Installation Instructions

Part No: CRECOMZR109A00, CRECOMZR110A00, CRECOMZR111A00, CRECOMZR112A00

CONTENTS

SAFETY CONSIDERATIONS

Installation of this accessory can be hazardous due to system pressures, electrical components, and equipment location (such as a roof or elevated structure). Only trained, qualified installers and service technicians should install, start-up, and service this equipment.

When installing this accessory, observe precautions in the literature, labels attached to the equipment, and any other safety precautions that apply:

• Follow all safety codes

• Wear safety glasses and work gloves

• Use care in handling and installing this accessory

It is important to recognize safety information. This is the safety-alert symbol: ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ **CAUTION**

PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

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

GENERAL

The EconomizerONE system utilizes the latest technology available for integrating the use of free cooling with mechanical cooling for packaged rooftop units. The solid-state control system optimizes energy consumption, zone comfort, and equipment cycling by operating the compressors when the outdoor air temperature is too warm, integrating the compressor with outdoor air when free cooling is available, and locking out the compressor when outdoor air temperature is too cold. Demand controlled ventilation is supported. The EconomizerONE system can be used with 1 and 2-speed units.

The EconomizerONE system utilizes gear-drive technology with a direct-mount spring return actuator that will close upon loss of power. The EconomizerONE system comes standard with an outdoor air temperature sensor, mixed air temperature sensor (also called supply air temperature sensor). Outdoor enthalpy, indoor (return) dry bulb or enthalpy, and CO_2 sensors are available for field installation. Standard barometric relief dampers provide natural building pressurization control. An optional power exhaust system is available for applications requiring even greater exhaust capabilities. The power exhaust set point is adjustable at the EconomizerONE controller. See Table 1 and 2 for package usage. See Tables 3 and 4 for package contents. See Table 5 for sensor usage.

IMPORTANT: Read these instructions completely before attempting to install the accessory economizer.

Compliance

Economizers meet California Energy Commission Title 24-2013/2016 prescriptive section 140.4 (damper leakage etc.), and mandatory section 120.2.i for Fault Detection and Diagnostic controls (HJW10). Economizers meet ASHRAE 90.1-2013/2016 damper leakage requirements as stated in Section 6.5.1.1.4 and Table 6.4.3.4.3, and meet 2016 Fault Detection and Diagnosis requirements in section 6.4.3.12. Economizers meet IECC 2012 section C402.4.5.2 and, IECC 2015 sections C403.2.4.3 and C403.3.3.5 for outside air, and return air damper leakage requirements, and IECC 2015 section C403.2.4.7 for Fault Detection and Diagnostic requirements. NOTE: IECC 2015 section C403.2.4.7.1 requires differential return air sensor, which must be ordered separately. Outside air and return air (volume) dampers are AMCA rated.

Table 1 — Economizer Usage — Vertical Units

EconomizerONE ACCESSORY KIT NUMBER	MODEL NUMBER
CRECOMZR109A00(LL), CRECOMZR111A00 (ULL)	48/50FC 16, 50FCQ14
	48/50GC 14, 50GCQ12
	582K/559K 16, 547K 14
	581K/551K 14, 549K 12
	RAV/RGV 180, RHV150
	RAW/RGW 150, RHW 120

LEGEND

LL — Low Leak Economizer
ULL — Ultra-Low Leak Economizer

Table 2 — Economizer Usage — Horizontal Units

EconomizerONE ACCESSORY KIT NUMBER	MODEL NUMBER
CRECOMZR110A00 (LL), CRECOMZR112A00(ULL)	48/50FC 16, 50FCQ14
	48/50GC 14, 50GCQ12
	582K/559K 16, 547K 14
	581K/551K 14, 549K 12
	RAV/RGV 180, RHV150
	RAW/RGW 150, RHW 120

LEGEND

LL — Low Leak Economizer
ULL — Ultra-Low Leak Economizer

Table 3 — Package Contents — Vertical Units

EconomizerONE ACCESSORY KIT NUMBER	QTY	DESCRIPTION
CRECOMZR109A00 (LL)	1	50TM001000 Low Leak Vertical Economizer with HF23BL005 Actuator Motor and 48TC004997 Economizer harness plug
	1	50TM401806 Hood Assembly with Aluminum Filters
	1	Hardware Package contains one each of the following: - HH63LW001 POL 224 Economizer Controller - 48TC005897 POL 224 Economizer Harness - HH79NZ039 Dry Bulb Temperature Sensor Assembly
CRECOMZR111A00 (ULL)	1	50TM000999 Ultra Low Leak Vertical Economizer with HF23BL005 Actuator Motor and 48TC004997 Economizer harness plug
	1	50TM401806 Hood Assembly with Aluminum Filters
	1	Hardware Package contains one each of the following: - HH63LW001 POL 224 Economizer Controller - 48TC005897 POL 224 Economizer Harness - HH79NZ039 Dry Bulb Temperature Sensor Assembly

LEGEND

LL — Low Leak Economizer
ULL — Ultra-Low Leak Economizer

Table 4 — Package Contents — Horizontal Units

EconomizerONE ACCESSORY KIT NUMBER	QTY	DESCRIPTION
CRECOMZR110A00 (LL)	1	50TM002979 Low Leak Horizontal Economizer with HF23BL005 Actuator Motor and 48TC004997 Economizer harness plug
	1	50TM401804 Hood Assembly with Aluminum Filter
	1	Hardware Package contains one each of the following: - HH63LW001 POL 224 Economizer Controller - 48TC005897 POL 224 Economizer Harness - HH79NZ039 Dry Bulb Temperature Sensor Assembly
CRECOMZR112A00 (ULL)	1	50TM002977 Ultra Low Leak Outside Air Horizontal Economizer Damper with HF23BL005 Actuator Motor and 48TC004997 Economizer harness plug
	1	50TM002978 Ultra Low Leak Return Air Horizontal Economizer Damper with HF23BL005 Actuator Motor and 48TC005897 harness.
	1	50TM002564 Relief Hood
	1	50TM002563 Filter Door Assembly
	1	50TM401806 Hood Assembly with Aluminum Filters
	1	Hardware Package contains one each of the following: - HH63LW001 POL 224 Economizer Controller - 48TC005897 POL 224 Economizer Harness - HH79NZ039 Dry Bulb Temperature Sensor Assembly

LEGEND

LL — Low Leak Economizer
ULL — Ultra-Low Leak Economizer

Table 5 — EconomizerONE Sensor Usage[a]

APPLICATION	EconomizerONE WITH OUTDOOR AIR DRY BULB SENSOR (ACCESSORIES REQUIRED)
Outdoor Air Dry Bulb	The HH79NZ039 outdoor air dry bulb sensor is factory installed on the economizer.
Mixed Air Sensor	HH79NZ039 provided with economizer and field-installed in blower compartment.
Single Enthalpy Sensor	CRENTSEN001A00[b]
Differential Dry Bulb Or Enthalpy	HH57LW001 (Qty. 2 required)
CO_2 for DVC Control using a Wall-Mounted CO_2 Sensor	33ZCSPTCO2LCD-01 or 33ZCSPTCO2-01 or CRCBDIOX005A003
CO_2 for DVC Control using a Duct-Mounted CO_2 Sensor	33ZCSPTCO2LCD-01 or 33ZCSPTCO2-01

NOTE(S):
a. Dry Bub sensor HH79NZ039 is included in the kit. Dry Bulb sensor HH57LW001 can be used as a replacement part.
b. Enthalpy sensor HH57LW001 and required 5-pin plug 48TC005213 included with CRENTSEN001A00 kit.

ECONOMIZER INSTALLATION

Figure 1 shows component locations on the EconomizerONE system.
1. Turn off unit power supply and install lockout tag.
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. 2.)

   NOTE: Save the panel. It will be reinstalled for vertical economizers at Step 5.
3. Remove the indoor coil access panel. (See Fig. 2.)

   NOTE: Save the indoor coil access panel for future use in the event that the EconomizerONE assembly is ever removed.
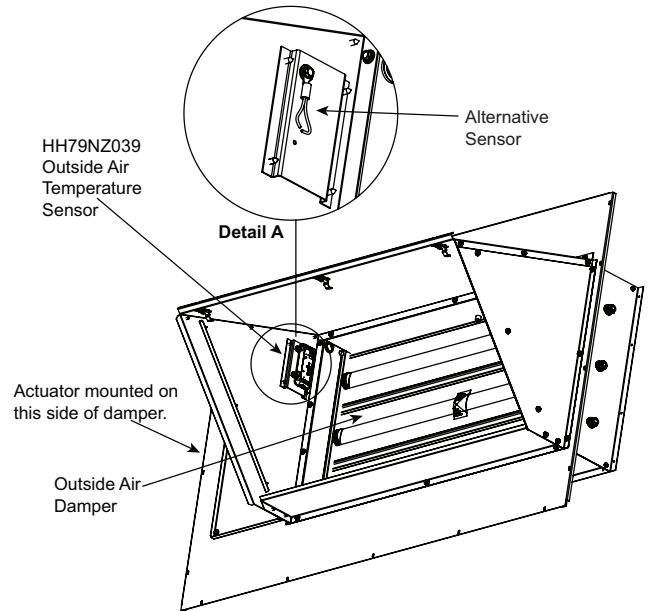

Fig. 1 — EconomizerONE Component Locations (CRECOMZR112A00 Shown)
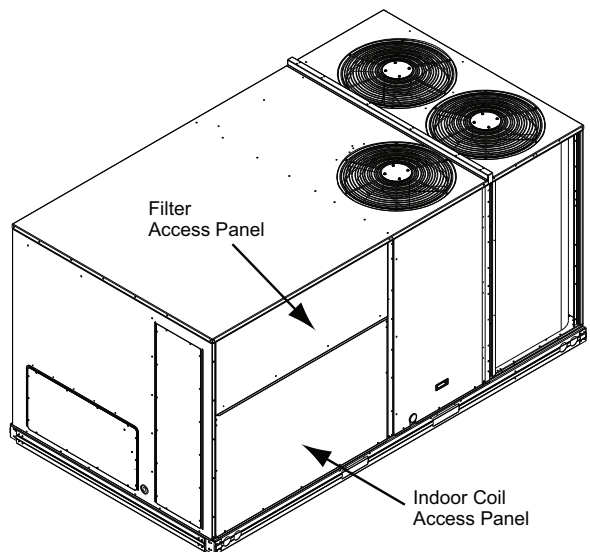

Fig. 2 — Filter Access View

NOTE: Steps 4-8 apply to CRECOMZR109A00 and CRECOMZR111A00 units only.
4. For CRECOMZR109A00 and CRECOMZR111A00 vertical installations — Slide the EconomizerONE into the unit as shown in Fig. 3. Secure the economizer with the screws provided.
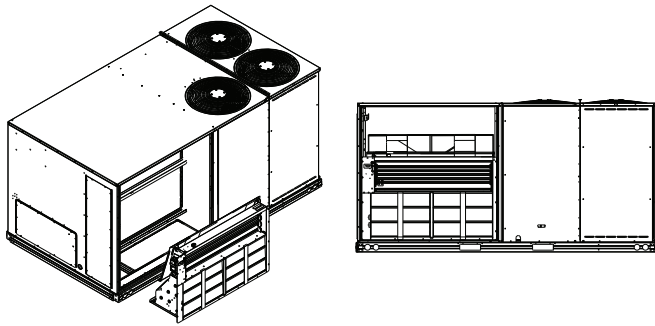
Fig. 3 — Insert Vertical EconomizerONE into the RTU

5. The hood for the vertical EconomizerONE units is shipped with the economizer. The hood top and sides are factory assembled. Attach the hood divider to the hood assembly and then attach the hood assembly to the RTU as shown in Fig. 4.

    NOTE: The aluminum filters and filter divider are shipped taped to the inside of the hood top. Remove the aluminum filters and filter divider before attaching the hood assembly to the RTU.

