMi$er+ 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. 12.

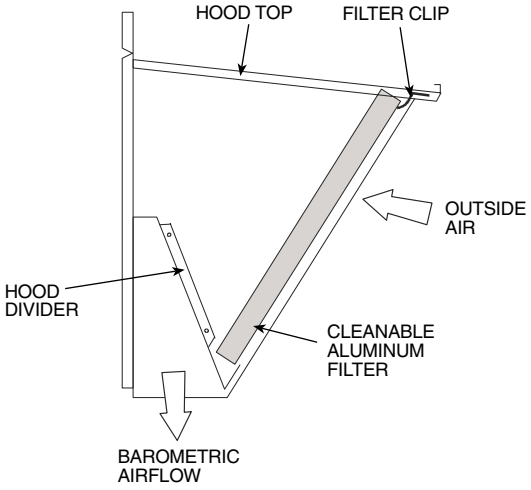


Fig. 5 — Filter Installation (3 to 12½ Ton Units)

3. Remove 25% outdoor air damper section. Save screws. See Fig. 13.
4. Remove shorting plug located in the left front of return air compartment at back of unit control box. See Fig. 13.
5. Remove EconoMi$er+ damper assembly from shipping carton. See Fig. 14.
6. Install seal strip on left and right sides of EconoMi$er+ opening.
7. Slide EconoMi$er+ assembly into unit opening as shown in Fig. 15.
8. Secure bottom of assembly of to unit (Fig. 16). For end view of installed EconoMi$er+, see Fig. 17. Ensure that EconoMi$er+ bottom flange is positioned on basepan before installing 2 screws connecting bottom flange to unit basepan.
9. Using 4 screws removed at Step 3, secure the damper assembly to the unit. See Fig. 16.
10. Plug EconoMi$er+ wiring assembly into the receptacle at the back of unit control box where shorting plug was removed. See Fig. 18. See Fig. 19 for wiring diagram.
11. Install frame top above damper assembly. See Fig. 16.
12. Install discharge air thermistor in fan section on hole 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. 20.

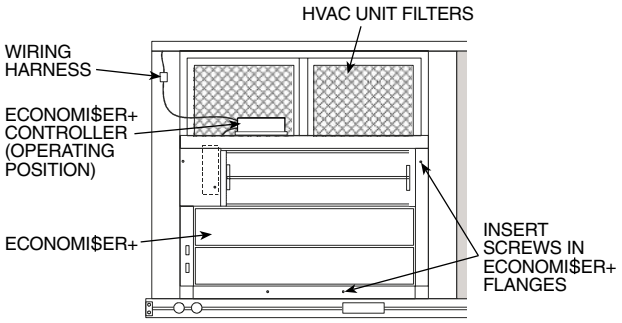


Fig. 6 — EconoMi$er+ Installed in HVAC Unit (3 to 6 Ton Shown)

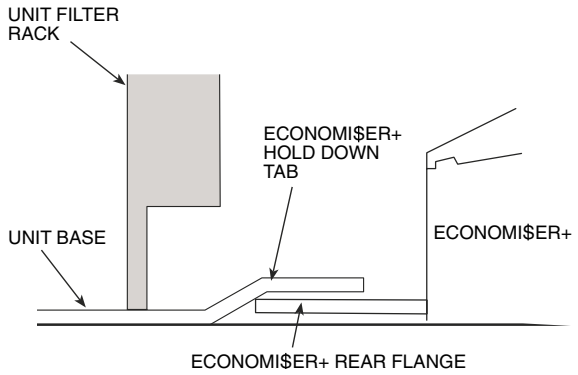
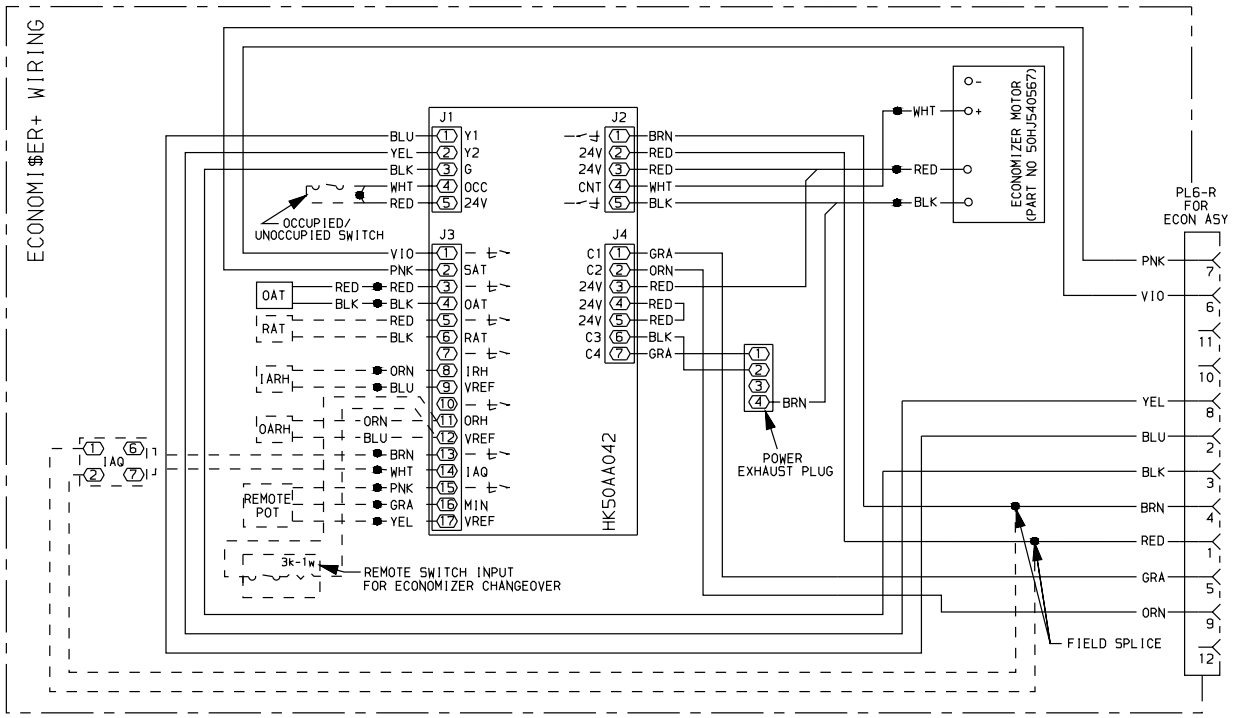


Fig. 7 — Rear EconoMi$er+ Flange Installation (3 to 12½ Ton Units)



LEGEND

IAQ	— Indoor Air Quality	**OAT**	— Outdoor-Air Temperature	**SAT**	— Supply-Air Temperature
IARH	— Indoor Air Relative Humidity (Signal)	**ORH**	— Outdoor Air Relative Humidity (Sensor)	**SRT**	— Small Rooftop Unit
IRH	— Indoor Air Relative Humidity (Sensor)	**POT**	— Potentiometer	**TB**	— Terminal Block
OARH	— Outdoor Air Relative Humidity (Signal)	**RAT**	— Return-Air Temperature		

NOTES:
1. Terminals 13-17 are wired to 5-pin plug assembly (P/N CRE+PLUG001A00).
2. Pin numbers are not printed on the controller. They are provided in this book as a reference.

Fig. 8 — EconoMi$er+ Wiring (3 to 12½ Ton Units)

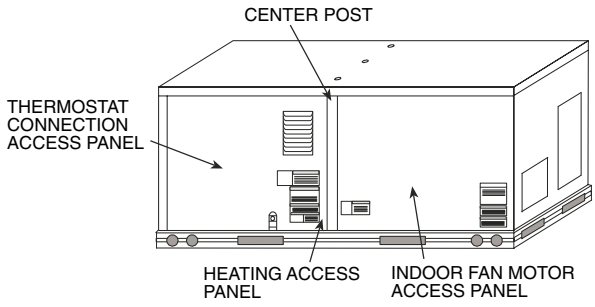


Fig. 9 — Typical Access Panel Locations (3-12½ Ton Units)

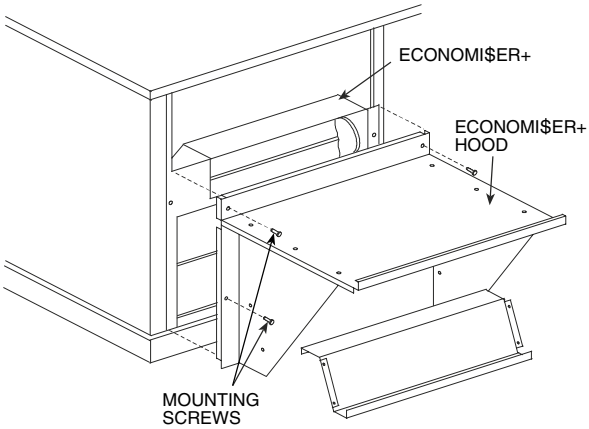


Fig. 11 — EconoMi$er+ Hood Installation (3 to 12½ Ton Units)

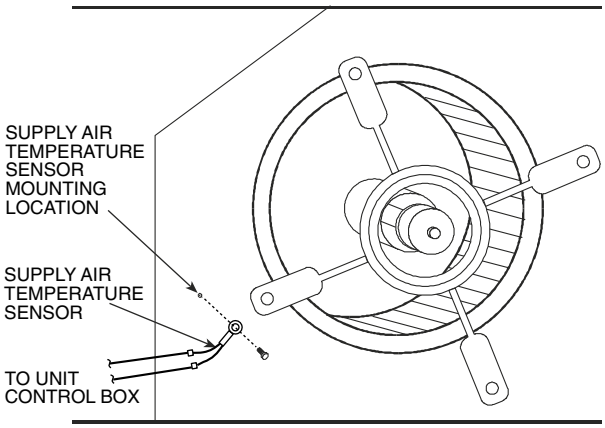


Fig. 10 — Mixed Air Sensor Placement (3 to 12½ Ton Units)

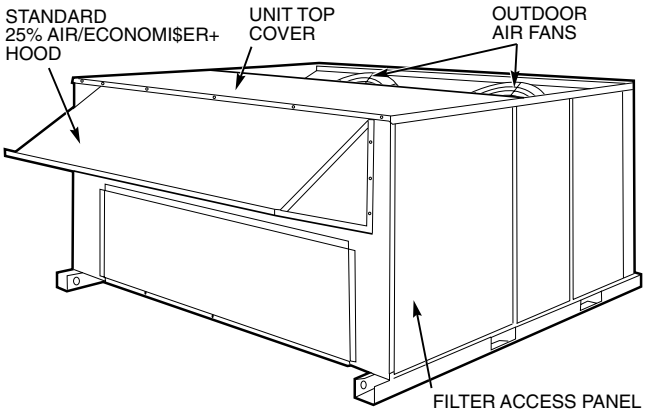


Fig. 12 — Base Unit Details (13 to 25 Ton Units)

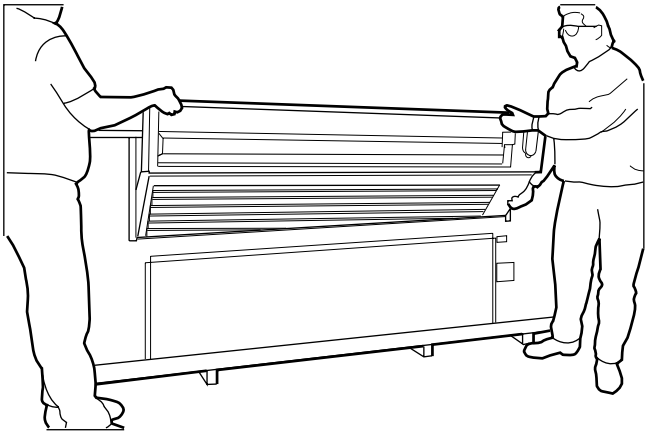


Fig. 15 — Slide EconoMi$er+ Assembly Into Unit (13 to 25 Ton Units)

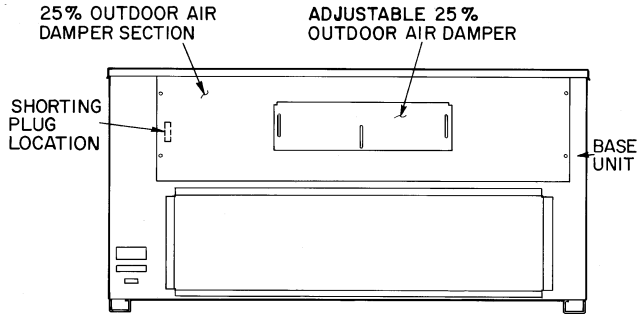


Fig. 13 — Standard 25% Outdoor-Air Section Details (13 to 25 Ton Units)