6. Attach the filter divider and reinstall the filter access panel as shown in Fig. 4.

Fig. 4 — Install the Vertical Hood Assembly

7. If the EconomizerONE system will be operating with an enthalpy outside air sensor, then remove the factory installed HH79NZ039 dry bulb sensor from the front face of the economizer (see Fig. 1), and install the accessory enthalpy sensor HH57LW001 in the same location. Connect the (5) wire harness with plug from the EconomizerONE assembly to the enthalpy sensor. See Fig. 20 for wiring diagram. Refer to "INSTALLING OPTIONAL HH57LW001 SINGLE OUTSIDE AIR ENTHALPY SENSOR" on page 11 for more details on enthalpy settings.

8. Continue at Step 23.

NOTE: Step 9 applies to CRECOMZR110A00 and CRECOMZR112A00 units only.

9. For horizontal installations — Locate Mixed Air Temperature Switch (MTS) with its bracket on left side of the unit. Remove left filter to access MTS bracket screws. Remove screws and relocate the bracket with MTS on the next set of holes up, having the bracket now above the opening of the filter access opening. See Fig. 5.

Detail A

Fig. 5 — Mixed Air Temperature Switch Relocation for Horizontal Units

NOTE: Steps 10-16 apply to CRECOMZR110A00 horizontal low leak units only.

10. Set the EconomizerONE O/A assembly upright. (See Fig. 6.)

11. Insert the EconomizerONE assembly into the rooftop unit, positioning it to the far left side of the opening. (See Fig. 6.) Slide the EconomizerONE all the way back into the RTU until it locks into the horizontal opening.

12. Secure the EconomizerONE mounting flanges to the RTU unit with the screws provided

13. If the EconomizerONE system will be operating with an enthalpy outside air sensor, then remove the factory installed HH79NZ039 dry bulb sensor from the front face of the economizer (see Fig. 1), and install the accessory enthalpy sensor HH57LW001 in the same location. Connect the (5) wire harness with plug from the EconomizerONE assembly to the enthalpy sensor. See Fig. 20 for wiring diagram. Refer to "INSTALLING OPTIONAL HH57LW001 SINGLE OUTSIDE AIR ENTHALPY SENSOR" on page 11 for more details on enthalpy settings.

14. Attach the O/A (Outdoor Air) panel, see Fig. 7.

15. Attach the horizontal economizer hood and filter access panel, see Fig. 8.

16. Continue at Step 23.
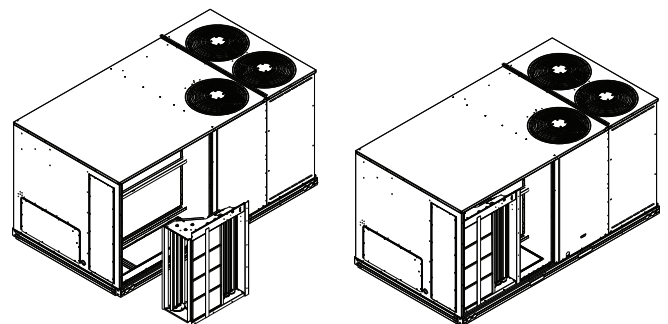
Fig. 6 — Low Leak Horizontal EconomizerONE (CRECOMZR110A00) Positioned for Installation in Unit

Fig. 7 — Attach the O/A Panel
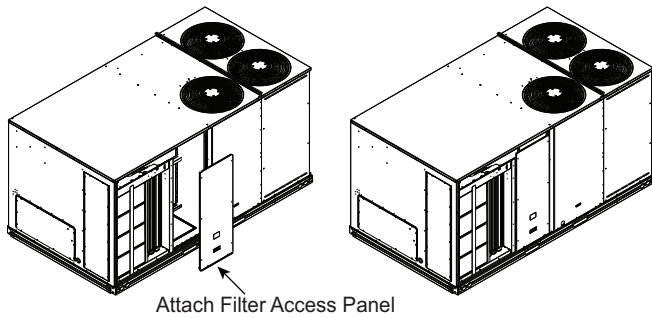
Attach Filter Access Panel
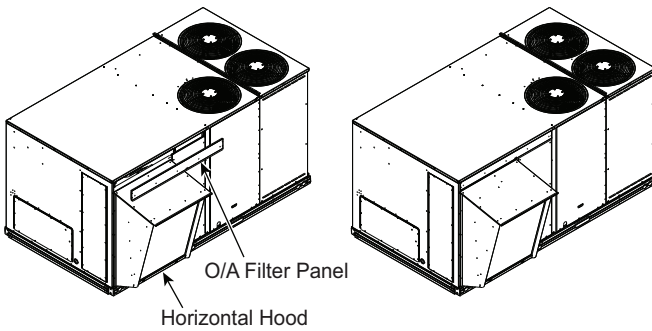
Fig. 8 — Attach the Filter Access Panel and Hood

O/A Filter Panel

Horizontal Hood

NOTE: Steps 17-22 apply to CRECOMZR112A00 horizontal ultra low leak units only.

17. Locate Mixed Air Temperature Switch (MTS) with its bracket on left side of the unit. Remove left filter to access MTS bracket screws. Remove screws and relocate the bracket with MTS on the next set of holes up, having the bracket now above the opening of the filter access opening. See Fig. 5.

18. Slide the EconomizerONE O/A assembly all the way back and into the R/A (Return Air) section. (See Fig. 9.)
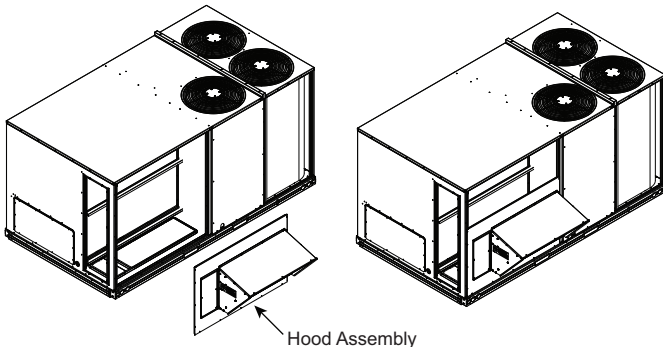
Hood Assembly

Fig. 9 — Install O/A Damper with Hood Assembly

19. Attach the R/A damper assembly into the horizontal return duct opening using the provided screws. See Fig. 10.

20. Connect the R/A assembly actuator wires to the O/A harness. Refer to Fig. 21 for wiring details.
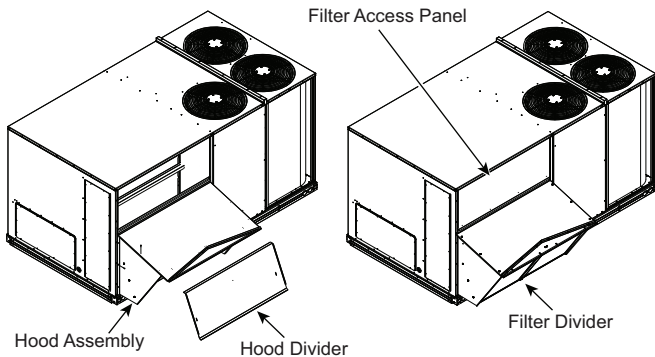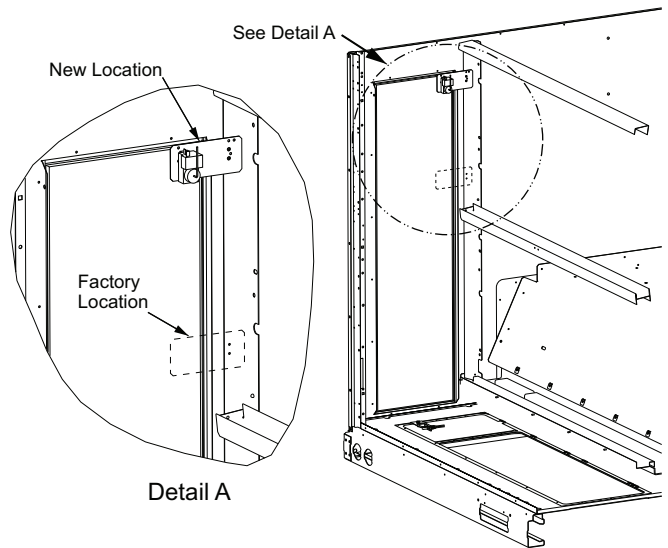

R/A Damper Assembly
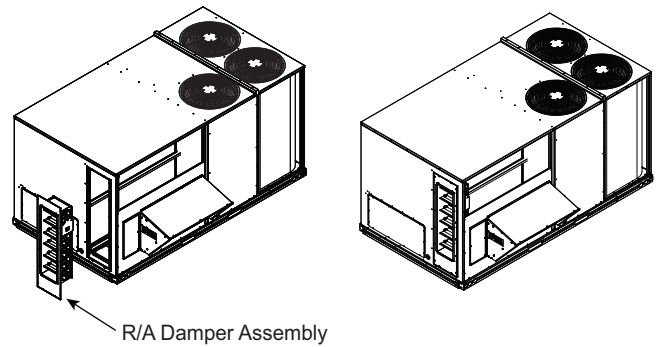
Fig. 10 — Install the R/A Damper

21. If the EconomizerONE system will be operating with an enthalpy outside air sensor, then remove the factory installed HH79NZ039 dry bulb sensor from the front face of the economizer (see Fig. 1), and install the accessory enthalpy sensor HH57LW001 in the same location. Connect the (5) wire harness with plug from the EconomizerONE assembly to the enthalpy sensor. See Fig. 21 for wiring details. Refer to "INSTALLING OPTIONAL HH57LW001 SINGLE OUTSIDE AIR ENTHALPY SENSOR" on page 11 for more details on enthalpy settings.

22. Continue at Step 23.

23. Remove and save the 12-pin jumper plug from the unit economizer harness located in the upper left corner of the unit. Insert the EconomizerONE plug into the unit wiring harness. (See Fig. 11.)

NOTE: The 12-pin jumper plug should be saved for future use, in the event that the EconomizerONE assembly is ever removed. The jumper plug is not needed as long as the EconomizerONE is installed.

Top View

Rooftop Unit's 12-Pin Male Plug

EconomizerONE 12-Pin Female Plug
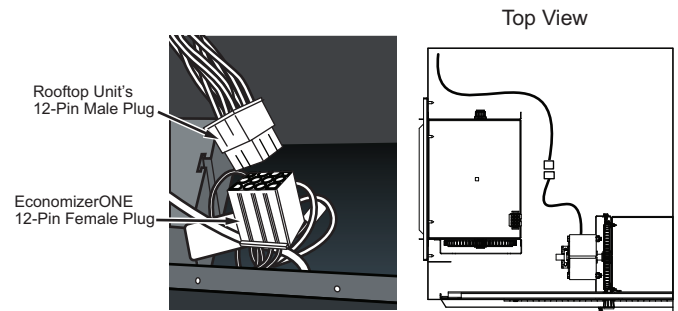
Fig. 11 — Connect EconomizerONE Harness to Unit PL6 Economizer Harness

NOTE: Step 24 applies to CRECOMZR110A00 and CRECOMZR112A00 units only.

24. Attach filter access panel above O/A panel assembly. Slide under RTU (Packaged Rooftop Unit) top flange then drop down until bottom mount holes align with top holes on O/A assembly. Fasten with provided sheet metal screws. (See Fig. 12.) Continue at Step 26.
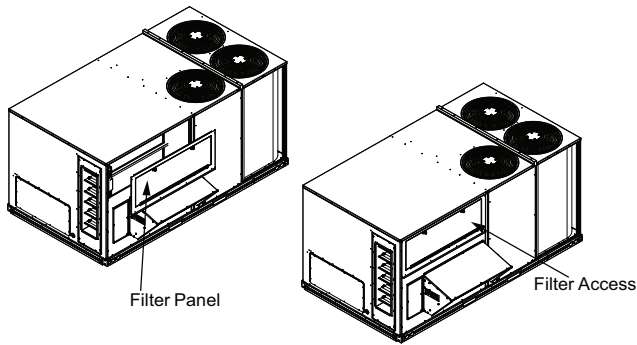
Fig. 12 — Install the Filter Access Panel

NOTE: Step 25 applies to CRECOMZR112A00 units only.

25. For CRECOMZR112A00 horizontal ultra low leak units only: Install provided barometric relief hood on field-installed R/A duct ensuring it is water tight. (See Fig. 13.)