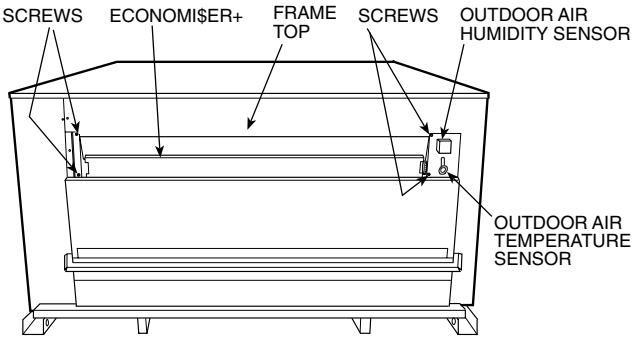


Fig. 16 — EconoMi$er+ Assembled in Unit — End View (13 to 25 Ton Units)

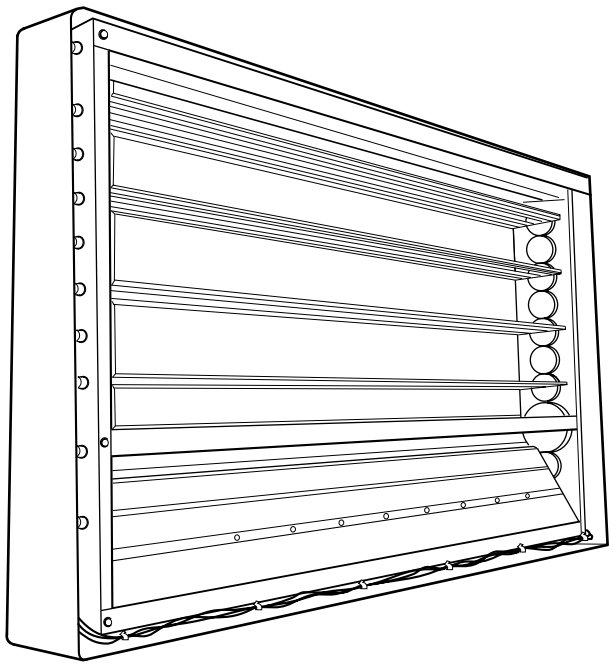


Fig. 14 — EconoMi$er+ Shipping Packaging (13 to 25 Ton Units)

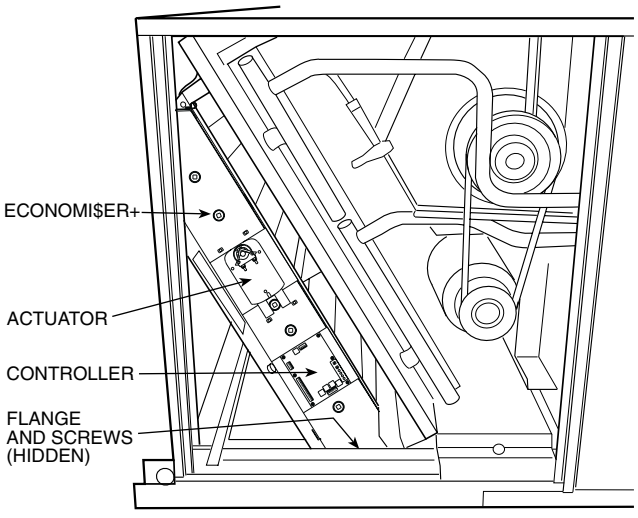


Fig. 17 — EconoMi$er+ Assembled in Unit — Side View (13 to 25 Ton Units)

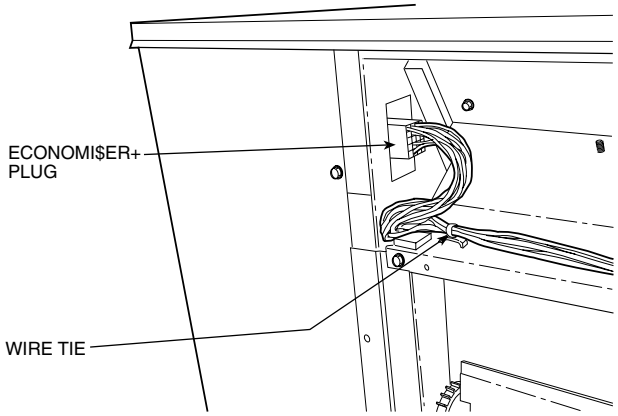


Fig. 18 — EconoMi$er+ Plug (13 to 25 Ton Units)

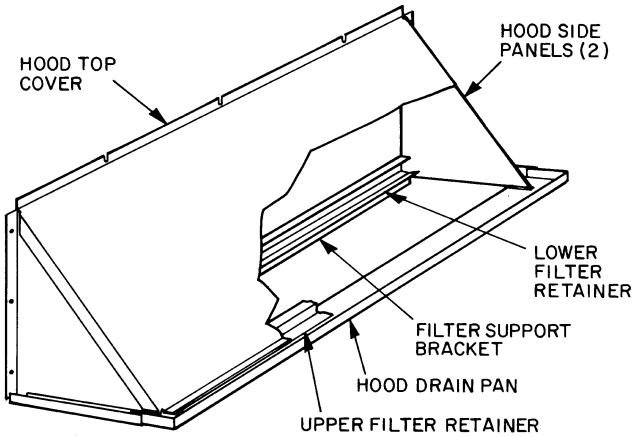
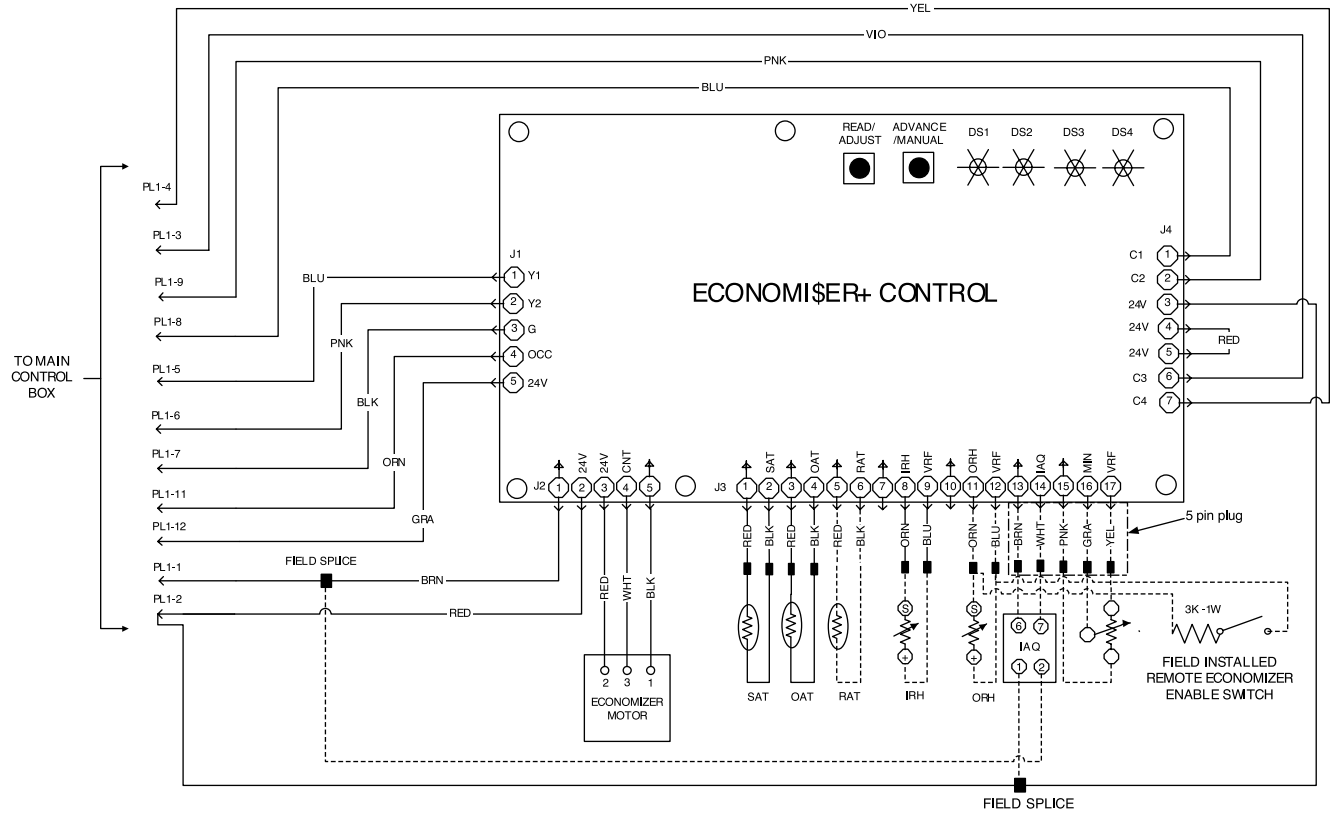


Fig. 20 — Outdoor-Air Hood Details (13 to 25 Ton Units)



LEGEND

IAQ — Indoor Air Quality
IRH — Indoor Air Relative Humidity
OAT — Outdoor-Air Temperature
ORH — Outdoor Air Relative Humidity
RAT — Return-Air Temperature
SAT — Supply-Air Temperature

NOTE: Terminals 13-17 are wired to 5-pin plug assembly (P/N CRE+PLUG001A00).

Fig. 19 — EconoMi$er+ Wiring (13 to 25 Ton Units)

Outside Air Temperature Sensor — The outside air temperature sensor is a 10K thermistor used to measure the outside air temperature. A temperature versus resistance curve is provided. See Table 5. The sensor controls EconoMi$er+ changeover and compressor lockout. The sensor is factory installed on the EconoMi$er+ in the outdoor airstream. The operating range of temperature measurement is 0° to 158 F. See Table 6 for resolution. The outside air temperature sensor is factory-wired to the EconoMi$er+ controller. The sensor is located on the face of the EconoMi$er+, to the left of the lower air intake damper on 3 to 12½ ton units and to the right of the outdoor air intake damper on 13 to 25 ton units.

Supply Air Temperature Sensor — The supply air temperature sensor is a 10K thermistor used to measure the supply-air temperature. A temperature versus resistance curve is provided. See Table 5. The sensor is located at the inlet to the indoor fan and must be field installed. The operating range of temperature measurement is 0° to 158 F. See Table 6 for resolution.

**EconoMi$er+ Control Mode —** The control mode of the EconoMi$er+ should be determined before installing accessories. Different sensors are required for different control modes. See Table 3.

DIFFERENTIAL DRY BULB CHANGEOVER — The control supports differential dry bulb changeover control. An accessory return air temperature sensor CRTEMPSN001A00 must be installed in the return airstream. See Table 3. Refer to the Control and Operation section for details on how to configure and enable the control mode. The user can also check the operation of the sensor using the READ function.

OUTSIDE AIR ENTHALPY CHANGEOVER — The control supports outside air enthalpy changeover control. The factory-supplied outside air temperature sensor (OAT) and an accessory outdoor air humidity sensor (ORH) (Part No. CRHUMDSN001B00) are required. See Table 3. Refer to the Operation and Configuration sections for details on how to configure and enable the control mode. The user can also check the operation of the sensors using the READ function.

DIFFERENTIAL ENTHALPY CHANGEOVER — The control supports differential enthalpy changeover control. The factory-supplied outside air temperature sensor, an accessory outdoor air humidity sensor, an accessory return air temperature sensor, and an accessory indoor air humidity sensor are required. See Table 3. Refer to the Operation and Configuration sections for details on how to configure and enable the control mode. The user can also check the operation of the sensors using the READ function.

**EconoMi$er+ Accessories —** The EconoMi$er+ is supplied from the factory with a supply air temperature sensor and an outside air temperature sensor. This allows for operation of the EconoMi$er+ with outside air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the EconoMi$er+ and unit.

THERMOSTATS — The EconoMi$er+ control has been designed to work with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The EconoMi$er+ control does not support sensor thermostats like the T56 and T57. Connections are made at the thermostat terminal connection board located in the main control box.

INDOOR AIR QUALITY (IAQ) SENSOR — Any indoor air quality or CO_2 sensor that provides a 2 to 10 vdc output can be used as the IAQ sensor. The controller will modulate the outdoor damper to provide ventilation based on the sensor output and the IAQ setting of the controller. The CO_2 sensor will modulate the outside air damper from the minimum position (base ventilation rate) to the maximum position (design ventilation rate for full occupancy).

Mount the sensor according to manufacturer specifications. The sensor should be wired to the 5-pin plug accessory (part number CRE+PLUG001A00). See Fig. 8. The accessory 5-Pin Wiring Plug is connected to pins 13-17 of J3 on the EconoMi$er+ controller. Push the plug down onto the pins of the EconoMi$er+ controller to install. Pins 13 and 14 are used for the IAQ sensor. Pins 15-17 are used for the field-installed remote potentiometer. Connect the IAQ sensor to the BRN and WHT wires of the accessory 5-pin plug. Sensor wiring should be extended with wire and wire nuts and routed to the IAQ sensor location. Adjust the IAQ setting at the controller to correspond to the IAQ voltage output of the sensor at the user-determined set point. See Fig. 21. Power for the sensor can be provided by a factory or field-supplied transformer.