26. Remove the indoor blower access panel and the panel(s) covering the unit control box. (See Fig. 14.)

27. In the hardware kit provided with the EconomizerONE is the POL 224 controller. Mount the controller assembly on the left side of the unit control box. Screw controller to the control box through pre-punched holes in control box. (See Fig.15.)

28. Unplug the 12-pin female ECON plug currently connected to the Unit Control Board (UCB). (See Fig. 16.)

29. Connect the 12-pin male ECON plug removed from the UCB to the 12-pin female plug from the controller harness. Refer to Fig. 17 and wiring diagrams on pages 9 and 10.

30. Connect the 12-pin male plug from the controller harness to ECON on the UCB. Refer to Fig. 18 and wiring diagrams on pages 9 and 10.

R/A ductwork not shown.
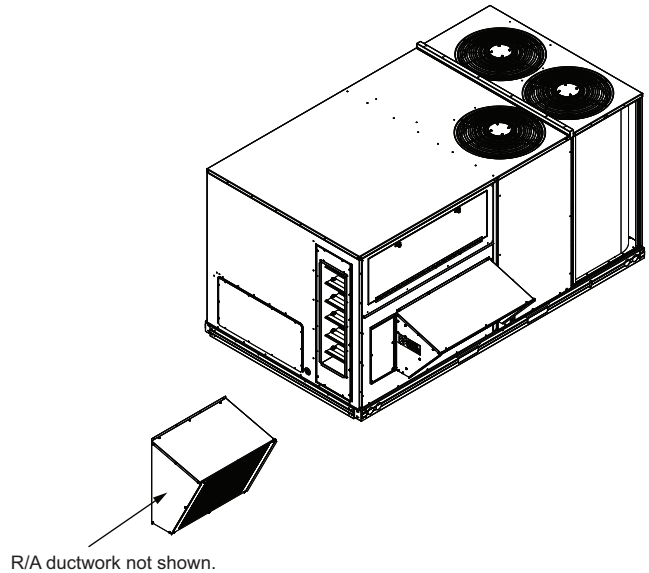
Fig. 13 — Attach Barometric Relief Damper Hood Assembly to Return Duct
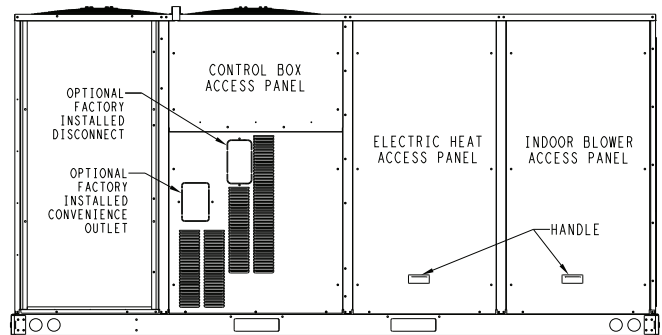
Fig. 14 — Typical Indoor Fan Motor Access Panel Locations

EconomizerONE
(POL 224) Controller
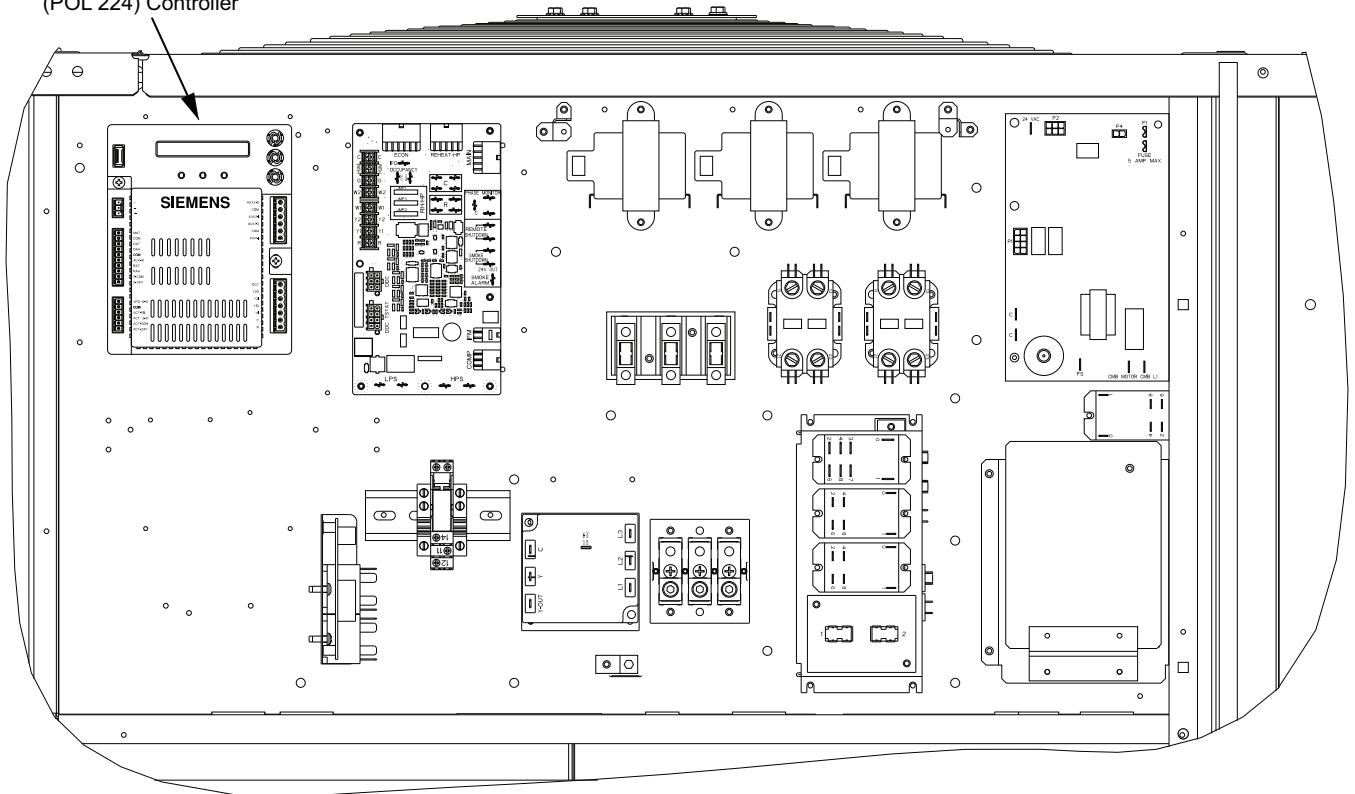
Fig. 15 — Mount Controller Assembly in Unit Control Box
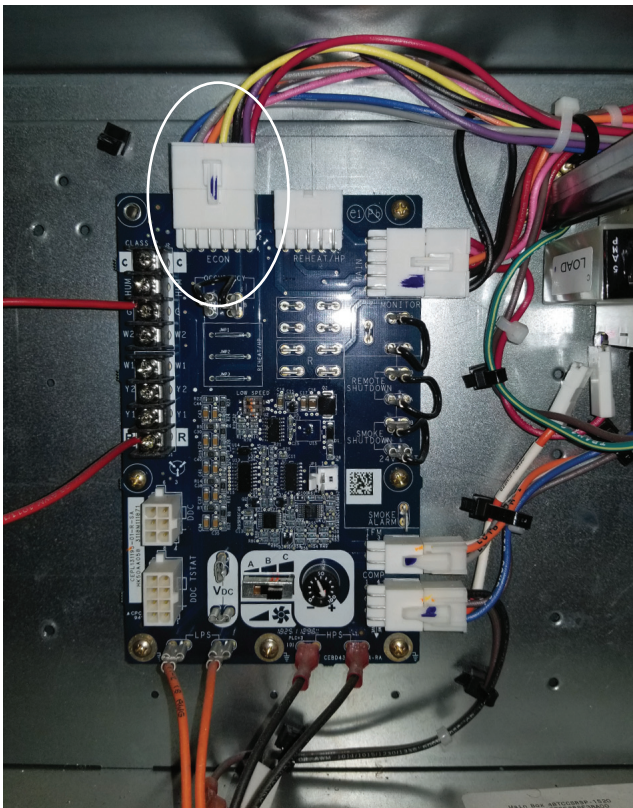
Fig. 16 — Unplug ECON plug from Unit Control Board
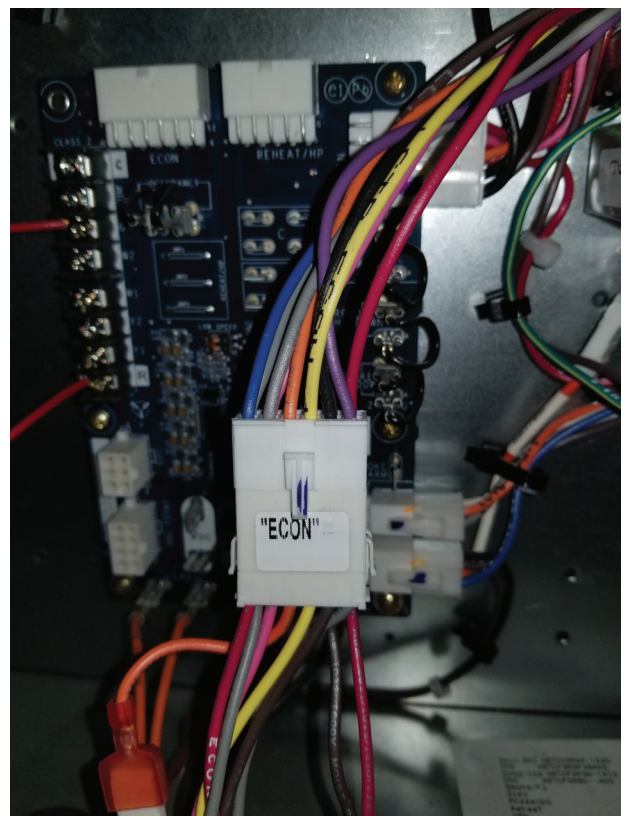
Fig. 17 — Connect 12-pin Plugs Together
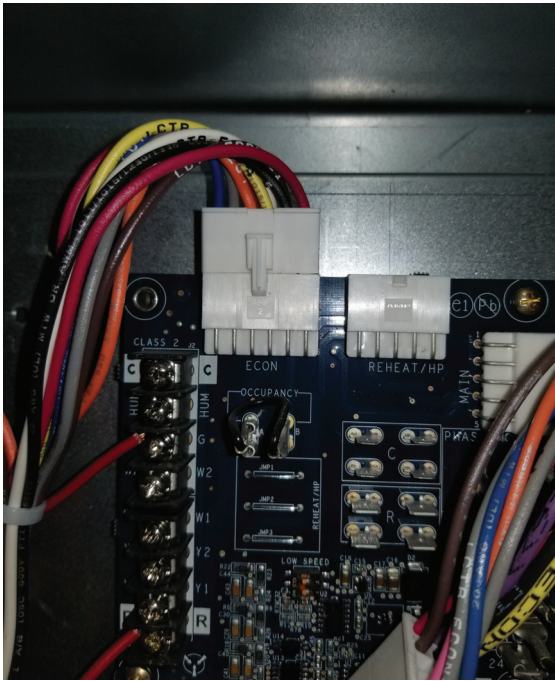
Fig. 18 — Connect 12-Pin Plug to Unit Control Board

31. Connect the brown wire from the controller harness to the UCB. Refer to economizer wiring diagrams on pages 9 and 10. The brown wire connects to "C", on the UCB.

32. Locate the 4 wires labeled (Supply Air Thermostat) SAT and (Outdoor Air Thermostat) OAT, connected to the controller harness.

33. Route the 4 wires through the divider between the control box and the indoor blower section. (See Fig. 19.)

34. The supply air temperature sensor may look like an eyelet terminal with wires running to it (HH79NZ039). The sensor is located on the "crimp end" and is sealed from moisture. Mount the supply air temperature sensor (provided) to the fan deck, near the right hand side corner post. Connect the sensor red and black wires to the orange and brown wires from the controller. (See Fig. 20 and 21.)

35. Connect the pink and violet wires routed from the controller harness to the pink and violet terminals in the wire bundle in the indoor blower section. (See Fig. 20 and 21.)

36. If using differential return sensor or (demand controlled ventilation) DCV sensor, then install this now. Refer to Table 7 for Sensor Usage and Table 6 for Enthalpy Manual Entry Setpoints details. Refer to page 19 for Damper settings. See installation details on page 19.