RETURN AIR TEMPERATURE SENSOR — The EconoMi$er+ controller will accept input from the accessory 10K return air temperature sensor in addition to the outdoor air temperature sensor shipped with the EconoMi$er+. By using both sensors, the outdoor air and the return air temperatures are compared for optimal energy savings.

Mount the return air temperature sensor on the EconoMi$er+, through pre-punched holes. See Fig. 22. The return air temperature (RAT) sensor is provided with a 2-wire, 42-in. wiring harness with a 2-pin connector plug. The plug is installed on pins 5 and 6 on J3 of the EconoMi$er+ controller. The pins are labeled with a ground symbol and RAT on the EconoMi$er+ controller. See Fig. 8. The red wire of the harness is connected to pin 5 (ground). The black wire of the harness is connected to pin 6 (RAT). The wiring harness should be routed from the EconoMi$er+ controller to sensor. The controller compares the temperatures of the 2 airstreams, chooses the best, and modulates the EconoMi$er+ actuator accordingly.

This 10K thermistor is used to measure the return-air temperature vs. resistance curve, per Table 5. The range of temperature measurement is between 0° to 158 F. See Table 6 for resolution.

OUTDOOR AIR HUMIDITY SENSOR — The EconoMi$er+ controller accepts input from the accessory outdoor air humidity sensor in addition to the outdoor air temperature sensor shipped with the EconoMi$er+. By using both sensors, the total enthalpy of the outside air is calculated.

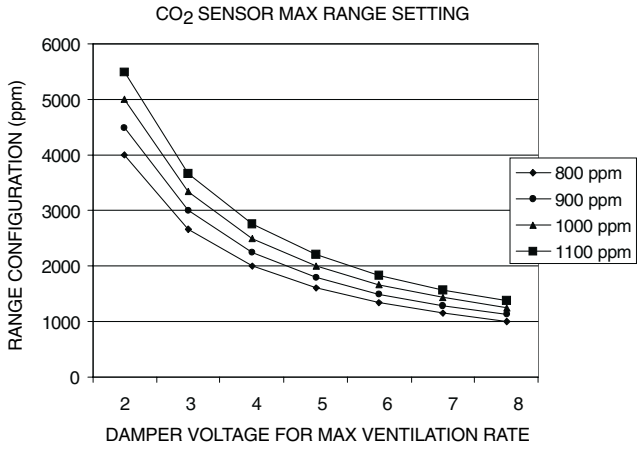


Fig. 21 — Indoor Air Quality Voltage Setting

Mount the outdoor-air humidity sensor in to the EconoMi$er+, through the pre-punched holes. See Fig. 1, 2, and 16 for sensor location. The outdoor-air humidity sensor is provided with a 2-wire, 42-in. wiring harness with a 2-pin connector plug. The plug is installed on pins 11 and 12 on J3 of the EconoMi$er+ controller. The pins are labeled ORH and VREF on the EconoMi$er+ controller. See Fig. 8. The orange wire of the harness is connected to pin 11 (ORH). The blue wire of the harness is connected to pin 12 (VREF). The wiring harness should be routed from the EconoMi$er+ controller to the sensor location.

The calculated outdoor-air enthalpy value is compared to the user selected enthalpy and dry bulb curve. The outdoor enthalpy changeover curve is set at the EconoMi$er+ controller. The curve configurations are A, B, C, and D. See Fig. 23.

Table 5 — Outside Air, Return Air, and Supply Air Temperature Sensors (CRTEMPSN001A00) — 10K Thermistor Curve

TEMPERATURE		RESISTANCE	TEMPERATURE		RESISTANCE	TEMPERATURE		RESISTANCE
C	F	ohms	C	F	ohms	C	F	ohms
120	248.0	390.0	66	150.8	2,011.0	12	53.6	18,090.0
119	246.2	401.2	65	149.0	2,083.0	11	51.8	18,972.0
118	244.4	412.8	64	147.2	2,157.0	10	50.0	19,903.0
117	242.6	424.8	63	145.4	2,235.0	9	48.2	20,883.0
116	240.8	437.2	62	143.6	2,315.0	8	46.4	21,918.0
115	239.0	450.0	61	141.8	2,400.0	7	44.6	23,013.0
114	237.2	462.5	60	140.0	2,488.0	6	42.8	24,117.0
113	235.4	475.5	59	138.2	2,579.0	5	41.0	25,396.0
112	233.6	488.9	58	136.4	2,675.0	4	39.2	26,686.0
111	231.8	502.7	57	134.6	2,774.0	3	37.4	28,052.0
110	230.0	517.0	56	132.8	2,878.0	2	35.6	29,498.0
109	228.2	531.0	55	131.0	2,986.0	1	33.8	31,030.0
108	226.4	545.6	54	129.2	3,099.0	0	32.0	32,654.0
107	224.6	560.5	53	127.4	3,217.0	–1	30.2	34,367.0
106	222.8	576.0	52	125.6	3,340.0	–2	28.4	36,182.0
105	221.0	592.0	51	123.8	3,469.0	–3	26.6	38,109.0
104	219.2	608.5	50	122.0	3,603.0	–4	24.8	40,153.0
103	217.4	625.5	49	120.2	3,743.0	–5	23.0	42,324.0
102	215.6	643.0	48	118.4	3,889.0	–6	21.2	44,617.0
101	213.8	661.2	47	116.6	4,042.0	–7	19.4	47,052.0
100	212.0	680.0	46	114.8	4,203.0	–8	17.6	49,640.0
99	210.2	700.0	45	113.0	4,370.0	–9	15.8	52,392.0
98	208.4	720.6	44	111.2	4,544.0	–10	14.0	55,319.0
97	206.6	742.0	43	109.4	4,727.0	–11	12.2	58,415.0
96	204.8	764.1	42	107.6	4,918.0	–12	10.4	61,711.0
95	203.0	787.0	41	105.8	5,117.0	–13	8.6	65,219.0
94	201.2	810.8	40	104.0	5,327.0	–14	6.8	68,957.0
93	199.4	835.5	39	102.2	5,546.0	–15	5.0	72,940.0
92	197.6	861.0	38	100.4	5,774.0	–16	3.2	77,162.0
91	195.8	888.5	37	98.6	6,014.0	–17	1.4	81,662.0
90	194.0	915.0	36	96.8	6,266.0	–18	–0.4	86,463.0
89	192.2	944.0	35	95.0	6,530.0	–19	–2.2	91,588.0
88	190.4	974.0	34	93.2	6,806.0	–20	–4.0	97,060.0
87	188.6	1005.0	33	91.4	7,096.0	–21	–5.8	102,868.0
86	186.8	1037.0	32	89.6	7,401.0	–22	–7.6	109,075.0
85	185.0	1070.0	31	87.8	7,720.0	–23	–9.4	115,710.0
84	183.2	1104.0	30	86.0	8,056.0	–24	–11.2	122,807.0
83	181.4	1140.0	29	84.2	8,407.0	–25	–13.0	130,402.0
82	179.6	1177.0	28	82.4	8,776.0	–26	–14.8	138,482.0
81	177.8	1215.0	27	80.6	9,164.0	–27	–16.6	147,134.0
80	176.0	1255.0	26	78.8	9,571.0	–28	–18.4	156,404.0
79	174.2	1297.0	25	77.0	10,000.0	–29	–20.2	166,342.0
78	172.4	1340.0	24	75.2	10,449.0	–30	–22.0	177,000.0
77	170.6	1385.0	23	73.4	10,921.0	–31	–23.8	188,340.0
76	168.8	1431.0	22	71.6	11,418.0	–32	–25.6	200,510.0
75	167.0	1480.0	21	69.8	11,942.0	–33	–27.4	213,570.0
74	165.2	1530.0	20	68.0	12,493.0	–34	–29.2	227,610.0
73	163.4	1582.0	19	66.2	13,071.0	–35	–31.0	242,700.0
72	161.6	1637.0	18	64.4	13,681.0	–36	–32.8	258,730.0
71	159.8	1693.0	17	62.6	14,323.0	–37	–34.6	275,970.0
70	158.0	1752.0	16	60.8	15,000.0	–38	–36.4	294,520.0
69	156.2	1813.0	15	59.0	15,714.0	–39	–38.2	314,490.0
68	154.4	1876.0	14	57.2	16,464.0	–40	–40.0	336,000.0
67	152.6	1943.0	13	55.4	17,255.0			

Table 6 — Outside Air, Return Air, and Supply Air Temperature Sensors (CRTEMPSN001A00) — Thermistor Resolution

RANGE		RESOLUTION
Low	High	
F	F	F
–41	–18	4.0
–17	14	2.0
15	28	1.0
29	47	0.8
48	86	0.7
87	108	0.8
109	126	1.0
127	171	2.0
127	195	4.0

INDOOR AIR HUMIDITY SENSOR — For differential sensing, the EconoMi$er+ controller uses the standard outdoor air temperature sensor, the outdoor air humidity sensor, the return air temperature sensor, and the indoor air humidity sensor. The indoor-air humidity sensor is provided with a 2-wire, 42-in. wiring harness with a 2-pin connector plug. The plug is installed on pins 8 and 9 on J3 of the EconoMi$er+ controller. The pins are labeled IRH and VREF on the EconoMi$er+ controller. See Fig. 8. The orange wire of the harness is connected to pin 8 (IRH). The blue wire of the harness is connected to pin 9 (VREF). The wiring harness should be extended with wires and wire nuts and routed from the EconoMi$er+ controller to the sensor location. See Fig. 22 for sensor location. The EconoMi$er+ controller compares the outdoor air enthalpy to the return air enthalpy to determine EconoMi$er+ 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, the EconoMi$er+ controller opens the damper to bring in outdoor air for free cooling.

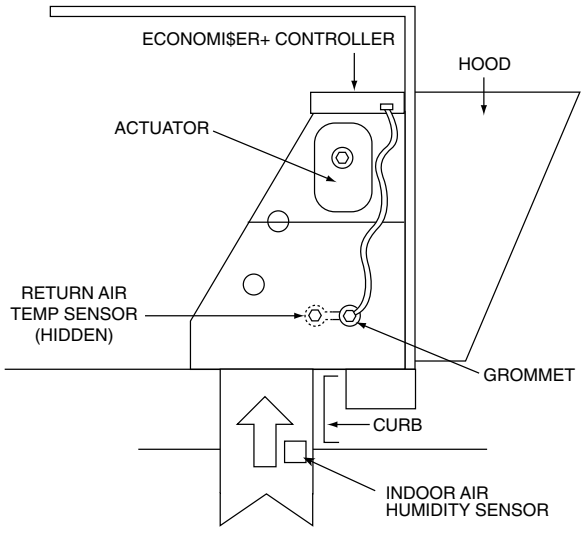
Mount the return-air sensor in the return-air duct. The outdoor enthalpy changeover curve is set with at the EconoMi$er+ controller. Configure the curve to the D setting for differential enthalpy. See Fig. 23.

OCCUPIED MINIMUM POSITION REMOTE POTENTIOMETER — The occupied minimum position set point remote potentiometer is used when requiring additional temporary ventilation. The remote potentiometer will only control the occupied minimum position. The unoccupied minimum position can only be set at the controller. The occupied minimum position set point configured at the EconoMi$er+ controller must be set to 0 when using a remote potentiometer.

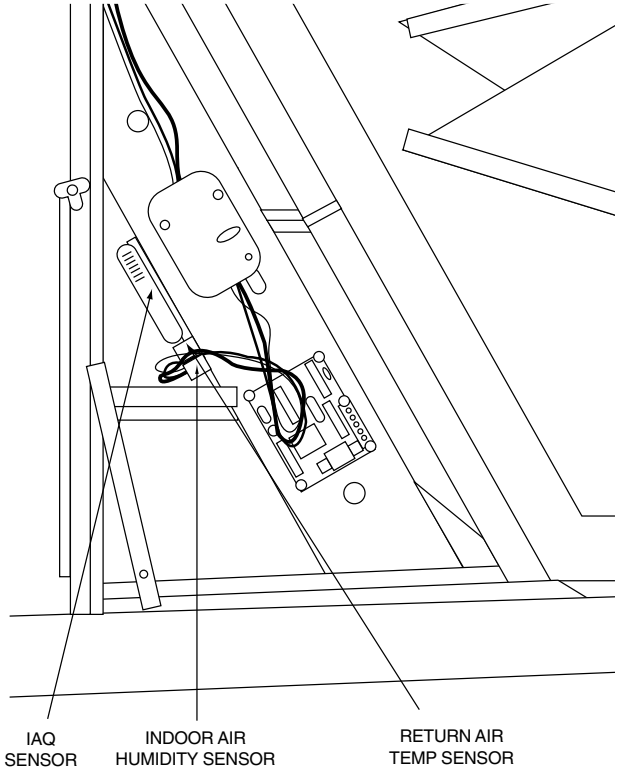
Normally the minimum position will be set in software through the configuration input. There is also an option for a remote potentiometer. This will only be used to override the standard occupied minimum position. If the remote potentiometer position is greater than the software minimum economizer position, then the remote potentiometer setting will be used. The minimum position will also be used as part of the IAQ routine.

In the event that the remote potentiometer (occupied) position is greater than the EconoMi$er+ controller unoccupied minimum position, then the remote potentiometer setting will be used. The remote potentiometer is field supplied and must be a 3-wire potentiometer with a resistance between 10K ohm and 100K ohm (such as the Honeywell S963B1128).

The remote potentiometer (10 Kohm to 100 Kohm, linear) is wired to the accessory 5-pin wiring plug. The accessory 5-pin wiring plug must be ordered to install the remote potentiometer. The plug is installed on pins 15, 16 and 17 on J3 of the EconoMi$er+ controller. The pins are labeled with the ground symbol, MIN and VREF on the EconoMi$er+ controller. See Fig. 8. The pink wire of the harness is connected to pin 15 (ground symbol). The gray wire of the harness is connected to pin 16 (MIN). The yellow wire of the harness is connected to pin 17 (VREF). The wiring harness should be extended with wires and wire nuts and routed from the EconoMi$er+ controller to the remote potentiometer location.



VERTICAL ECONOMI$ER+
(3 TO 12 1/2 TON UNITS)
(SIDE VIEW)



VERTICAL AND HORIZONTAL ECONOMI$ER+
(13 TO 25 TON UNITS)
(SIDE VIEW)

Fig. 22 — Return Air Temperature Sensor and Indoor Air Humidity Sensor Installation

NOTE: Pins 13 (ground symbol) and 14 (IAQ), which are wired to the accessory 5-pin plug, are not used for the remote potentiometer installation. They are used for an accessory IAQ sensor (if required).

OCCUPIED/UNOCCUPIED SWITCH — This switch controls the minimum position of the EconoMi$er+ damper. The minimum position of the damper will be at the occupied or unoccupied set point based on the position of the switch. A jumper wire is factory-installed to force the control into occupied configuration whenever G or Y1 are closed. Without the jumper wire, the control will always be in unoccupied mode.

For 3 to 12½ ton units, a wire from J1-OCC (pin 4) and a wire from J1-24V (pin 5) are wire-nutted together to jumper the terminals.

For 13 to 25 ton units, the red jumper wire is factory-installed on terminals 9 and 10 of the TB2 thermostat terminal board. Terminal TB2-9 is connected to J1-OCC (pin 4) through the PL1-11 orange wire. Terminal TB2-10 is connected to J1-24V (pin 5) through the PL1-12 gray wire.

An occupied/unoccupied switch can be field-installed in place of the jumper to allow the user to force the control into occupied or unoccupied mode of operation for EconoMi$er+ damper position. The occupied/unoccupied switch is required if the user wants to use unoccupied free cooling or different EconoMi$er+ damper vent positions in the unoccupied mode.

REMOTE ECONOMI$ER+ ENABLE CONTROL — When the control is used with energy management systems that enable and disable the EconoMi$er+, the user can install a field-supplied enable/disable switch. The switch must be wired in series with a 3 Kohm, 1 watt or greater resistor. The switch is wired to terminals ORH (pin 11) and VREF (pin 12) on J3. Refer to the Operation and Configuration sections for details on how to configure the control.

POWER EXHAUST — Refer to the Accessory Power Exhaust installation instructions for information on installing the power exhaust accessory.

DEMAND VENTILATION CONTROL — Demand ventilation control uses an IAQ sensor to control the amount of outside air admitted into the system. Normally, the minimum position of the EconoMi$er+ damper is established based on the demand occupancy of the space. The IAQ sensor will be used to modulate the EconoMi$er+ minimum damper position below the normal minimum position based on full occupancy. The lower limit is called the base ventilation rate.

For the demand ventilation control logic, the lower and upper actuator position is configured by the user to establish the base ventilation rate (IAQMIN_SP) and the design ventilation rate (ECONOMIN_SP) for full occupancy. When the EconoMi$er+ damper is being modulated for demand ventilation control, the damper position will be between IAQMIN_SP and ECONOMIN_SP. See Fig. 24.

The upper IAQ differential set point is DAQHI. The lower IAQ differential set point is DAQLO. The differential set points represent the differential CO_2 level (in ppm) above the outdoor reference IAQ levels. Normally, the outdoor reference IAQ levels are around 400 ppm, but the value should be configured based on the reference levels taken at the job site.

The following equation is used to determine EconoMi$er+ damper position (ECONOMIN_POS).

$$\text{IAQMIN\_SP} + \frac{(\text{ECONOMIN\_SP} - \text{IAQMIN\_SP}) * (\text{IAQ} - \text{OAQ} - \text{DAQLO})}{(\text{DAQHI} - \text{DAQLO})}$$

CONTROL CURVE	CONTROL POINT APPROX. °F (°C) AT 50% RH
A	73 (23)
B	70 (21)
C	67 (19)
D	63 (17)

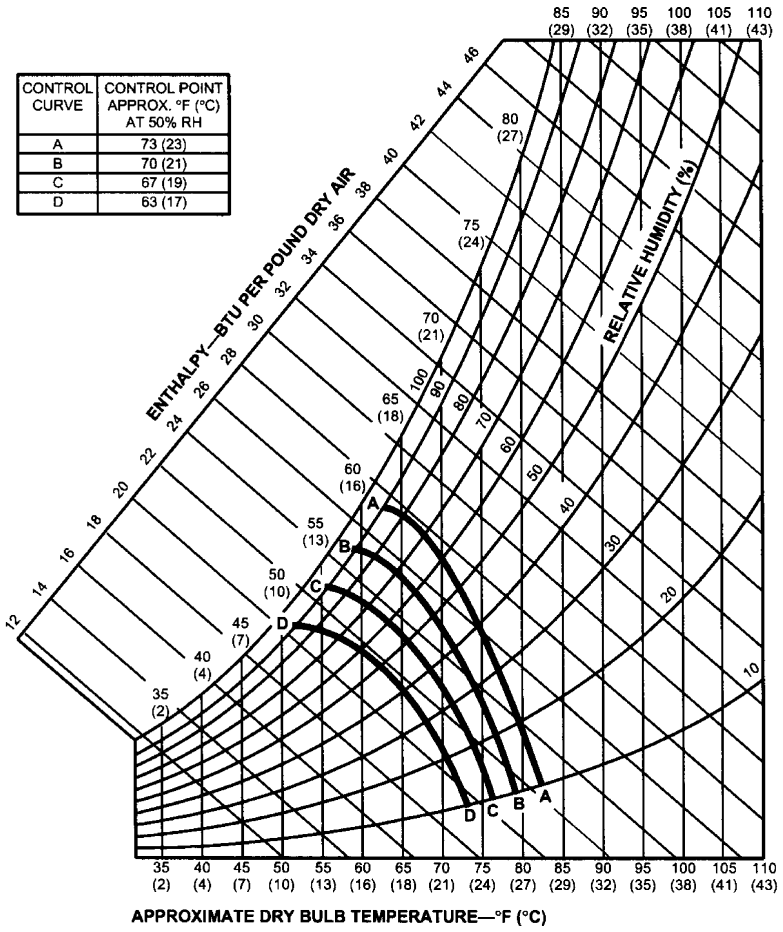


Fig. 23 — Enthalpy Changeover Settings

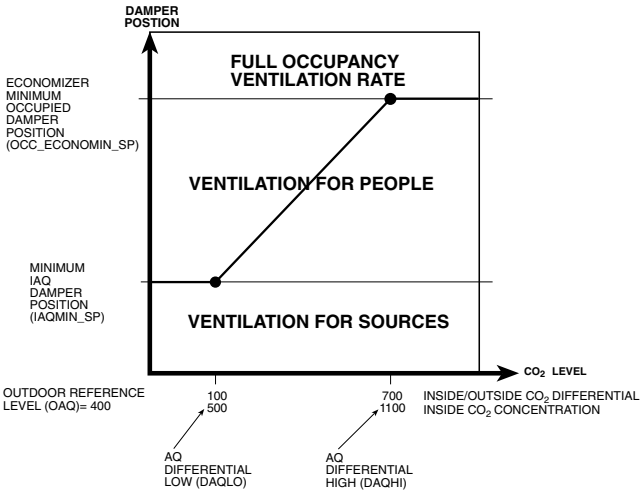


Fig. 24 — Demand Ventilation Control

CO_2 SENSOR CONFIGURATION — The CO_2 sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. See Table 7.

NOTE: Use setting 1 or 2. See Table 7.

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode 2 times. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. See Table 7.
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

The custom settings of the CO_2 sensor can be changed anytime after the sensor is energized. Follow the steps below to change the non-standard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode 2 times. 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 (3 to 12½ Ton Units Only) — Information from ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, a device such as a energy recovery unit is 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.

This makes the control of the dehumidification device simple when using the enthalpy or differential enthalpy sensor. The enthalpy sensor or differential enthalpy sensor is installed on the equipment to determine economizer operation. The high enthalpy signal from the temperature and humidity sensors or differential temperature and humidity sensors can be used to turn on the outdoor air moisture removal device any time fresh air is required for the space.

The energy recovery device should be sized for maximum latent and sensible conditioning at maximum ventilation on a design day. A calculation for leaving-air temperature on a low ambient, low ventilation day should also be done to determine the supply-air temperature of the return and pre-conditioned outside air. The design should produce air temperature somewhat near room conditions to prevent reheat of the air mixture. The energy recovery device should be interlocked with the heat to turn off the device when in the heat mode.

If more moisture removal is required, a humidity sensor in the space can be used to activate a moisture removal device. The dehumidification device improves the latent capacity of the compressor cooling while the cooling is active. This will remove any moisture introduced from the conditioned space (such as from kitchen equipment).

OPERATION

Sequence of Operation — When the EconoMi$er+ control is the occupied mode and a call for cooling exists (Y1 on the thermostat), the control will first check for indoor fan operation. If the fan is not on, then cooling will not be activated. If the fan is on, then the control will open the EconoMi$er+ damper to the minimum position.

If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to main the supply air temperature set point plus 2° F.

If there is a further demand for cooling (cooling second stage — Y2 is energized), then the control set point for the leaving air will be set at the supply air set point to increase the cooling capacity. If this cannot satisfy the load then the control will bring on compressor stages as needed to maintain the supply air temperature set point. The EconoMi$er+ damper will be locked open at 100% or the maximum damper position set point.

Table 7 — CO_2 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	Interface w/Standard Building Control System	Proportional	Any	4-20 mA	0-2000	1000	50
2		Proportional	Any	7-20 mA	0-2000	1000	50
3		Exponential	Any	4-20 mA	0-2000	1100	50
4	Economizer	Proportional	15	4-20 mA	0-1100	1100	50
5		Proportional	20	4-20 mA	0- 900	900	50
6		Exponential	15	4-20 mA	0-1100	1100	50
7		Exponential	20	4-20 mA	0- 900	900	50
8	Health & Safety	Proportional	—	4-20 mA	0-9999	5000	500
9	Parking/Air Intakes/ Loading Docks	Proportional	—	4-20 mA	0-2000	700	50

LEGEND

ppm — Parts Per Million

NOTE: Check that the transformer(s) are sized properly. If a common transformer is used, make sure that polarity is observed on the secondary. This means connect all No. 1 wires to one leg of the transformer and all No. 2 wires to the other leg of the transformer.

If multiple transformers are used with one control signal, make sure all No. 1 wires are tied together and tied to control signal negative (–). Controllers and actuators must have separate 24 vac/vdc power sources.

To ensure that there is no short cycling, the compressors will operate for at least 3 minutes. If, during this period, the leaving temperature drops below the set point by 5 F, then the EconoMi$er+ dampers will be closed to 60% until the compressor is turned off to avoid cold leaving air temperatures.

If the conditions are not suitable for free cooling then the EconoMi$er+ dampers will be closed to the minimum ventilation position. Compressor stages will be used to cool the air.

If the control is configured for direct control by Y1 and Y2, then the stages will sequence based on the demand of Y1 and Y2. If the control is configured for leaving air temperature control, then Y1 will maintain the leaving air temperature at the supply air set point plus 2 F. If Y1 and Y2 are closed, then the leaving air will be controlled to the supply air set point. If Y2 is closed and Y1 is open, then control will shut down and indicate an error due to a thermostat failure or improper wiring of the thermostat.