37. Re-install the Indoor blower access panel. (See Fig. 14.)

38. After powering unit controller, program the POL 224 controller. After all settings have been made, re-install the unit control box panel. (See Fig. 14.)

39. Install the filter by opening 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. 22.)

Economizer performance charts are shown in Fig. 23 and 24 on page 11. See base unit installation manual to make adjustments to meet building ventilation requirements.
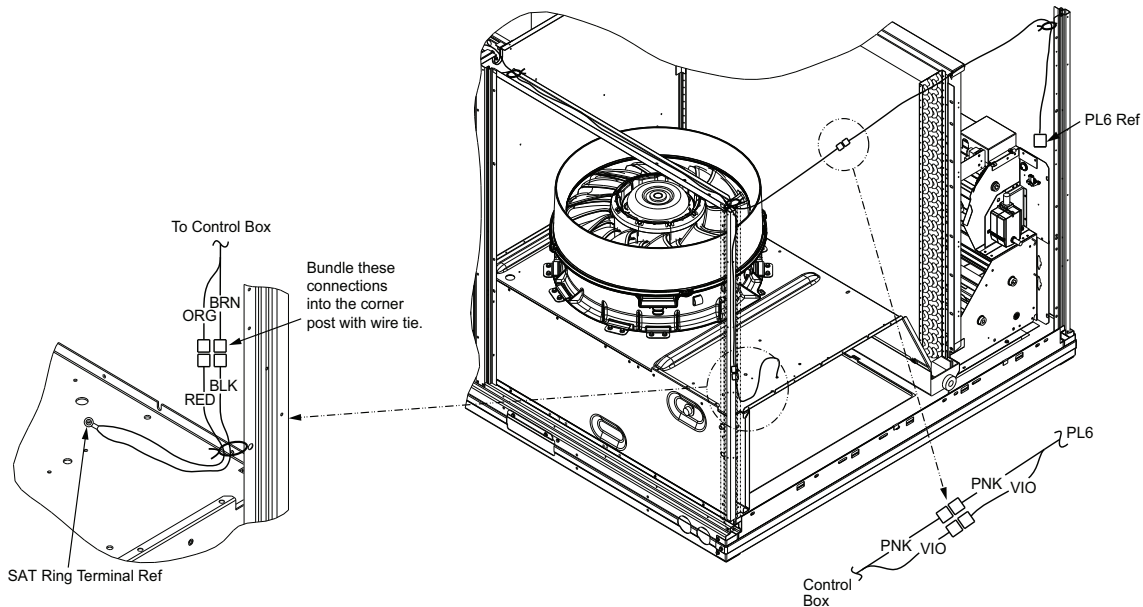
Fig. 19 — Supply Air Sensor Installation POL 224 (Vane Axial Fan System)
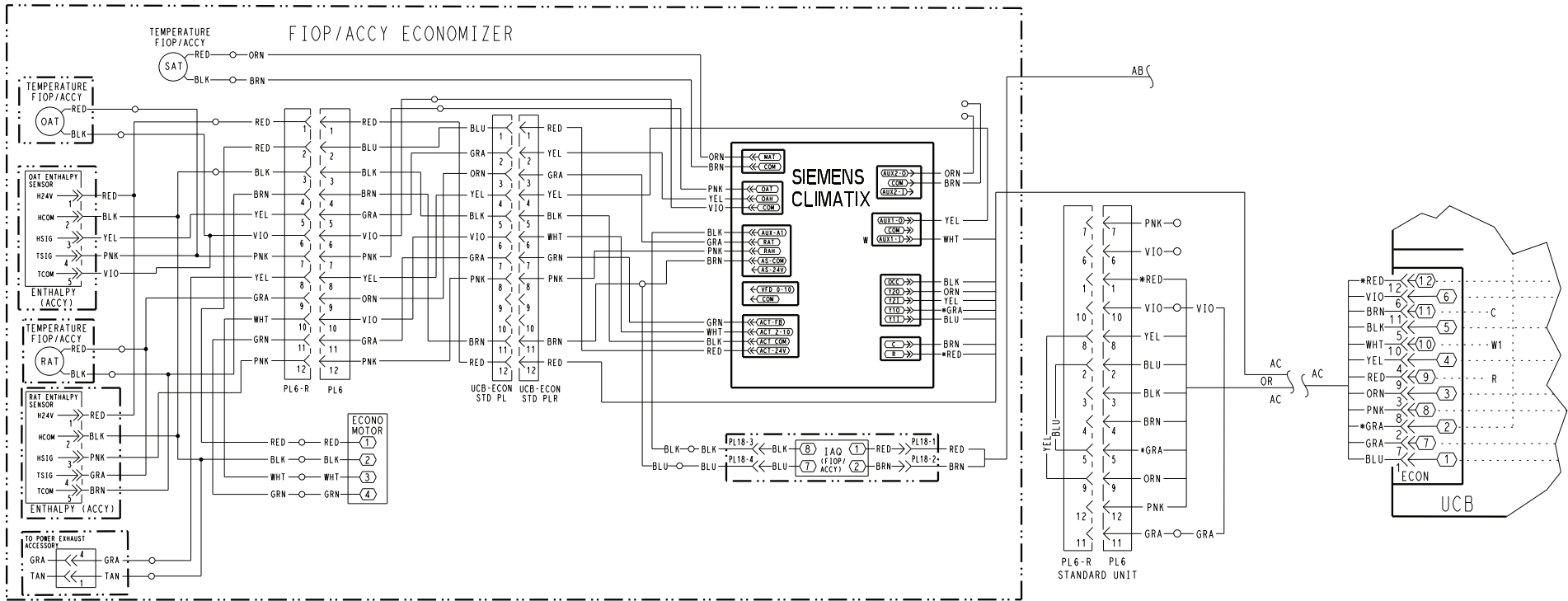
Fig. 20 — Economizer Wiring Diagram for CRECOMZR109A00, CRECOMZR110A00, and CRECOMZR111A00 Single Actuator Units
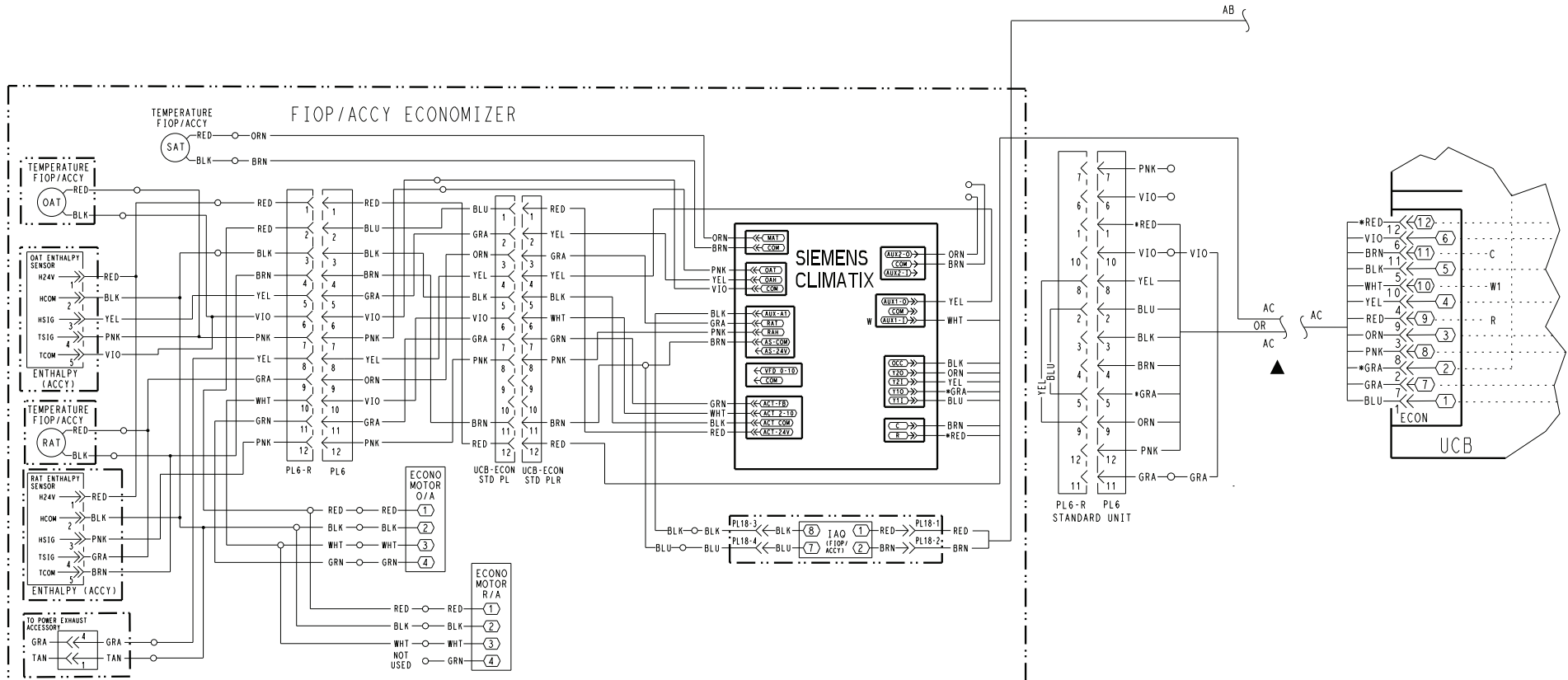
Fig. 21 — Economizer Wiring Diagram for CRECOMZR112A00 Ultra Low Leak Horizontal Dual Actuator Units Only

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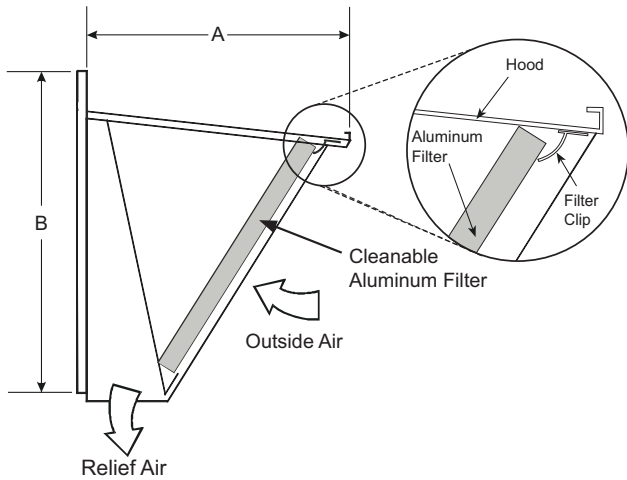
Fig. 22 — EconomizerONE Hood Detail
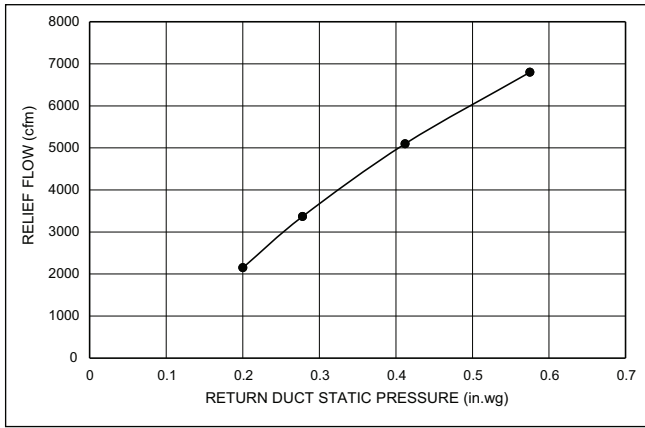
Fig. 23 — Barometric Relief Flow Capacity
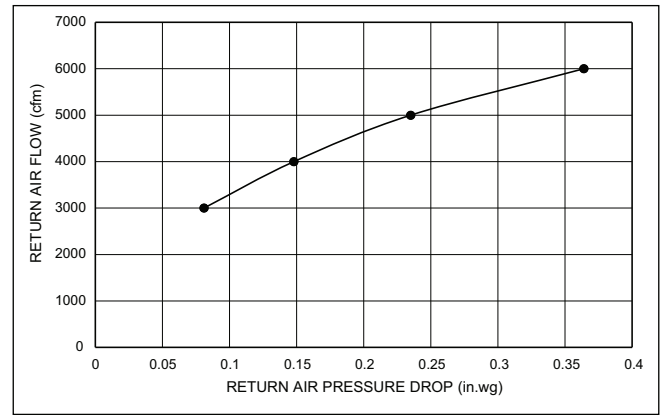
Fig. 24 — Return Air Pressure Drop

INSTALLING OPTIONAL HH57LW001 SINGLE OUTSIDE AIR ENTHALPY SENSOR

When using the HH57LW001 enthalpy sensor (see Fig. 28) for outside air changeover, the existing HH79NZ039 dry bulb sensor (see Fig. 27) must be removed. The enthalpy sensor will be mounted in the same location as the dry bulb sensor (see Fig. 1). When the enthalpy sensor's OA (Outside Air) temperature, enthalpy and dew point are below the respective setpoints, the outside air can be used for free-cooling. When any of these are above the setpoint, free-cooling will not be available. Enthalpy setpoints are configurable and create an enthalpy boundary according to the user's input. For additional details see Fig. 25-26 and Table 6.