If the unit is in the unoccupied mode, then the control of the temperature will depend on the unoccupied free cooling configuration: no unoccupied cooling, unoccupied free cooling with any mechanical cooling, or unoccupied free and mechanical cooling. If free cooling is enabled, then the control will check if free cooling can be used. The EconoMi$er+ will then control to the leaving air temperature set point plus 2 F for a Y1 command, or the leaving air temperature set point for a Y1 and Y2 command. If mechanical cooling is allowed to be used, then the control will then bring on additional stages of mechanical cooling if free cooling cannot satisfy the load.

NOTE: The thermostat can have a different space temperature set point for occupied and unoccupied operation.

If the EconoMi$er+ control:

- is in the occupied mode,
- is configured to use demand ventilation,
- cannot use free cooling,
- has return air or space CO_2 levels below the DAQLO limit,

then the EconoMi$er+ damper position will be set to the IAQMIN_SP set point. If the CO_2 level rises above the DAQLO limit, then the dampers will modulate open in a linear relationship until the return air or space CO_2 levels are at or above the DAQHIGH limit. The damper position will be at the OCC_ECONOMIN_SP set point.

When the EconoMi$er+ is being used for free cooling and the position exceeds the power exhaust set point, then the control will turn on the appropriate power exhaust fans.

Refer to Fig. 25 for barometric relief capacity. Refer to Fig. 26 and Table 8 for outdoor air leakage. Refer to Fig. 27 and Table 9 for return air pressure drop.

Unoccupied and Occupied Minimum Position Control — There is a unoccupied minimum damper position and an occupied minimum damper position on the EconoMi$er+ controller. When the HVAC fan is off the outside air damper will always be closed. When the fan is on and in the unoccupied mode, the outside air damper will be at the unoccupied minimum position. When the fan is on and in the occupied mode, the outside air damper will be at the occupied minimum position.

IMPORTANT: A jumper wire is factory-installed to force the unit into occupied configuration whenever G or Y1 are closed. Without the jumper wire, the unit will always be in unoccupied mode.

The 2 minimum position settings are also used in the IAQ sequence of operation. See Indoor Air Quality Sensor, EconoMi$er+ Accessories section.

NOTE: The minimum position signal takes priority over the maximum position signal. If the maximum damper position is set below the minimum damper position, the EconoMi$er+ controller will maintain the actuator at minimum position.

Adjust the unoccupied minimum position 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 (6 C) temperature difference between the outdoor and return air temperatures.

To determine the unoccupied minimum position setting, perform the following procedure:

Calculate the appropriate supply-air temperature using the following formula:

$(T_O \times OA) + (T_R \times RA) = T_M$

T_O = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T_R = Return-Air Temperature

RA = Percent of Return Air

T_M = Supply-Air Temperature

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60 F, and return air temperature is 75 F:

$(60 \times 0.10) + (75 \times 0.90) = 73.5$ F

Carefully adjust the unoccupied minimum position until the measured supply-air temperature matches the calculated value.

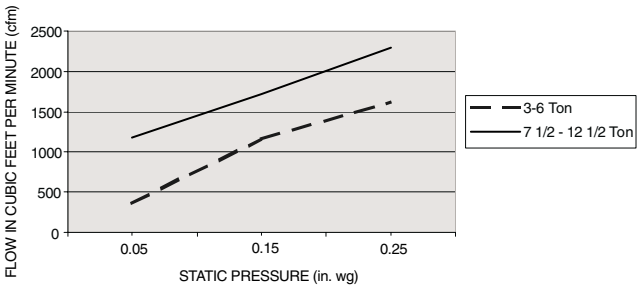


Fig. 25 — Barometric Relief Flow Capacity (3 to 12½ Ton Units)

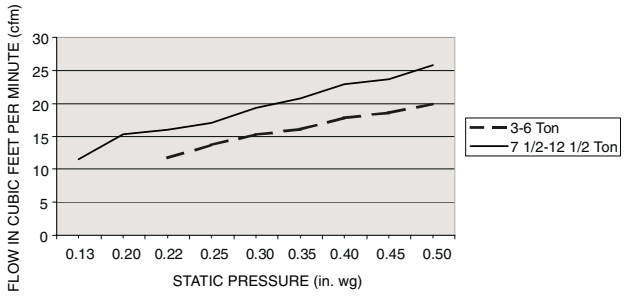


Fig. 26 — Outdoor Air Damper Leakage (3 to 12½ Ton Units)

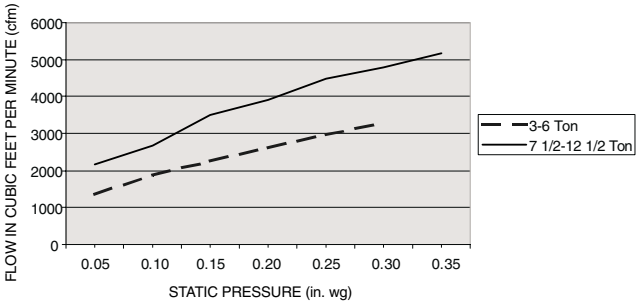


Fig. 27 — Return Air Pressure Drop (3 to 12½ Ton Units)

To adjust the occupied minimum position, carefully adjust the occupied minimum position set point on controller until the desired position is reached.

**EconoMi$er+ Controller —** For 3 to 12½ ton units, the EconoMi$er+ controller is mounted to the top of the EconoMi$er+ damper and is accessible by removing the filter access door of the unit. The EconoMi$er+ controller is protected by a sheet metal enclosure mounted over the controller. Remove the single screw on the front of the enclosure and lift off the top for access to the EconoMi$er+ controller.

For 13 to 25 ton units, the EconoMi$er+ controller is mounted on the side of the EconoMi$er+ damper and is accessible by removing the filter access door of the unit.

The primary purpose of the controller is to provide control of the EconoMi$er+ dampers and the cooling compression stages. The status of the indoor fan is monitored through the G input but is not directly controlled by the controller. The heating function is not controlled by the controller.

The controller can only be used with conventional thermostats with Y1, Y2 and G input to the controller, and can not be used with electronic thermostats with a proportional room temperature input or Variable Air Volume systems.

There are 4 LEDs on the control which are used to display status and configuration information. There are 2 buttons (READ/ADJUST and ADVANCE/MANUAL) which are used to change modes and configure the controller. See Fig. 28 and Table 10.

Table 8 — Outdoor Air Damper Leakage (13 to 25 Ton Units)

LEAKAGE (cfm)	DAMPER STATIC PRESSURE (in. wg)					
	0.2	0.4	0.6	0.8	1.0	1.2
	35	53	65	75	90	102

The EconoMi$er+ microprocessor based control system provides the following control functions:

- EconoMi$er+ damper control for free cooling
- Minimum position control for ventilation
- Demand Ventilation Control using a CO_2 sensor
- Compressor Cooling Stage Control
- Occupied/Unoccupied Control
- Diagnostics Display and History
- Manual test control

The board has 13 inputs and 10 outputs which are summarized in Table 10.

INTEGRATED DISPLAY — The control board includes an integrated display which is used for the following functions:

- Configuration and setup
- Set point and control adjustment
- Status and alarm monitoring
- Manual control

There are 5 modes of display operation:

- Startup Mode
- Run Mode
- Read Mode
- Setup Mode
- Manual Mode

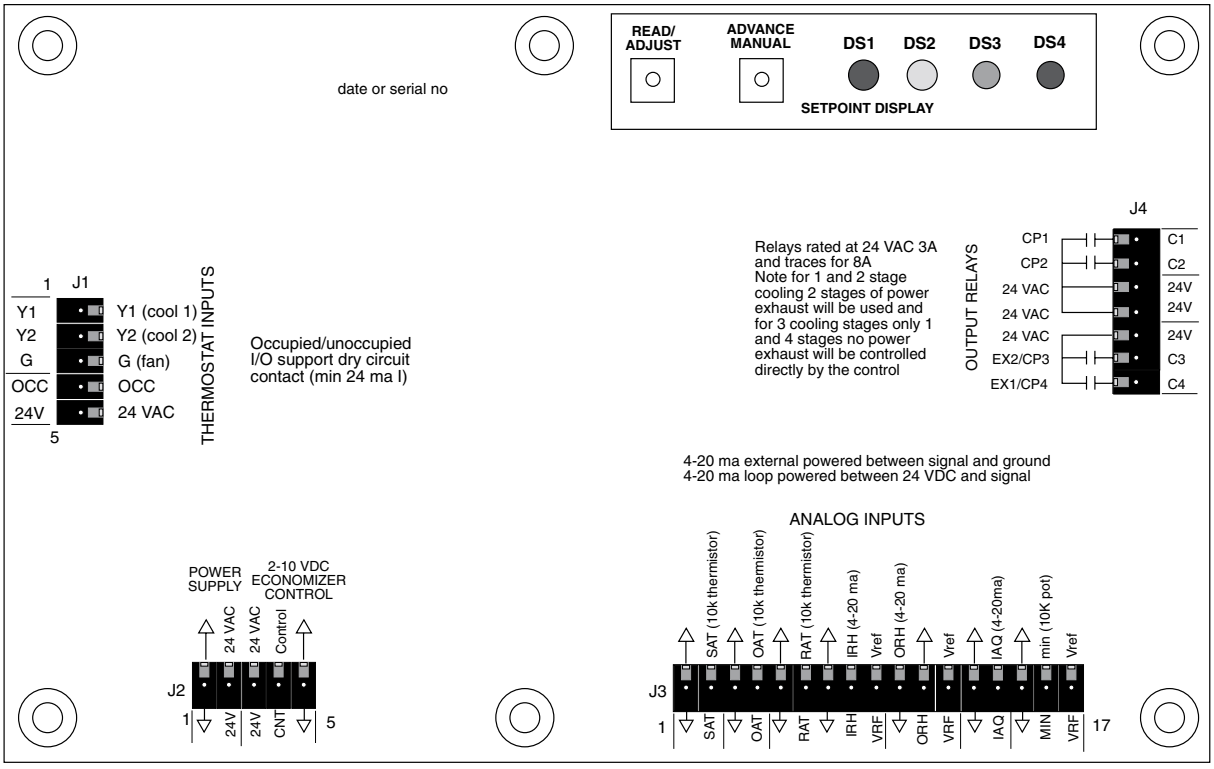
External devices are not required to operate and configure the control.

STARTUP MODE — During the first 3 seconds after power is applied to the control, the four LEDs flash as shown in Table 11, indicating that the control is being initialized.

The buttons are not operational during Startup Mode.

Table 9 — Return Air Pressure Drop (in. wg) (13 to 25 Ton Units)

CFM								
4500	5000	5400	6000	7200	7500	9000	10,000	11,250
0.040	0.050	0.060	0.070	0.090	0.100	0.110	0.120	0.140



NOTE: Part number for replacement EconoMi$er+ controller board is HK50AA042.

Fig. 28 — EconoMi$er+ Controller Board

Table 10 — EconoMi$er+ Inputs and Outputs

INPUT	NAME	TYPE	USE	INPUT/OUTPUT RANGE	CONVERSION RANGE	CONVERSION RESOLUTION	CONNECTION	PIN NO.
THERMOSTAT INPUTS								
Y1 (Cool/Low Cool)	Y1	Switch	Standard	18-30 vac 50/60 Hz w/Min 24 mA Load	NA	On/Off	J1	1
Y2 (Cool 2/High Cool)	Y1	Switch	Option	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	2
G (fan)	G	Switch	Standard	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	3
Occupied/Unoccupied	OCC	Switch	Option	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	4,5
POWER								
Power	24V	Input	Standard	18-30 VAC 50/60 Hz	NA	NA	J2	1,2
ECONOMIZER MOTOR								
Control	CNT	2-10 vdc	Standard	2-10 vdc	0-100%	1%	J2	3,4,5
ANALOG INPUTS								
Supply Air Temperature	SAT	10 K Thermistor	Standard	1816 to 86407 Ohms	30 to 125 F	0.8 F	J3	1,2
Outside Air Temperature	OAT	10 K Thermistor	Standard	1816 to 86407 Ohms	30 to 125 F	0.8 F	J3	3,4
Return Air Temperature	RAT	10 K Thermistor	Option	1816 to 86407 Ohms	30 to 125 F	0.8 F	J3	5,6
Indoor Humidity	IRH	4-20 mA, Loop Powered	Option	4-20 mA, 24 vdc	0-100%	.08 mA	J3	7,8,9
Outdoor Humidity	ORH	4-20 mA, Loop Powered	Option	4-20 mA, 24 vdc	0-100%	.08 mA	J3	10,11,12
Indoor CO_2	ICO2	4-20 mA, Ext Sourced	Option	4-20 mA, 24 vdc	0-200 PPM/10	10 PPM	J3	13,14
Remote Minimum Position Pot	MIN	10K	Option	10K to 100K Ohms	0 to 100%	1%	J3	15,16,17
RELAY OUTPUTS								
Cooling Stage 1	CP1	Relay	Standard	24 vac, 2.5 Amps @ 24 vac	NA	On/Off	J4	1,3,4
Cooling Stage 2	CP2	Relay	Option	24 vac, 2.5 Amps @ 24 vac	NA	On/Off	J4	2,3,4
Power Exhaust 2/ Cooling Stage 3*	CP3/ EX2	Relay	Option	24 vac, 2.5 Amps @ 24 vac	NA	On/Off	J4	5,6
Power Exhaust 1/ Cooling Stage 4†	CP4/ EX1	Relay	Option	24 vac, 2.5 Amps @ 24 vac	NA	On/Off	J4	5,7
DISPLAY								
Setpoint Switch 1	SP1	Digital	Standard	Open/Closed	Logic	Open/Closed	On Board	NA
Setpoint Switch 2	SP2	Digital	Standard	Open/Closed	Logic	Open/Closed	On Board	NA
LED 1	DS1	LED Output	Standard	Red	Logic	On/Off	On Board	NA
LED 2	DS2	LED Output	Standard	Yellow	Logic	On/Off	On Board	NA
LED 3	DS3	LED Output	Standard	Green	Logic	On/Off	On Board	NA
LED 4	DS4	LED Output	Standard	Green	Logic	On/Off	On Board	NA

*If there are 3 stages then there can only be 1 stage of power exhaust.
†If there are 4 stages then there will be not power exhaust stages that will be directly controlled.

Table 11 — Start-Up Mode Sequence

TIME	LED 1/DS1 (RED)	LED 2/DS2 (YELLOW)	LED 3/DS3 (GREEN)	LED 4/DS4 (GREEN)
0-1.0 SEC	OFF	OFF	OFF	OFF
1-1.5 SEC	FLASH ½ SEC	OFF	OFF	OFF
1.5-2.0 SEC	OFF	FLASH ½ SEC	OFF	OFF
2.0-2.5 SEC	OFF	OFF	FLASH ½ SEC	OFF
2.5-3.0 SEC	OFF	OFF	OFF	FLASH ½ SEC

RUN MODE — Run mode indicates status of controller and unit. The buttons are not be used in this mode. The mode can be changed to the Read, Setup, or Manual modes.

The DS1 heartbeat indicator LED (red) will flash to indicate the controller is operating properly.

The DS2 Econo indicator LED (yellow) will flash whenever economizer is being used for free cooling.

The DS3 first stage cooling indicator LED (green) will flash to indicate demand for stage 1 cooling.

The DS4 second stage cooling indicator LED (green) will flash to indicate demand for stage 2 cooling.

If the controller is in a different mode, the controller will return to Run mode after 10 minutes of user inactivity. If the READ/ADJUST and ADVANCE/MANUAL buttons are held for 3 seconds, then the controller will return to Run mode.

READ MODE — Read mode is used to check set points and I/O channel status. Enter the Read mode by pushing and releasing the READ/ADJUST button. See Tables 12 and 13.

NOTE: If the user pushes and holds the READ/ADJUST button for more than 3 seconds, then the control will go into the Setup mode.

While in READ mode, DS1 LED (Red) flashes to indicate setup point number as defined in the setup table. See Table 12. If the number is less than 5, the DS1 LED will count out the value by flashing at 1-second intervals to show the value of the number. For example if the number is 4, the DS1 LED will flash the red LED 4 times at 1-second intervals. If the number is greater than 4, then the DS1 LED will flash quickly in increments of 5, then pause, and then flash the remaining flashes at 1-second intervals. For example to display 19, the DS1 LED will flash 3 groups of 5 at a high flash rate to indicate 15 and then follow with 4 flashes at 1-second intervals to complete the display of the number 19.

This will then be followed by the display of the value of the display item. This will be done through the two green LEDs (DS3 and DS4). The DS3 LED will be used to display the tens digit and the DS4 LED will be used to display the ones digit of the value. If the value is less than 5, the LEDs will count out the number at 1 second intervals. If the value is greater than 4, the LEDs will first count out the increments of 5 at a high rate and then count out the remaining value at 1-second intervals.

The controller will first display the tens digit and then pause and display the ones digit. For example to display the number

124, the DS3 LED would flash 2 groups of 5 flashes followed by 2 one-second flashes to indicate the 12. The controller would then pause and flash 4 one-second interval flashes on DS4 to indicate the 124. To read the display again, push the READ/ADJUST button and the sequence will repeat as many times as needed.

To advance to the next setup point, push the ADVANCE/MANUAL button. The controller will cycle through all the setup channels (Table 12) and then the I/O channels (Table 13) and then back to the first setup channel.

In the Read mode for setup variables, the LEDs will not turn on steady; the LEDs will always flash. Steady-on indicators are reserved for the configuration modes. No data is modified in the Read mode. The controller will always remain at the last read number even if reset back to normal operation.

NOTE: To enter another mode, the user first must exit the Read mode.

If no buttons are pushed 10 minutes, Read mode will automatically be exited. Also, if the READ/ADJUST and ADVANCE/MANUAL buttons are pushed and held for more than 3 seconds, then Read mode will be exited to Run Mode. While in the Read mode, the controller will continue to operate with normal unit control.

After advancing through all the configuration variables, the controller will then advance through the status of the I/O channels. See Table 13. At the first I/O point (Compressor 1 Output), the DS2 LED (Yellow) will flash with the number of the I/O channel and the DS1 LED (red) will stop flashing. This will be followed by the I/O channel status. To read the value again, push the READ/ADJUST button. To advance to the next channel, push the ADVANCE/MANUAL button.

If the number of the channel or the status value is greater than 4 the controller will count out the increments of 5 at a high flash rate followed by the remaining digits. The channel number will be counted out through the DS2 LED (yellow). The status value will be counted out through the DS3 and DS4 LEDs (green).

If the status value is an analog value then the numeric value will be displayed by using the DS3 Green LED to display the tens digit and the DS4 will be used to display the ones digit.

If the channel is a digital output (relay), the DS3 LED (green) will indicate ON status and the DS4 LED (green) will indicate OFF status. If the output is the economizer control signal then the DS3 LED will be used to indicate the motor is being driven open, and the DS4 LED will be used to indicate it is being closed. If the motor is not being commanded in either direction then both the DS3 and DS4 LEDs will be on. The controller will first go through the output relays, then the economizer motor, and will then follow with the values currently being read for the analog input channels as defined in the configuration table. All values are maintained in memory even during a power loss. To exit Setup mode, push and hold the READ/ADJUST and ADVANCE/MANUAL buttons for more than 3 seconds. Setup mode will automatically be exited after 10 minutes of no activity.

SETUP MODE — The Setup mode is used to change set points and configuration values.

Enter the Setup mode by pushing and holding the READ/ADJUST button 1 for 3 seconds.

In this mode, all configurations can be modified even while the unit is running, but the user will not be able to adjust the I/O channels. Therefore, only channels 1 through 20 on Table 12 will be accessible in the Setup mode. Channel 20 will be used to reset any alarms that may have occurred. As an option, alarms can also be reset by cycling power to the controller.

NOTE: During the Setup/Adjust mode, all routines including safety routines will continue to run and control the unit.

While in this mode, the DS1 LED (red) will flash to indicate the number of the configuration item. The DS2 LED (yellow) will be on continuously to indicate that the unit is in csetup mode. Use the ADVANCE/MANUAL button to sequence through the setup channels. If the value of the channel is less than 5 it will count out the value of the channel on the DS1 LED at 1-second intervals. If it is greater than 4 it will first count out the increments of 5 and then following with the remaining digit.

Once the desired channel is flashing, use the READ/ADJUST button to first enter the tens value, then pause and enter the ones value for analog settings. Push the ADVANCE/MANUAL button and the appropriate LED will flash to indicate that the command is being accepted. If the configuration is a discrete on/off setting use the ADVANCE/MANUAL button to toggle the LED 3 or 4 on or off. To check the value that has been configured, push the READ/ADJUST button. To exit the mode, push and hold the READ/ADJUST and ADVANCE/MANUAL buttons for more than 3 seconds.

MANUAL MODE — Manual mode is used to control the status of I/O channels for use in troubleshooting. See Table 13.

Enter the Manual mode by holding down the ADVANCE/MANUAL button for 3 seconds.

The DS1 LED turns on steady to indicate Manual mode. All EconoMi$er+ control outputs are turned off. The DS1 LED remains on until the Manual mode is exited.

The DS2 LED flashes once to indicate the I/O channel. See Table 13. If the value is less than 5, the DS2 LED will count out the value using 1-second flashes. If the value is greater than 4, the DS2 LED will count out groups of 5 at a high flash rate and then follow with the additional value at a flash rate of once per second. For example a flash of 1 indicates Compressor Relay Output 1.

Once the channel number is displayed it will then turn on the appropriate LED (DS3 or DS4) to indicate the status of the output. For relay outputs if the DS3 LED is on, then the output is on. If DS4 is on, then the output is off.

The LED will remain on for about 2 seconds and if during this time the READ/ADJUST button is pushed, then the output will toggle to the alternate state. To change again, push the READ/ADJUST button and repeat the test or change the status of the output. As an example, for channel 5 (EconoMi$er+ control damper motor) use the READ/ADJUST button to toggle the motor from open to close in %.

At any time, the ADVANCE/MANUAL button can be used to advance to the next SET I/O. To exit the mode, push and hold the READ/ADJUST and ADVANCE/MANUAL buttons for more than 3 seconds.

NOTE: After exiting the Manual mode, the controller will re-initialize and start with all outputs off.

Table 12 — Configuration Variables

NO.	SETUP POINTS (viewable and adjustable)	UNITS	MINIMUM VALUE	MAXIMUM VALUE	FACTORY SETTING	INC	COMMENTS
1	Supply Air Temperature Setpoint	F	40 F	65 F	55 F	1 F	Leaving Air Temperature Control Point
2	Occupied Minimum Economizer Position	%	IAQMIN_AP+1%	100%	15%	1%	Min Econo Position (occupied mode)
3	Unoccupied Minimum Economizer Position	%	1%	100%	5%	1%	Min Econo Position (unoccupied mode)
4	Economizer Maximum Position	%	1%	100%	100%	1%	Maximum Econo Position
5	Economizer Type	—	1	3	2	1	1 = Vent Only, 2 = Proportional, 3 = 3 Position
6	Economizer Changeover Type	—	1	5	2	1	1 = Switch, 2 = Outdoor Dry Bulb, 3 = Diff Dry Bulb, 4 = Outdoor Enthalpy, 5 = Diff Enthalpy
7	Economizer Changeover Setpoint mode 2)	F	45 F	70 F	65 F	1 F	For Outdoor Changeover
8	Economizer Changeover Setpoint mode 3)	—	1	4	1	1	Outdoor Enthalpy Changeover Setpoint 1 = A, 2 = B, 3 = C, 4 = D
9	No. of compressors	—	1	4	2	1	1, 2, 3, or 4
10	Compressor Sequencing	—	1	4	1	1	1 = DC-Sensible, 2 = DC-Latent, 3 = LAT-Sensible, 4 = LAT-Latent
11	Power Exhaust Stage 1 Activation	%	1%	PWREX_ SP2-5%	25%	1%	Economizer Position
12	Power Exhaust Stage 2 Activation	%	PWREX_SP+1%	100%	50%	1%	Economizer Position (> stage 1)
13	Unoccupied Configuration	—	1	3	3	1	1 = No Unoccupied Cooling, 2 = Unoccupied Free Cooling, 3 = Unoccupied Free & Mech Cooling
14	Compressor Lockout Temperature	—	1 F	65 F	45 F	1 F	Compressor Operation
15	IAQ Min Economizer Position Setpoint	%	1%	OCC_ECONOMIN _SP+1%	5%	1%	Min IAQ Position for VOC Emissions
16	IAQ Enable	—	1	2	1	1	1 = Disabled, 2 = Enabled
17	Outdoor IAQ Reference	PPM/10	1 PPM/10	100 PPM/10	400 PPM/10	1 PPM/10	Outdoor Reference IAQ Level
18	IAQ Lower Limit Control Point Differential	PPM/10	1 PPM/10	DAQ HI-1 PPM/10	300 PPM/10	1 PPM/10	Differential Lower Limit Indoor IAQ Level
19	IAQ Upper Limit Control Point Differential	PPM/10	DAQLO+1 PPM/10	200 PPM/10	140 PPM/10	1 PPM/10	Differential Upper Limit Indoor IAQ Level
20	1st Most Recent Error/Reset	—	1	8	—	—	Used in Setup Mode to Reset Alarms
21	2nd Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode
22	3rd Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode
23	4th Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode
24	5th Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode

LEGEND

DC — Direct Control
IAQ — Indoor Air Quality
LAT — Leaving Air Temperature Compensated Control
VOC — Volatile Organic Compounds

NOTE: The accessibility of these channels will be as follows:
READ MODE — All channels will be accessible.
SETUP MODE — Only channels 1-20 will be accessible and 20 will be used to reset alarms.