Harness 48TC005213 is required to be connected between the EconomizerONE harness in the return air chamber. Harness 48TC005213 has a 5 pin plug that connects directly to the HH57LW001 enthalpy sensor. The CRENTSEN001A00 accessory kit includes enthalpy sensor (HH57LW001) and associated 5-pin plug (48TC005213) and may be ordered as a finished good.

Enthalpy Control Sensor Configuration

The optional enthalpy control sensor (Part No.: HH57LW001) communicates with the POL 224 economizer controller using the five-wire harness, 48TC005213. The HH57LW001 sensor can be used as a single outside air enthalpy, a differential return enthalpy, or a differential return temperature sensor. See Fig. 20 and 21 for wiring the HH57LW001 enthalpy sensor for each option. Use Fig. 28 and Table 8 on page 14 to locate the wiring terminals for each enthalpy control sensor.

U.S. and Canada I-Codes / ASHRAE Zones

■	Climate Zone 1	▨	Climate Zone 5 and Marine
■	Climate Zone 2	▣	Climate Zone 6
■	Climate Zone 3	▤	Climate Zone 7 and 8
▢	Climate Zone 4 (Except Marine)		
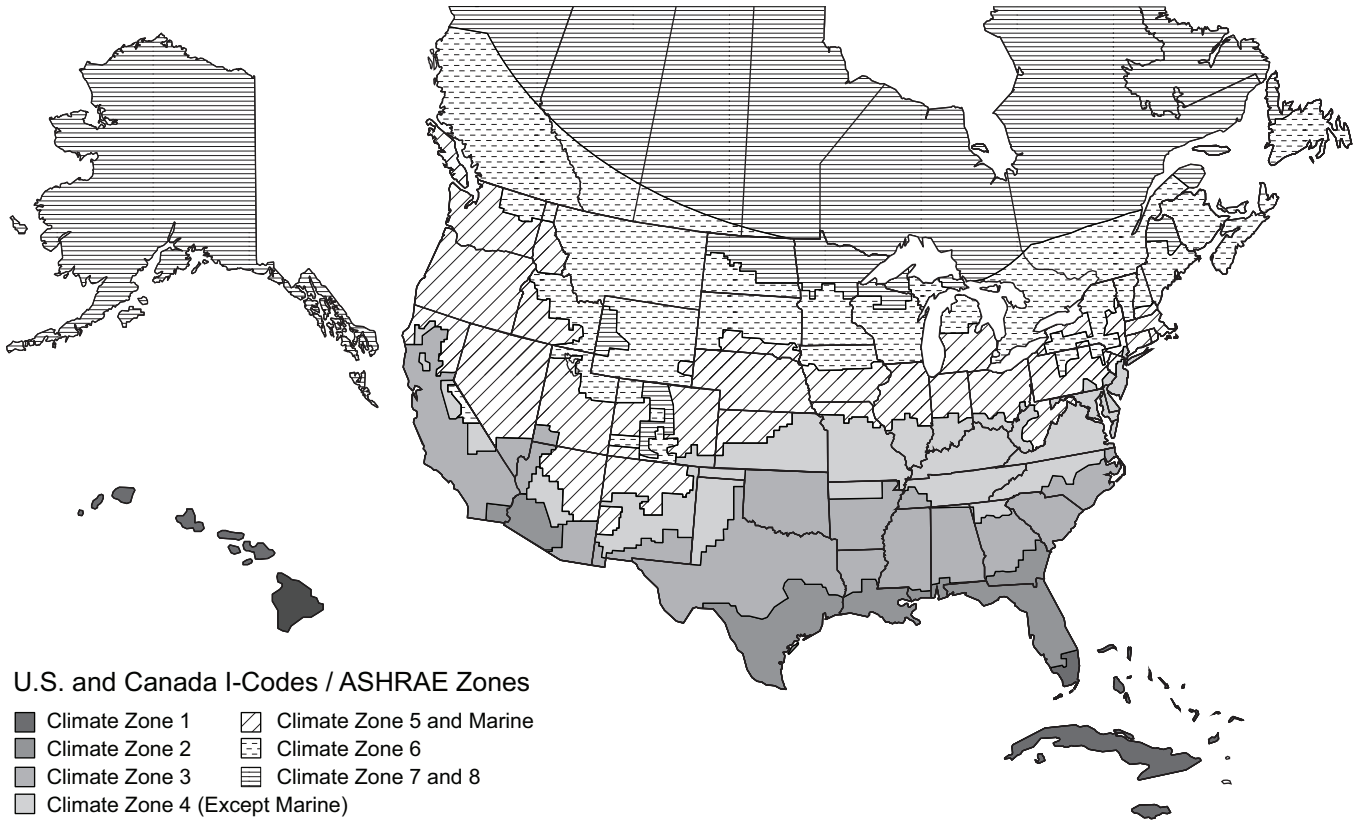
Fig. 25 — U.S. and Canada Climate Zones
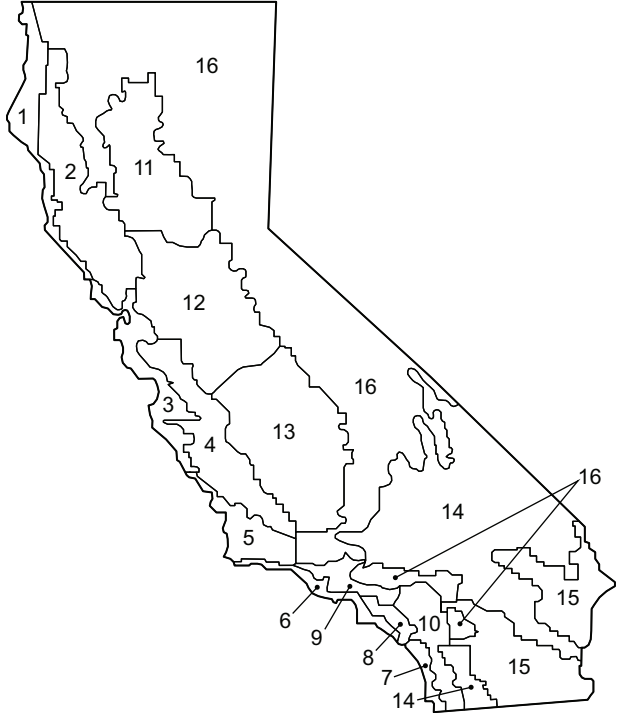
Fig. 26 — California Title 24 Zones

Table 6 — Enthalpy Manual Entry Setpoints for EconomizerONE Per Climate Zone

CLIMATE ZONES[a]	2 TEMP OFF	Lowest Setting	RH%	2 ENTH OFF	RH%	2THL	2EHL	RH%
1	65° F	22 Btu/lbm	43%	28 Btu/lbm	86%	83° F	33 Btu/lbm	48%
2	65° F	22 Btu/lbm	43%	28 Btu/lbm	86%	83° F	33 Btu/lbm	48%
3	65° F	22 Btu/lbm	43%	28 Btu/lbm	86%	83° F	33 Btu/lbm	48%
4	65° F	22 Btu/lbm	43%	28 Btu/lbm	86%	83° F	33 Btu/lbm	48%
5	70° F	22 Btu/lbm	28%	28 Btu/lbm	65%	83° F	33 Btu/lbm	48%
6	70° F	22 Btu/lbm	28%	28 Btu/lbm	65%	83° F	33 Btu/lbm	48%
7 & 8	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
CALIFORNIA TITLE 24 ZONES[b]	**2 TEMP OFF**	**Lowest Setting**	**RH%**	**2 ENTH OFF**	**RH%**	**2THL**	**2EHL**	**RH%**
1	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
2	73° F	22 Btu/lbm	22%	28 Btu/lbm	55%	83° F	33 Btu/lbm	48%
3	75° F	22 Btu/lbm	19%	28 Btu/lbm	55%	83° F	33 Btu/lbm	48%
4	73° F	22 Btu/lbm	22%	28 Btu/lbm	55%	83° F	33 Btu/lbm	48%
5	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
6	71° F	22 Btu/lbm	28%	28 Btu/lbm	62%	83° F	33 Btu/lbm	48%
7	69° F	22 Btu/lbm	32%	28 Btu/lbm	68%	83° F	33 Btu/lbm	48%
8	71° F	22 Btu/lbm	28%	28 Btu/lbm	62%	83° F	33 Btu/lbm	48%
9	71° F	22 Btu/lbm	28%	28 Btu/lbm	62%	83° F	33 Btu/lbm	48%
10	73° F	22 Btu/lbm	22%	28 Btu/lbm	55%	83° F	33 Btu/lbm	48%
11	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
12	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
13	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
14	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
15	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
16	75° F	22 Btu/lbm	19%	28 Btu/lbm	50%	83° F	33 Btu/lbm	48%
Controller Default Settings	**2 TEMP OFF**	—	—	**2 ENTH OFF**	—	**2THL**	**2EHL**	**RH%**
Default Set Points	63° F	—	—	28 Btu/lbm	94%	83° F	33 Btu/lbm	48%

NOTE(S):

a. See Fig. 25 for map of U.S. and Canada climate zones.
b. See Fig. 26 for map of California Title 24 zones

Economizers are shipped standard with an HH79NZ039 outside air dry bulb sensor (see Fig. 27). System default setting (high temp limit) is 63°F (17°C), and has a range of 48°F to 80°F (9°C to 27°C). Sensor is factory installed on economizer.

NOTE: A second HH79NZ039 sensor is provided for mixed air temperature.

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

ENTHALPY SETTINGS (ENTHALPY OPTION)

If installing the optional HH57LW001 enthalpy sensor, the HH79NZ039 dry bulb outside air sensor must first be removed. Wire sensor to harness 48TC005213 and the (5) wires from the harness to the EconomizerONE harness in the return air chamber. Harness 48TC005213 has a 5 pin plug that connects directly to the HH57LW001 enthalpy sensor. See Fig. 20 and 21 for wiring connections. Refer to Fig. 28 and Table 8.

California's Title 24 High Temperature Limit Settings

California's Title 24 code requires a high temperature limit setting for all dry bulb outside air economizer changeover. The temperatures vary by the region within California. See Table 7 for high limit settings.