Table 13 — Input/Output Channels

NO.	I/O POINTS	UNITS	MINIMUM VALUE	MAXIMUM VALUE	INC	COMMENTS
1	C1 Output	—	Off	On	—	Compressor 1
2	C2 Output	—	Off	On	—	Compressor 2
3	C3 Output	—	Off	On	—	Compressor 3/Power Exhaust 2
4	C4 Output	—	Off	On	—	Compressor 4/Power Exhaust 1
5	Economizer Damper Output	%	1 F	100 F	1%	Damper Commanded Position
6	Supply Air Temperature	F	1 F	150 F	1 F	Supply Air Temperature
7	Outdoor Air Temperature	F	1 F	150 F	1 F	Outdoor Air Temperature
8	Return Air Temperature	F	1 F	150 F	1 F	Return Air Temperature
9	Indoor Relative Humidity	%	1%	100%	1%	Return Air Relative Humidity
10	Outdoor Relative Humidity	%	1%	100%	1%	Outdoor Air Relative Humidity
11	Indoor Air Quality	PPM	1 PPM/10	200 PPM/10	10 PPM	Indoor Air Quality (/10)
12	Remote Minimum Position	%	1%	100%	1%	Remote Minimum Pot Position
13	Y1 Status	—	Open	Close	—	Thermostat Y1 Status
14	Y2 Status	—	Open	Close	—	Thermostat Y2 Status
15	G Status	—	Open	Close	—	Indoor Fan Status
16	Occ Status	—	Open	Close	—	Remote Occupied Status

NOTE: The accessibility of these channels will be as follows:
READ MODE — All channels will be accessible for reading.
ADJUST MODE — Only channels 1-5 will be accessible.
MANUAL MODE — Only channels 1-5 will be accessible.

CONFIGURATION

There are 19 different variables that can be used to configure the control for wide range of applications.

The EconoMi$er+ control accepts an occupied/unoccupied switch input. This input is used to control the occupied and unoccupied minimum ventilation damper position as shown in Table 12 items 2 (OCC_ECONOMIN_SP) and 3 (U_ECONOMIN_SP). These values represent the minimum damper position. In addition the controls allows for different modes of compressor operation in the unoccupied mode. Using item 13 in Table 12 (OCC_MODE), the user can select one of the following unoccupied modes:

1. No unoccupied cooling,
2. Unoccupied free cooling (EconoMi$er+)
3. Unoccupied free cooling and mechanical cooling

The EconoMi$er+ will control the cooling operation of the unit based on the demand from the thermostat outputs Y1 and Y2. The EconoMi$er+ will monitor the fan output G, but will not control the fan directly. Note that G must be energized for any cooling to take place.

Gas or electric heating will be controlled directly from the thermostat.

When a demand for cooling occurs, the control will check to see if it is in the occupied or unoccupied mode. Depending on the configuration, the control will move the outside air damper to the ventilation position. If the outside air conditions are acceptable, then the control will use the EconoMi$er+ for free cooling. If the supply air temperature does not meet the configurable set point, then the control will turn on additional stages of mechanical cooling. Several compressor sequences can be used depending on the application requirements. These will be covered in the mechanical compressor staging section.

Compressor Configuration and Control — The control can support from 1 to 4 compressor stages. For the 3 to $12^1/_2$ ton units, there will only be 1 or 2 stages of compressor cooling, so the control is factory configured for 2 stages. There is no difference between 1 and 2 stages. The control also has the option of configuration for high sensible or high latent loads, but for units with only two compressors this option is not applicable. The configuration is done through item 10 (STAGE_TYPE) in Table 12. The control also has the capability of controlling directly to Y1 and Y2 inputs. The control can be configured to control to the leaving air temperature using Y1 and Y2 as a low cool and high cool demand based on the supply air set point and the rate of change of supply air temperature. For low cool the leaving air temperature set point will be SAT_SP+2 F. For high cool the leaving air temperature set point will be the supply air temperature set point (SAT_SP).

To use this option, configure the Compressor Sequencing variable (STAGE_TYPE) to a value of 3. Configure the Supply Air Temperature set point (SAT_SP) to the desired leaving air temperature.

NOTE: The Supply Air Temperature set point is also the temperature used for EconoMi$er+ control.

The logic will control the operation of the compressors depending on the configuration selected. If free cooling can be used, then the compressors will be integrated with the EconoMi$er+ to provide the lowest cost cooling control. The logic includes time guards on the compressors to provide a minimum of 3 minutes on and 3 minutes off time. The control will also prevent two compressors from starting at the same time. The logic uses the EconoMi$er+ to prevent rapid cycling of the compressors and low air temperatures.

**EconoMi$er+ Configuration and Control —** There are several items that need to be configured for the EconoMi$er+ to control the ventilation air and free cooling.

ECONOMI$ER+ TYPE — First, select the type of EconoMi$er+ control that will be used. This is the EconoMi$er+ Type function (ECONO_TYPE) defined by item 5 in Table 12. The choices are:

1. Vent only — This is used to have just ventilation control. The EconoMi$er+ will not provide free cooling, but the occupied and unoccupied minimum positions can be used.
2. Proportional — In this configuration, full proportional EconoMi$er+ control will be used. When EconoMi$er+ free cooling cannot be used, the dampers will be set to the appropriate occupied and unoccupied minimum positions.
3. Three-Position — This mode of EconoMi$er+ is used to provide a minimum ventilation EconoMi$er+ position and a fixed free cooling or high ventilation position. The high ventilation position is controlled by the optional Remote EconoMi$er+ Enable Switch Input connected to terminals 11 and 12 on T3.

SUPPLY AIR TEMPERATURE SET POINT — Once the type of EconoMi$er+ control has been selected, the user will then need to set the Supply Air Temperature set point (SAT_SP). The SAT_SP has a range of 40 to 65 F.

NOTE: This will be the set point when both Y1 and Y2 are closed. When just Y1 is closed, the set point will be 2 F higher.

MINIMUM DAMPER POSITION — Set the occupied minimum damper position (OCC_ECONOMIN_SP) and unoccupied minimum position (U_ECONOMIN_SP). These should be set to provide the ventilation requirements at full occupancy as defined by the building specifications. When demand ventilation is used, the control will close the dampers below this position based on measured CO_2 levels in the space to provide additional operation savings.

The control will also allow for the use of a remote minimum position potentiometer. This will only adjust the Occupied Minimum position. If used, the software set point OCC_ECONOMIN_SP should be set to 0 as the control will use the largest set point.

The damper position is not linear with the amount of outside air, so the user will need to set the position of the EconoMi$er+ accordingly. It is best to use the following equation and measured data to set the position:

$$OA = \frac{SAT - RAT}{OAT - RAT} * 100$$

OA = % Outside air

SAT = supply-air temperature

RAT = return-air temperature

OAT = outside-air temperature

The SAT and OAT can be read from the control and, if the unit is equipped with an RAT sensor, then all three values can be read. For the calculation to work properly, there should be at least a 10 F difference between the OAT and RAT temperatures.

MAXIMUM DAMPER POSITION — Set the maximum EconoMi$er+ position. Normally this is set at 100%. If using 3-position control or there is a reason not to use 100% outside air, this can be set using the EconoMi$er+ Maximum Position (MAX_POS_SP).

COMPRESSOR LOCKOUT TEMPERATURE — Set the Compressor Lockout Temperature. The Compressor Lockout Temperature (CMP_LOCK) is used to prevent compressor from running at low ambient conditions when an EconoMi$er+ can easily satisfy the load.

ECONOMI$ER+ CHANGEOVER CONTROL — Determine the type of EconoMi$er+ changeover control which will

be used to enable and disable free cooling. This is done using the EconoMi$er+ Changeover Type (ECONO_TYPE).

1. Switch — This changeover setting is used when a remote signal from an energy management system will enable and disable the EconoMi$er+. This is done through a remote EconoMi$er+ enable switch.
2. Outdoor Dry Bulb — For this changeover setting, the EconoMi$er+ will be enabled based on the outside air temperature. The EconoMi$er+ is shipped with an outside air temperature sensor. The outside air temperature set point can be configured by the user. The EconoMi$er+ will be disabled when the outdoor air temperature rises above the set point. The configuration variable is the EconoMi$er+ Changeover set point (OAT_SP).
3. Differential Dry Bulb — For this changeover setting, the EconoMi$er+ will be enabled whenever the outside air temperature is lower than the return air temperature. No configuration of set points is required other than to select the differential dry bulb function.
4. Outdoor Enthalpy — For this changeover setting, the control will enable the EconoMi$er+ based on the outside air enthalpy curves as shown in Fig. 21. Using the EconoMi$er+ Changeover set point (ENTHALPY_SP), select curves A, B, C or D. The control will then use the EconoMi$er+ at conditions below the curve. The control uses the OAT and optional humidity sensor to calculate the enthalpy and also has the A, B, C, and D curves stored in memory.
5. Differential Enthalpy — For this changeover setting, the EconoMi$er+ will be enabled based on the comparison of the enthalpy of the return air and outside air. If the outside air enthalpy is lower than the return air, then the EconoMi$er+ will be enabled. To use this option, an accessory outside air humidity sensor, a return air dry bulb sensor and a return air humidity sensor must be ordered and installed. No configuration of set points is required other than to select the function.

Demand Ventilation Configuration — The EconoMi$er+ control has demand ventilation control capability when using an IAQ sensor. The indoor air quality (IAQ) is measured using a CO_2 sensor. The IAQ sensor can be field-installed in the return duct or the occupied space.

The EconoMi$er+ control algorithm modulates the position of the EconoMi$er+ damper between two user configurations depending upon the relationship between the IAQ and the Outdoor Air Quality (OAQ). The lower of these two positions is referred to as the Minimum IAQ Minimum EconoMi$er+ Position (IAQMIN_SP). The higher position is referred to as the Occupied EconoMi$er+ Minimum Position (OCC_ECONOMIN_SP). The IAQMIN_SP should be set to an EconoMi$er+ position that brings in enough fresh air to remove contaminants and CO_2 generated by sources other than people. The OCC_ECONOMIN_SP should be set to an EconoMi$er+ position that brings in enough fresh air to remove contaminants and CO_2 generated by all sources including people at the design value for maximum occupancy.

A reference differential CO_2 level above the outside CO_2 level is used as the starting point for IAQ control and another reference differential level for maximum ventilation at design occupancy is used for the end of IAQ control. Between these points the control will modulate the dampers open from the IAQMIN_SP and the OCC_ECONOMIN_SP setpoints. The damper position will never go above OCC_ECONOMIN_SP or below IAQMIN_SP.

The control does not measure the outdoor IAQ reference level as these levels are relatively constant. The installer should take a measurement at start-up of the unit and enter this value into the control using the Outdoor Air IAQ reference level configuration.

The control is configured for air quality sensors which provide 4 mA at 0 PPM and 20 mA at 2000 PPM. If a sensor has a different range, these bounds must be reconfigured.

To configure the control for an IAQ sensor perform the following steps:

1. Determine the Occupied EconoMi$er+ Minimum position (ECONOMIN_SP) and enter it into the control.
2. Determine the IAQ minimum EconoMi$er+ position (IAQMIN_SP) and enter it into the control.
3. Enable IAQ control using the IAQ Enable (IAQ_FLG).
4. Determine the Outdoor Air IAQ Reference (OAQ) and enter it into the control.

NOTE: The value entered into the control will be the CO_2 ppm level divided by 10. For example, 400 ppm would be entered as 40.

5. Determine the lower control point differential level (DAQLO) and enter it into the control. This is a differential level so if the desired level to start IAQ control is 500 ppm and the OAQ reference level is 400 then a value of 100 would be used.

NOTE: The value entered into the control will be the CO_2 ppm level divided by 10. For example 100 ppm would be entered as 10.

6. Determine the upper control point differential level (DAQHIGH) and enter it into the control. This is a differential level so if the desired level to start IAQ control is 1100 ppm and the OAQ reference level is 400 then a value of 700 would be used.

NOTE: The value entered into the control will be the CO_2 ppm level divided by 10. For example 700 ppm would be entered as 70.

Power Exhaust Configuration — The Economi$er+ has the capability of controlling up to 2 stages of power exhaust. The activation of the power exhaust is done through configurable damper position set points. The first stage of power exhaust is controlled by relay C4 on the EconoMi$er+ board. The activation point for the first stage is set using the Power Exhaust Stage 1 Activation set point (PE_SP1). The second stage of power exhaust must be set at a value greater than the first stage. It is configured using the Power Exhaust Stage 2 Activation set point (PE_SP2).