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

DEVICE TYPE[b]	CLIMATE ZONES	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN): DESCRIPTION
FIXED DRY BULB	1, 3, 5, 11-16	OAT exceeds 75°F
	2, 4, 10	OAT exceeds 73°F
	6, 8, 9	OAT exceeds 71°F
	7	OAT exceeds 69°F
DIFFERENTIAL DRY BULB	1, 3, 5, 11-16	OAT exceeds RA temperature
	2, 4, 10	OAT exceeds return air temperature −2°F
	6, 8, 9	OAT exceeds return air temperature −4°F
	7	OAT exceeds return air temperature −6°F
FIXED ENTHALPY[c] + FIXED DRY BULB	All	OAT exceeds 28 Btu/lb of dry air[b] or OAT exceeds 75°F

NOTE(S):

a. This table sourced from 2019 California Energy Code, Title 24, Part 6, Table 140.4-E Air Economizer High Limit Shut Off Control Requirements.
b. Only the high limit control devices listed are allowed to be used and at the set points listed. Others such as Dew Point, Fixed Enthalpy, Electronic Enthalpy, and Differential Enthalpy Controls, may not be used in any climate zone for compliance with Section 140.4(e)1 unless approval for use is provided by the Energy Commission Executive Director.
c. At altitudes substantially different than sea level, the Fixed Enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at approximately 6,000 foot elevation, the fixed enthalpy limit is approximately 30.7 Btu/lb

LEGEND

OAT — Outdoor-air Thermostat

RA — Return Air
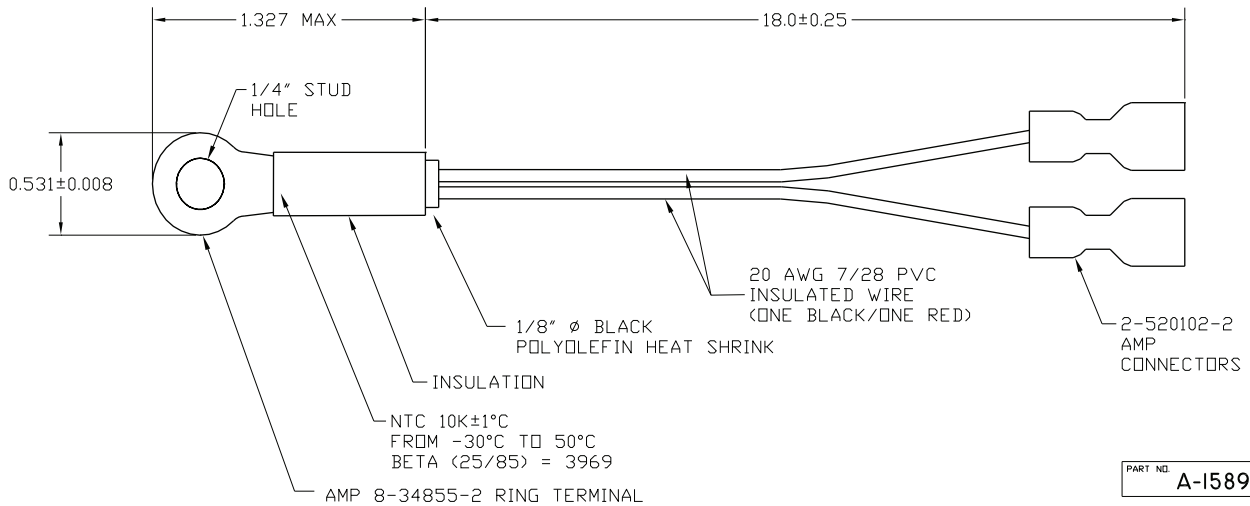
Fig. 27 — HH79NZ039 Dry Bulb and Mixed Air Sensor Wiring
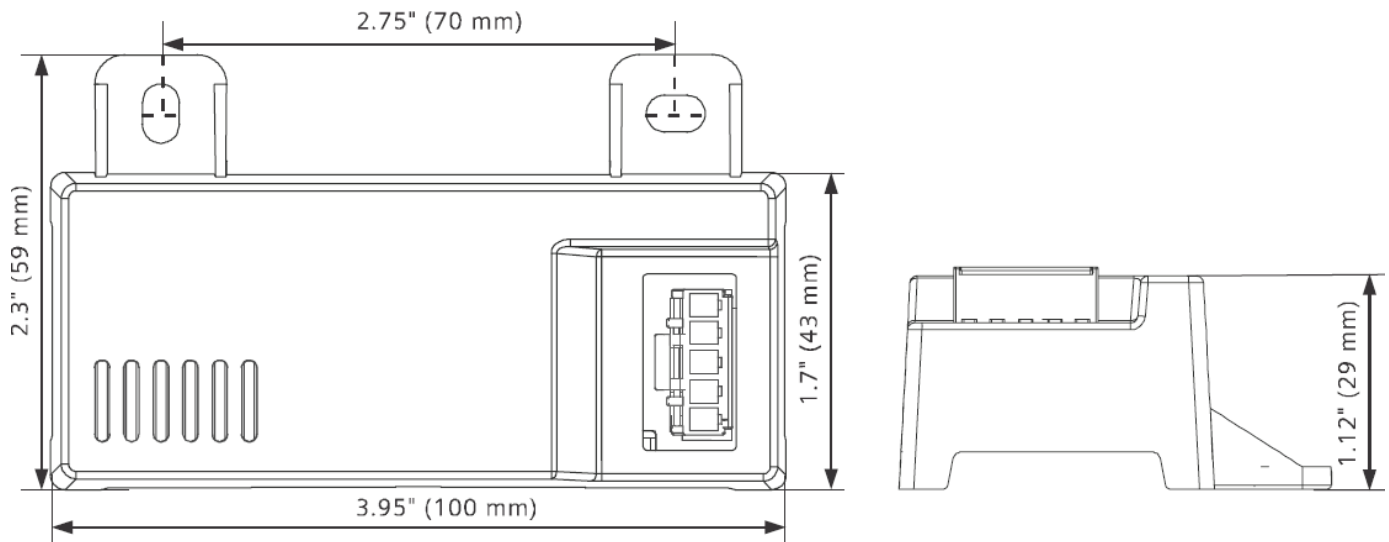
Dimensions in inch (mm)

Fig. 28 — HH57LW001 Dimensional, Connection and Switching information

Table 8 — HH57LW001 Sensor Wiring Terminations

TERMINAL		TYPE	DESCRIPTION
NUMBER	LABEL		
1	TCOM	NTC 10k	Outside Air Temperature Sensor Output
2	TSIG	NTC 10k	Outside Air Temperature Sensor Output
3	HSIG	0-10 vdc	Outside Air Relative Humidity Sensor Output
4	HCOM	COMMON	Sensor 24-v Common Input
5	H24V	24 vac	Sensor 24-v Operating Voltage Input

ECONOMIZER SETTINGS

Interface Overview

ECONOMIZERONE

The field-installed accessory consists of the following:

- Low Leak Economizer Assembly
- HH79NZ039 OA Dry Bulb Sensor
- HH79NZ039 Mixed Air Sensor
- POL 224 Controller
- 48TC005897 Harness

POL 224 ECONOMIZER MODULE WIRING

The economizer controller used on electromechanical units is a Siemens POL 224 which is to be located the RTU base unit's control box. See Fig. 29 for button description of the POL 224 controller. See the Installation Instruction for the base unit location of the control box access panel. Refer to Fig. 14.

The POL 224 controller provides the following:

1. One-line LCD — After a period of inactivity, the controller displays the default HMI screen (free cooling status, 1FREE-COOL YES or 1FREE COOL NO). See Fig. 29-33.

2. Operation button (Up button) — Move to the previous value, step, or category.

3. Operation button (Down Button) — Move to the next value, step, or category.

4. Operation Button (Enter Button):

    a. Press Enter to edit the current value or option.
    b. Press Enter to confirm a newly selected value or option.
    c. Press Enter + Up to jump up one entire category.
    d. Press Enter + Down to jump down one entire category.

User Interface and Keypad

The controller user interface consists of an LCD display and a 3-button keypad for input. The LCD is a 16 character by 1-line dot matrix display. The keypad is used to navigate and change the desired menu items on the display. See Fig. 29.

The Climatix™[1] mobile application allows for installation, commissioning, and servicing. Scanning a QR code on the controller allows users to download the Climatix™ mobile application on Android™[1] or Apple iOS®[1], but a Wi-Fi/WLAN stick is needed. See Fig. 29 and 30. Plug Wi-Fi/WLAN stick into controller USB port for temporary connection for mobile application setup. Each Wi-Fi/WLAN stick can be used for multiple units.

Menu Structure

Menus are displayed in the economizer controller via categories. There are eight first-level menus, each of which is represented by a number at the beginning of the line on the LCD. Pressing Enter + Up or Down can toggle between different first-level menus. Submenus follow the numbered first-level menus closely. Pressing Up or Down can toggle between different submenus.

At the end of the line, the LCD displays the value of the current submenu (if any). If the value is editable, then pressing Enter will put terminal in the Edit mode. The value is then highlighted for change. After making a change by pressing Up or Down, press Enter to confirm the change and exit the Edit mode. See Fig. 32.

Powering The Economizer Controller

The POL 224 controller power connections are made through the economizer harness (P/N 48TC005879). Connections from the harness are made to the C (24 vac common) and R (24 vac power) terminals of the economizer controller. See Fig. 31.

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1. Third-party trademarks and logos are the property of their respective owners.

LED Indication

NOTE: If different faulty events occur at the same time, then sensor/DAC LED lights up following the priority below: Red → Yellow →Off. For example, if there is a humidity sensor error and air temperature failure at the same time, then the sensor LED turns red rather than yellow. See Fig. 33 and Table 9.

> IMPORTANT: After the economizer controller enters the running state, it may take one minute for peripheral devices to complete initialization. Before that, LED indication might be unstable.
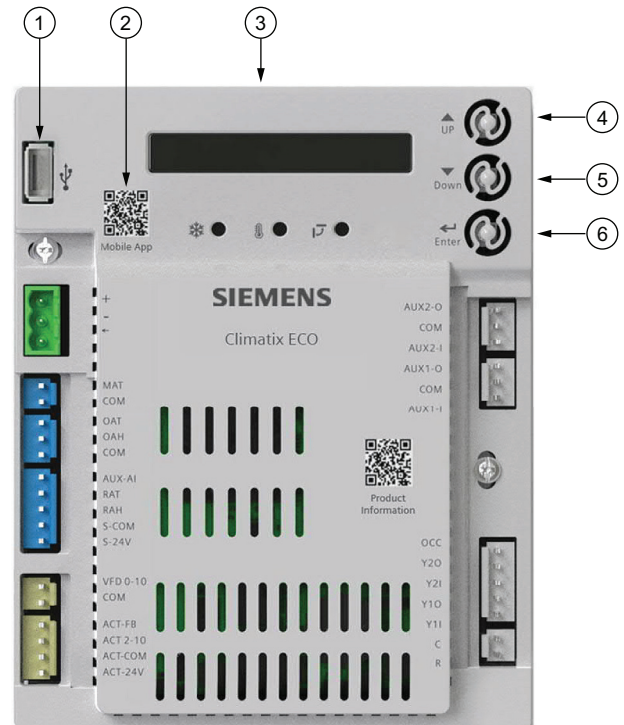
NOTE: QR codes in this image are for reference only.

NO	DESCRIPTION
1	USB port for Wi-Fi/WLAN stick
2	QR code to download Climatix™ mobile application
3	One-line LCD. After a period of inactivity, the controller displays the default HMI screen (free cooling status, 1FREECOOL YES or 1FREECOOL NO)
4	Operation button (Up button) — Move to the previous value, step, or category
5	Operation button (Down button) — Move to the next value, step, or category
6	Operation button (Enter button): • Press to edit the current value or option. • Press to confirm a newly selected value or option. • Press Enter + Up to jump up one entire category. • Press Enter + Down to jump down one entire category.

Fig. 29 — POL 224 Controller

NOTE: QR codes in this image are for reference only.

Fig. 30 — Wi-Fi/WLAN Stick
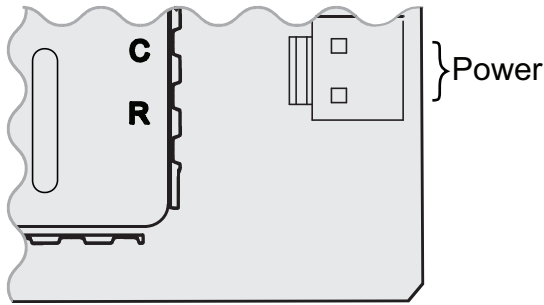
Fig. 31 — Powering the Economizer Controller
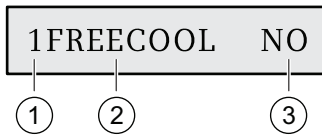
No.	Description
1	Number representing the first-level menu of **Status Display**. Different numbers represent different menus:
	1: Status Display
	2: Basic Settings
	3: Advanced Settings
	4: Alarms
	5: Enter Configuration State and Reset
	6: I/O Config
	7: Testing
	8: Enter Running State
2	Submenu*
3	Value of the current submenu*

*See Setup and Configuration for detailed submenus together with possible values or ranges.

Fig. 32 — Menu Structure Descriptions
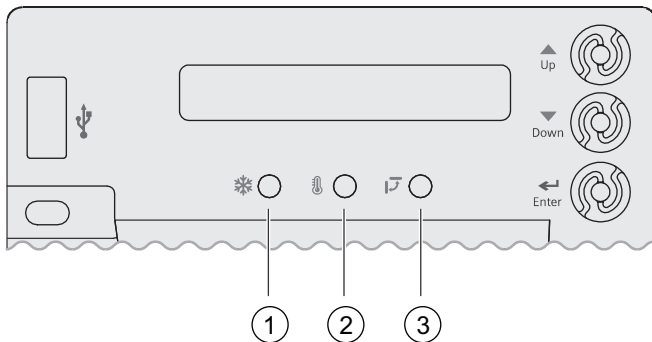
NO.	DESCRIPTION
1	Free Cooling LED
2	Sensor LED
3	DAC LED

Fig. 33 — LED Indication

Table 9 — LED Indication

STATUS	FREE COOLING LED	SENSOR LED	DAC LED
Commissioning mode	Yellow Blinking	Yellow Blinking	Yellow Blinking
Power start up	Yellow On	Yellow On	Yellow On
Free cooling is running	Green On	—	—
Free cooling is available but not running	Green Blinking	—	—
Not economizing when it should	Red Blinking	—	—
Economizing when it should not	Red On	—	—
Sensor working okay	—	Green On	—
Humidity sensor error	—	Yellow On	—
CO_2 sensor error	—	LED Off	—
Air temperature fault/failure	—	Red On	—
Excess outdoor air	—	Red Blinking	—
Damper working okay	—	—	Green On
Damper not modulating	—	—	Red On
Damper slippage	—	—	Red Blinking
Damper unplugged	—	—	Fast Red Blinking
Terminal ACT-FB is configured but no available feedback signal	—	—	LED Off

Functions

FREE COOLING ECONOMIZING

Free cooling uses unconditioned outside air to cool the space directly. The economizer controller enables or disables free cooling after it judges which control mode is active. It also uses hysteresis to ensure a smooth switchover.

Depending on the sensors that are used, there are four different control modes. In different control modes, the assessed conditions are different. See Table 10.

DEFAULT HYSTERESIS SETTING

Hysteresis setting (DB) defaults to 2°F. Refer to Fig. 34.
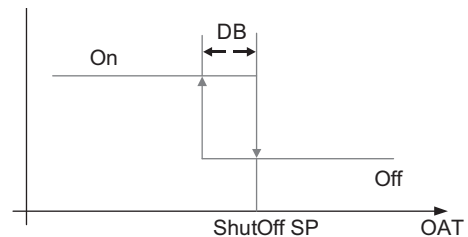
LEGEND
OAT — Outside Air Temperature
DB — Deadband
SP — Set Point

Fig. 34 — Hysteresis Settings

DAMPER MODULATION DURING FREE COOLING

Once outside air is suitable for free cooling, the controller modulates the damper based on MAT (mixed air temperature, default) or OAT (outside air temperature). Refer to Table 10.

If MAT is used when free cooling is enabled, then MAT setpoint (**3MAT SET**, configurable in "Parameter Settings — Advanced" on page 28) is used for MAT modulating. When MAT falls below the anti-freeze setpoint (**3FRZ PROT**), the damper either fully closes or opens to the minimum position (configurable in "Parameter Settings — Advanced" on page 28.

- If MAT is lower than MAT setpoint, then the damper is modulated to maintain MAT setpoint, towards fully closes or opens to the minimum position based on occupancy status if MAT continues dropping.
- If MAT is in the range [MAT setpoint, (MAT setpoint + neutral zone band (1°F by default))], then the damper position does not change.
- If MAT is higher than (MAT setpoint + neutral zone band), then the damper opens towards fully open.
- If MAT is 10°F higher than MAT setpoint, then the damper fully opens to 100%.

If OAT is used when there is a cooling demand, then the damper can be opened to different positions depending on different outside air temperatures:

- If outside air is higher than 50°F but lower than the temperature shutoff setpoint, then the damper is fully open.
- If outside air is higher than OAT lockout setpoint but lower than 50°F, then linear modulation is applied when only Cooling Stage 1 input (Y1I) is ON. Result of the following formula indicates the damper's open position:

  ((OAT – OAT Lockout Setpoint) / (50 – OAT Lockout Setpoint)) * (80% – MIN POS) + MIN POS

NOTE: When both free cooling and mechanical cooling are on, damper remains fully open regardless of the modulating logic.

LOCATION-BASED SHUTOFF SETPOINTS

The economizer controller can get location-based temperature and enthalpy shutoff setpoints automatically if it is connected to the Climatix™ mobile application. Once a Wi-Fi/WLAN stick is plugged in, the economizer controller can establish network connection with the mobile application. The temperature and enthalpy shutoff setpoints obtained via the phone or tablet's GPS functionality can then be synchronized to the economizer controller.

COOLING STAGE OPERATION

The economizer controller accepts inputs for 1, 2 and 3-stage cooling inputs, and reroutes to the RTU through the relay connection Y1, Y2 and AUX1/AUX2.

The operation of the cooling stages is determined by the availability of Free Cooling provided by the economizer operation mode. See Cooling Stage I/O Logic Tables 11-12. Based on the use of Free Cooling, the operating modes are as follows:

- Y1 is Stage 1 Cooling Demand.
- Y2 is Stage 2 Cooling Demand.
- Y3 is Stage 3 Cooling Demand.
- Free Cooling is always the first cooling stage.
- Cooling Stage 1 call from the Commercial Thermostat (Y1) energizes the Y1 input to the economizer controller.
- Cooling Stage 2 call from the Commercial Thermostat (Y2) energizes the Y2 input to the economizer controller.
- Cooling Stage 3 call from the Commercial Thermostat energizes the AUX1/AUX2 input to the economizer controller.

Table 10 — Free Cooling Functions

CONTROL MODE	SENSORS USED	ENABLE FREE COOLING?
Control Mode 1 • Fixed Dry bulb	OA (outside air) temperature sensor and MA (Mixed Air) temperature sensor	The outside air dry bulb temperature is compared with the set temperature shutoff setpoint. If the outside air dry bulb temperature is below the temperature shutoff setpoint, then the outside air is used to meet all or part of the cooling demand.
Control Mode 2 • Differential Dry bulb (Dual Dry bulbs)	OA temperature sensor, RA (Return Air) temperature sensor and MA temperature sensor	The outside-air dry bulb temperature is compared with the return air dry bulb temperature. If both OAT and RAT are higher than the temperature high limitation, then free cooling is prohibited. If OAT or RAT is lower than the temperature high limitation and the outside air dry bulb temperature is lower than the return air dry-bulb temperature, then the outside air is used to meet all or part of the cooling demand.
Control Mode 3 • Combination Fixed Enthalpy and Fixed Dry bulb Control	OA temperature and humidity sensor, and MA temperature sensor	The outside air dry bulb temperature and enthalpy are compared with the set temperature and enthalpy shutoff setpoints. If the outside air enthalpy is lower than the set enthalpy shutoff setpoint, and the outside air dry bulb temperature is lower than the temperature shutoff setpoint, then the outside air can be used for economizing.
Control Mode 4 • Combination of Differential Enthalpy and Fixed Dry bulb	OA temperature and humidity sensor, RA temperature and humidity sensor, and MA temperature sensor	The outside air dry bulb temperature and enthalpy are compared with the temperature shutoff setpoint and return air enthalpy. If both OA enthalpy and RA enthalpy are higher than the enthalpy high limitation, then free cooling is prohibited. If OA enthalpy or RA enthalpy is lower than the enthalpy high limitation, outside air enthalpy is lower than the return-air enthalpy, and the outside air dry bulb temperature is lower than the set temperature shutoff setpoint, then outside air can be used for economizing.

Table 11 — 1 and 2-Stage Cooling Stage I/O Logic

ECONOMIZER CONDITION MET	Y1	Y2	COOLING STAGE 1	COOLING STAGE 2
NO	On	On	On	On
NO	On	Off	On	Off
NO	Off	Off	Off	Off
YES	On	On	On	On/Off[a]
YES	On	Off	Off	Off
YES	Off	Off	Off	Off

NOTE(S):

a. If OAT ≤ MAT setpoint (3MAT SET), then Relay 2 is always **OFF** to disable Cooling Stage 2. Otherwise, if both stages of cooling (Y1 and Y2) are **ON** for more than a set time (15 minutes by default), Y2 remains ON, and the OAT is higher than MAT setpoint, then Relay 2 energizes to allow Y2 pass-through to enable Cooling Stage 2. To change the set time, configure **3STG3 DLY** as desired. See Advanced Settings page 28 for more details of **3STG3 DLY**.

Table 12 — 2 and 3-Stage Cooling Stage I/O Logic

ECONOMIZER CONDITION MET	Y1	Y2	Y3	COOLING STAGE 1	COOLING STAGE 2	COOLING STAGE 3
NO	On	On	On	On	On	On
NO	On	On	Off	On	On	Off
NO	On	Off	Off	On	Off	Off
NO	Off	Off	Off	Off	Off	Off
YES	On	On	On	On	On	On/Off[a]
YES	On	On	Off	On	On/Off	Off
YES	On	Off	Off	Off	Off	Off
YES	Off	Off	Off	Off	Off	Off

NOTE(S):

a. If OAT ≤ MAT setpoint, then Relay 3 is always OFF to disable Cooling Stage 3. Otherwise, if all cooling stages (Y1, Y2 and Y3) are ON for more than a set time (15 minutes by default), Y3 remains ON, and the OAT is higher than MAT setpoint, then Relay 3 energizes to allow AUX1/AUX2 pass-through to enable Cooling Stage 3. To change the set time, configure 3STG3 DLY as desired. See Advanced Settings page 28 for more details of 3STG3 DLY.

IMPORTANT: The economizer controller can tolerate thermostat wiring mismatch, e.g. Thermostat Y1 → Economizer Y2-In, Thermostat Y2 → Economizer Y1-In. The handling logic is Stage =Y1I + Y2I + Y3I. For example, Y1O =1 if Stage > =1, Y2O =1 if Stage > = 2, Y3O=1 if Stage=3.

MULTI-SPEED FAN SUPPORT

The economizer controller supports connection to 2 and 3-speed fans. When the unit is equipped with a multi-speed fan, the damper responds to multiple fan speeds via multiple minimum positions **(MIN POS)** to keep minimum airflow. Refer to Tables 13-15.

Table 13 — Damper MIN POS for 2-Speed Fan[a]

Y1	Y2	W1 or O/B	Spd L	Spd H	Pos L	Pos H
X	—	—	X	—	X	—
X	X	—	—	X	—	X
—	—	X	—	X	—	X

NOTE(S):

a. A multi-speed fan is not controlled by the economizer controller, but an external logic board.

LEGEND

Pos L — Damper MIN POS for Low-Speed Fan
Pos H — Damper MIN POS for High-Speed Fan
Spd L — Low Speed (Fan)
Spd H — High Speed (Fan)

Table 14 — Different Fan Speeds with Different Configured Outputs[a]

FAN TYPE	1-SPEED COOLING[b]	2-STAGE COOLING[b]	3-STAGE COOLING[b]
1-SPEED FAN[c]	• Spd H) (regardless of cooling demand, OCC=Yes)	• Spd H) (regardless of cooling demand, OCC=Yes)	• Spd H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN[c]	• Spd L (0 or 1 cooling demand) • Spd H (2 cooling demands)	• Spd L (0 or 1 cooling demand) • Spd H3) (2 cooling demands)	• Spd L (0 or 1 cooling demand) • Spd H (2 or 3 cooling demands)

NOTE(S):

a. If a single-speed fan connects to the Controller, then it opens directly on the call of cooling/heating. The damper position is Pos H.
b. Configured by Y1O, Y2O, or Y3O.
c. Configured by 6FAN.