TROUBLESHOOTING

The EconoMi$er+ control has built-in diagnostics. The control has the capability of detecting and displaying 10 different diagnostic codes as shown in Table 14. The user can also use the integrated display to check the status of all the inputs and outputs and run the manual control mode to check the operation of the EconoMi$er+ and compressors.

Error Code 1 – SAT Sensor Failure

ERROR CRITERIA — An SAT Sensor Failure error will occur if the sensor is shorted or faulty. If the measured temperature reads below –40 F or above 250 F an error will occur.

REQUIRED ACTION — If an error occurs, then the control will default to Mode 2 compressor stage control where Y1 and Y2 have direct control of the compressors. Use of free cooling is disabled and the EconoMi$er+ will be set to the minimum damper position for either the occupied or unoccupied mode of operation. Replace sensor if faulty.

RESET METHOD — The error will automatically reset after the value has returned to a normal level. The alarm has to be cleared from the display in the Setup mode or a power reset.

Table 14 — EconoMi$er+ Error Codes

NO.	DESCRIPTION	CRITERIA
1	SAT Sensor Failure	Temperature <–40 F or Greater Than 250 F
2	RAT Sensor Failure	Temperature <–40 F or Greater Than 250 F
3	OAT Sensor Failure	Temperature <–40 F or Greater Than 250 F
4	ORH Sensor Failure	Read Less Than 2 mA or Greater Than 22 mA
5	IRH Sensor Failure	Read Less Than 2 mA or Greater Than 22 mA
6	IAQ Sensor Failure	Read Less Than 2 mA or Greater Than 22 mA
7	Y2 On Y1 Off	Wiring Error
8	Micro Fails E2 Tests	Hardware/Software Check
*	Micro Fails RAM Test	Hardware/Software Check
†	Micro Fails ROM Tests	Hardware/Software Check

LEGEND

IAQ — Indoor Air Quality
IRH — Indoor Relative Humidity
OAT — Outdoor Air Temperature
ORH — Outdoor Relative Humidity
RAT — Return Air Temperature
SAT — Supply Air Temperature

*If there is a RAM failure DS1+DS3/DS2+DS4 will alternately flash.
†If there is a ROM failure DS1+DS2/DS3+DS4 will alternately flash.

Error Code 2 — RAT Sensor Failure

ERROR CRITERIA — The RAT Sensor failure error is only applicable the unit has been configured for EconoMi$er+ changeover methods 3 (differential dry bulb) or 5 (differential humidity). For other modes it should be ignored. If the sensor is shorted or faulty, then the measured temperature will be below –40 F or above 250 F and the error will occur.

REQUIRED ACTION — If this error occurs, then change the default EconoMi$er+ changeover control to method 2 (dry bulb changeover control) or replace sensor.

RESET METHOD — This error will automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode.

Error Code 3 — OAT Sensor Failure

ERROR CRITERIA — An OAT Sensor Failure error occurs if the sensor is shorted or faulty, then the measured temperature will be below –40 F or above 250 F.

REQUIRED ACTION — If this error occurs disable the economizer and set the economizer to the minimum economizer position.

RESET METHOD — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

Error Code 4 — ORH (Outdoor Relative Humidity) Sensor Failure

ERROR CRITERIA — If the unit is configured for economizer changeover type 3 or 4, and the input signal is less than 2 mA or greater than 22 mA, then the sensor is faulty and an error will occur.

REQUIRED ACTION — If this error occurs, switch the EconoMi$er+ to dry bulb changeover control.

RESET METHOD — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

Error Code 5 — IRH (Indoor Relative Humidity) Sensor Failure

ERROR CRITERIA — This error occurs if the unit is configured for EconoMi$er+ changeover type 4 or 5 and the input signal is less than 2 mA or greater than 22 mA (faulty sensor).

REQUIRED ACTION — If this error occurs, switch the EconoMi$er+ to differential dry bulb changeover control.

RESET METHOD — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

Error Code 6 — IAQ Sensor Failure

ERROR CRITERIA — This error occurs if the unit is configured for IAQ demand ventilation control and the input signal is less than 2 mA or greater than 22 mA (faulty sensor).

REQUIRED ACTION — If this error occurs, disable the IAQ control routine and default to the standard EconoMi$er+ minimum position.

RESET METHOD — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

Error Code 7 — Y2 On With Y1 Off

ERROR CRITERIA — This error occurs if Y2 is turned on and Y1 is off. This indicates that there is a wiring error at the thermostat connections. This alarm should be ignored for the first 20 seconds of operation so that it does not conflict with the special production test mode.

REQUIRED ACTION — Shut the unit off and check wiring.

RESET METHOD — This error must be manually reset and requires a power reset.

Error Code 8 — E2 Test Failure

ERROR CRITERIA — This error occurs if internal hardware detects an E2 failure.

REQUIRED ACTION — Shut the unit off.

RESET METHOD — This error must be manually reset and requires a power reset.

RAM Test Failure

ERROR CRITERIA — If internal hardware detects a RAM failure, this alarm will be displayed by alternately flashing DS1+DS3 and DS2+DS4.

REQUIRED ACTION — Shut the unit off.

RESET METHOD — This error must be manually reset and requires a power reset.

ROM Test Failure

ERROR CRITERIA — If internal hardware detects a ROM failure, the alarm is displayed by alternately flashing DS1+DS2 and DS3+DS4.

REQUIRED ACTION — Shut the unit off.

RESET METHOD — This error must be manually reset and requires a power reset.

Unit Always in Unoccupied Mode — A jumper wire is factory-installed to force the unit into occupied configuration whenever G or Y1 are closed. Without the jumper wire, the unit will always be in unoccupied mode. Check the wire. An occupied/unoccupied switch may be installed in place of the jumper. Check the wiring and setting of the switch.

MODE OF OPERATION		PUSHBUTTONS		LED INDICATORS			
		Button 1	Button 2	DS1 (Red)	DS2 (Yellow)	DS3 (Green)	DS4 (Green)
STARTUP MODE	Action			flash →	flash →	flash →	flash

Note 1 Indicators flash in sequence at .5 sec intervals

RUN MODE							
	Names			HB	ECONO	Y1	Y2
	Actions			flash	flash	steady	steady

Note 1 Heartbeat Indicator flashes to indicate proper operation of the control
Note 2 Econo indicator flashes to indicate free cooling being used
Note 3 Y1 and Y2 are on steady when a call thermostat Y1 and Y2 are closed
Note 4 ERROR - HB and Econo are on steady to indicate the presence of an error

READ MODE							
	Names	READ	ADV	SET NO	I/O NO	TEN'S OR ON	ONES OR OFF
	Actions	Push	Push	flash, no	flash no	flash no	flash no

Note 1 Push and release the READ button to enter Read Mode. The SET NO Indicator flashes once to indicate the setup point is selected for viewing
Note 2 Push and release ADV button repreatedly to advance to the desired setup point or I/O point
Each time the ADV button is pushed, the SET NO flashes the point number until the desired I/O point is reached and then the I/O NO flashes the I/O point no.
Note 3 After the SET NO indicator identifies the desired point no, push and release the READ button to display the value in the TEN's and ONE's indicator (i.e., 5 flashes for a value of 5) or a steady TEN's indicator for an on and a steady ONE's for off.
To aid in counting, values of 5 are flashed in groups of 5 (i.e., 15 = 3 groups of fast 5 flashes) and then follow by balance in slow flashes (i.e., 7 = 5 quick flashed + 2 slow flashes)
Note 4 Setpoint values are displayed first followed by I/O values and then back to Setpoint values
Red Set No LED displays Setup item numbers, and Yellow I/O LED displays I/O item no
Note 5 Routine exits after 10 min of no activity or push and hold button 1 and 2 for 3 seconds to exit

MODE OF OPERATION		PUSHBUTTONS		LED INDICATORS			
		Button 1	Button 2	DS1 (Red)	DS2 (Yellow)	DS3 (Green)	DS4 (Green)

SETUP MODE							
	Names	ADJUST	ADV	SET NO	SETUP	TEN'S OR ON	ONES OR OFF
	Actions	Hold/Push	Push	flash, no	steady	flash no	flash no

Note 1 Push and hold the ADJUST button until the SETUP indicator turns on.
Note 2 Push and release ADV button repreatedly to advance to the desired setup point.
Each time the ADV button is pushed, the SET NO flashes the point number and then displays the current setting
Note 3 Once the current value has been displayed the TENS indicator will turn on steady and while it on use the ADJUST button to enter the value. (i.e., push the button 4 times to enter 4)
Then wait for the ONES indicator to turn on and enter the ONES setting
Wait for indicator to turn off and then push read/adjust to check the setting
Note 4 Routine exits after 10 min of no activity or push and hold button 1 and 2 for 3 seconds to exit

MANUAL							
	Names	ADJUST	MAN	MAN	I/O NO	TEN'S OR ON	ONES OR OFF
	Actions	Push	Hold/Push	steady	flash no	flash no	flash no

Note 1 Push and hold the MAN button until the MAN indicator turns on.
Note 2 Push and release MAN button repreatedly to advance to the desired I/O point.
Each time the MAN button is pushed, the I/O NO flashes the I/O point number.
Note 3 After the desired I/O No is reached push and release the ADJUST to toggle the output on and off or open and closed
Note 4 Routine exits after 10 min of no activity or push and hold button 1 and 2 for 3 seconds to exit

CONFIGURATION VARIABLES (READ AND SETUP MODE)

NO	SETUP POINTS (viewable and adjustable)	UNITS	COMMENTS
1	Supply Air Temperature Setpoint	F	Leaving air temperature control point
2	Occupied minimum economizer position	%	Min econo position (occupied mode)
3	Unoccupied minimum economizer position	%	Min econo position (unoccupied mode)
4	Economizer Maximum Position	%	Maximum econo position
5	Economizer Type	-	1 = vent only, 2 = porportional, 3 = 3 position
6	Economizer Changeover Type	-	1 = Switch, 2= Outdoor drybulb, 3=diff drybulb, 4 = outdoor enthalpy, 5= diff enthalpy
7	Economizer Changeover Setpoint (mode 2)	F	For outdoor changeover
8	Economizer Changeover Setpoint (mode 3)	-	Outdoor Enthalpy changeover setpoint 1 = A, 2=B, 3=C, 4=D
9	No of compressors	-	1, 2, 3, or 4
10	Compressor Sequencing	-	1 = DC-Sensible, 2=DC-Latent, 3 = LAT- Sensible, 4=LAT-Latent
11	Power Exhaust Stage 1 Activiation	%	economizer position
12	Power Exhaust Stage 2 Activiation	%	economizer position (> stage 1)
13	Unoccupied configuration	-	1 = no unoccupied cooling, 2= unoccupied free cooling, 3= unoccupied free & mech cooling
14	Compressor Lockout temperature		low ambient compressor limit
15	IAQ min economizer position setpoint	%	min IAQ positon for VOC emissions
16	IAQ Enable	-	1= Disabled, 2= Enabled
17	Outdoor IAQ Reference	PPM/10	outdoor reference IAQ level
18	IAQ lower limit control point differential	PPM/10	differential lower limit Indoor IAQ level
19	IAQ upper limit control point differential	PPM/10	differential upper limit indoor IAQ level
20	1st Most Recent Error /reset	-	used in setup mode to reset alarms
21	2nd Most Recent Error (read only)	-	not displayed in Setup mode
22	3rd Most Recent Error (read only)	-	not displayed in Setup mode
23	4th Most Recent Error (read only)	-	not displayed in Setup mode
24	5th Most Recent Error (read only)	-	not displayed in Setup mode

I/O POINTS

NO	I/O Points	UNITS
1	C1 Output	-
2	C2 Output	-
3	C3 Output	-
4	C4 Output	-
5	Economizer Damper Output	%
6	Supply Air temperature	F
7	Outside Air temperature	F
8	Return Air Temperature	F
9	Indoor Relative Humidity	%
10	Outdoor Relative Humidity	%
11	Indoor Air Quality	PPM
12	Remote Minimum Position	%
13	Y1 Status (next version)	-
14	Y2 Status (next version)	-
15	G Status (next version)	-
16	Occ Status (next version)	-

ALARM CODES

NO	DESCRIPTION
1	SAT sensor invalid
2	RAT Sensor Invalid (only with changeover type 2&4)
3	OAT Sensor Invalid
4	ORH Sensor invalid (only with changeover type 3&4)
5	IRH Sensor invalid (only with changeover type 4)
6	IAQ Sensor Invalid (only if IAQ=1)
7	Y2 on Y1 off
8	Micro Fails E2 test
note 1	Micro Fails RAM test
note 2	Micro Fails ROM test

Note 1 DS1+DS3/DS2+D4 will alternately flash
Note 2 DS1+DS2/DS3+D4 will alternately flash