LEGEND

Spd L — Low Speed (Fan)
Spd H — High Speed (Fan)

Table 15 — Different Damper Minimum Positions with Different Configured Outputs

FAN TYPE	1-SPEED COOLING[a]	2-STAGE COOLING[b]	3-STAGE COOLING[b]
1-SPEED FAN[b]	• Pos H (regardless of cooling demand, OCC=Yes)	• Pos H (regardless of cooling demand, OCC=Yes)	• Pos H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN[b]	• Pos H (regardless of cooling demand, OCC=Yes)	• Pos L (0 or 1 cooling demand) • Pos H (2 cooling demands)	• Pos L (0 or 1 cooling demand) • Pos H (2 or 3 cooling demands)

NOTE(S):

a. Configured by Y1O, Y2O, or Y3O.
b. Configured by 6FAN.

LEGEND

Pos L — Damper MIN POS for Low-Speed Fan
Pos H — Damper MIN POS for High-Speed Fan

If DCV (demand controlled ventilation) is enabled, then each fan speed corresponds to two damper position ventilation setpoints (VENT MIN, VENT MAX), e.g., Pos L corresponds to 2VENTMIN L... 2VENTMAX L. Refer to Table 16.

If CO_2 sensor is connected but DCV is disabled, then each fan speed corresponds to one minimum damper position ventilation setpoint. Refer to Table 17.

Table 16 — Different Damper Position Setting with Different Configured Outputs (DCV is Enabled)

FAN TYPE	1-STAGE COOLING[a]	2-STAGE COOLING[a]	3-STAGE COOLING[a]
1-SPEED FAN[b]	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand OCC=Yes)
2-SPEED FAN[b]	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN L to 2VENTMAXL (0 or 1 cooling demand) • 2VENTMIN H to 2VENTMAX H (2 cooling demands)	• 2VENTMIN L to 2VENTMAX L (0 or 1 cooling demand) • 2VENTMIN H to 2VENTMAX H (2 or 3 cooling demands)

NOTE(S):

a. Configured by Y1O, Y2O, or Y3O.
b. Configured by 6FAN.

**Table 17 — Different Damper Position Setting with Different Configured Outputs
(DCV is Disabled, CO_2 sensor is connected)**

FAN TYPE	1-STAGE COOLING[a]	2-STAGE COOLING[a]	3-STAGE COOLING[a]
1-SPEED FAN[b]	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN[b]	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN L (0 or 1 cooling demand) • 2VENTMIN H (2 cooling demands)	• 2VENTMIN L (0 or 1 cooling demand) • 2VENTMIN H (2 or 3 cooling demands)

NOTE(S):

a. Configured by Y1O, Y2O, or Y3O.
b. Configured by 6FAN.

COOLING DELAY VIA INCREASING FAN SPEED

If there is cooling demand while outside air is suitable for economizing, then the economizer controller tries to increase fan speed to maximize the use of outside air first. If the cooling demand is not reached within a set time, then mechanical cooling will be enabled.

Typical field application:

1. Prerequisites:
- Outside air is suitable for economizing and free cooling is ON.
- Fan connected to the controller supports multiple speeds. Cooling delay function does not work if only a one-speed fan is connected to the controller.

2. If it is a 2-speed fan and there are two cooling demand inputs/outputs, then Y1-Input is called, and the controller sets fan speed to Speed Low. Damper is fully open (100%).

   a. If Y2-Input is also called, then the controller increases fan speed to Speed High and starts fan delay (2FAN DLY) time. After the delay time runs out, the controller starts Y1-Output.

   b. If the cooling demand is not reached within 3STG3 DLY time and OAT is higher than MAT setpoint (3MAT SET), then the controller starts Y2-Output.

DEMAND CONTROLLED VENTILATION (DVC)

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

The controller modulates the outside air damper based on the CO_2 level through the ppm value selected between the range of 500 and 2000 ppm. The measured CO_2 concentration value is compared with the set DCV setpoint. If the measured CO_2 concentration value is below the DCV setpoint, then keep the damper to the minimum position. Otherwise, enable DCV. Once DCV is enabled, the DCV PID starts to run to control the indoor CO_2 concentration value towards the DCV setpoint. The damper opens to the maximum position.

NOTE: DCV is disabled if the controller receives no occupancy signal.

DCV operation is available in Occupied and Unoccupied periods with EconomizerONE system. However, a control modification will be required on the unit system to implement the Unoccupied period function. Refer to Appendix B, Tables A-B "Fixed Dry-Bulb without DCV (CO2 Sensor) — 2-Speed Fan" on page 32 and "Fixed Dry-Bulb with DCV (CO2 Sensor) — 2-Speed Fan In Conventional Mode" on page 33 for controls and command operation.

HIGH HUMIDITY LIMITATION

The economizer controller applies high limit of humidity to enthalpy-based economizing. When the OA dew point is below the dew point setpoint, enthalpy-based economizing is available. Otherwise, enthalpy-based economizing is unavailable.

ANTI-FREEZE PROTECTION

The economizer controller initiates the anti-freeze protection if MAT or OAT temperature falls below the anti-freeze setpoint.

MAT-BASED ANTI-FREEZE PROTECTION

1. If MAT temperature falls below the anti-freeze setpoint (3FRZ PROT), then:
- The controller closes both damper and compressor if unit type is conventional unit and cooling/heating conventional operation mode is enabled.
- The controller closes the damper if unit type is heat pump and heat pump operation mode is enabled.

2. If the MAT sensor fails, then MAT is substituted by OAT to continue the anti-freeze assessment. If OAT also fails, then the controller closes the damper immediately.

OAT-BASED ANTI-FREEZE PROTECTION

If OAT temperature falls below the OAT lockout setpoint (3OAT LOCK), then:
- The controller stops the compressor from running if unit type is conventional unit and cooling/heating conventional operation mode is enabled
- The controller compressor is bypassed if unit type is heat pump and heat pump operation mode is enabled.

EXHAUST FAN OPERATION

Up to two exhaust fans can be connected to the economizer controller.
- If Exhaust Fan 1 is connected and configured, then Exhaust Fan 1 parameter group (L, M and H) is available depending on fan configuration.
- If Exhaust Fan 2 is connected and configured, then Exhaust Fan 2 parameter group (L, M and H) is available depending on fan configuration.
- The controller energizes Exhaust Fan Relay 1 and Exhaust Fan Relay 2 if the damper position reaches Exhaust Fan 1 parameter setting and Exhaust Fan Relay 2 parameter setting respectively. The selection of L, M or H matches the current fan speed.

NOTE: If terminal ACT-FB is configured, then the damper position is the damper feedback position. If feedback signal is unavailable, then it is the simulated position.

OCCUPANCY INPUT

The economizer controller can receive an occupancy signal from the connected thermostat or work under Occupied mode all the time. This is configurable in the Thermostat setup from Climatix™ mobile application or under the menu of I/O Configuration on the inbuilt display. See "Parameter Settings — I/O Configurations" on page 28 for more information.

IMPORTANT: On the call of cooling when the controller is configured to receive signal from the thermostat but the thermostat is working under the Unoccupied mode, the damper is fully closed if outside air is not suitable for economizing. If outside air is suitable for economizing, then the damper is fully open.

PRE-OCCUPANCY PURGE

The Pre-Occupancy purge demand comes from the configuration of the Auxiliary features in Climatix™ mobile application or 6AUX2-I under the menu of I/O Configuration on the in-built display.

During pre-occupancy purge on the call of heating or when there is no cooling/heating demand, the damper position is MIN POS.

During pre-occupancy purge on the call of cooling, the damper position is MIN POS if outside air is not suitable for economizing. If outside air is suitable for economizing, then the damper is fully open.

AIRFLOW COMMISSIONING

Airflow measurement station (differential pressure signal) can connect to the controller temporarily to run airflow commissioning to calculate, calibrate, and store four fan speed characteristic curves automatically at damper positions 40%, 60%, 80% and 100%. The controller places the damper to a proper position to meet minimum or any other airflow requests in cfm. Users can enable this function only from the Climatix™ mobile application if the related function is available in the current mobile application version.

FAULT DETECTION AND DIAGNOSTICS

The economizer controller can detect and diagnose free cooling faults, sensor operation faults, and damper modulating faults. It can also report anti-freeze and shutdown notifications and actuator errors. Following is a list of all detectable or reportable information:
- Sensor disconnected or has no signal.
- Sensor short or high signal (under range or over range).
- Not economizing.
- Unexpected economizing.
- Excess outdoor air.
- Damper not modulating.
- Input power monitor and brownout. After detecting brownout, the economizer controller enters the brownout protection mode and disables all of the relay outputs.
- Anti-freeze notifications.
- Shutdown notifications.
- Actuator errors.
- Leaving air temperature is too low or too high.
- Cooling/heating error.
- Damper actuator cycle count. Parameter **1ACT CNT** indicates number of times actuator has cycled. It is resettable via HMI item **8ACT CNT RESET**.

IMPORTANT: The first six faults are detectable via LEDs or alarm reports on the LCD. See LED Indication on page 16 and Alarms on page 29 for fault indications. These faults can also be displayed in the Operating section of the Climatix™ mobile application.

FIRMWARE UPDATE

NOTE: Back up configurations before firmware update. All the previous configuration data are erased after firmware update.
NOTE: Contact Application Engineering for more information on support for firmware.

IMPORTANT: If the controller enters the configuration state for the convenience of I/O configurations, then users can manually switch to the running state after finishing configurations. To do so, press Enter + Up at the same time, and then press Enter to confirm the switch after 8RUN STATE appears on the LCD.

MOUNTING, INSTALLATION, AND WIRING

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

Mounting the Economizer Controller Base Module

Before mounting, leave specific mounting clearances so that there is space for mounting, wiring, and servicing. See Fig. 35 and Table 18 for economizer controller wiring details.

POL 224 can be mounted to sheet metal. Use two No. 6-3/4 in. self-tapping screws to mount POL 224. Order screws and spacers separately as they are not provided with the products.

See the installation instructions included with the controller for detailed clearance requirements and graphical mounting instructions.

Mounting Devices Connected to the Economizer Controller

Devices like damper actuators, sensors (temperature sensor, humidity sensor, combination temperature and humidity sensor, CO_2 sensor), thermostats and exhaust fans can be connected to the economizer controller. For information on how to mount the devices, see the device's installation instructions.
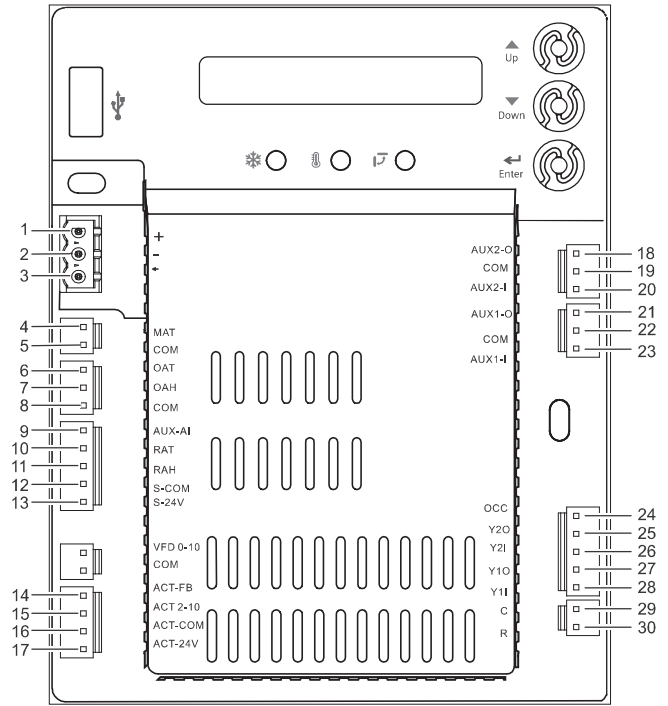
Fig. 35 — Economizer Control Wiring

Table 18 — Economizer Control Wiring Settings

NO.	LABEL	TYPE	DESCRIPTION
1	+	RS485 Modbus A	Line A
2	-	RS485 Modbus B	Line B
3	¬	GND_ISO	Earth Ground
4	MAT	Type II NTC 10K or 0-10 vdc	Mixed or Discharge Air Temperature Sensor
5	COM	COM	Mixed or Discharge Air Temperature Sensor Common
6	OAT	Type II NTC 10K or 0-10 vdc	Outside Air temperature Sensor
7	OAH	0-10 vdc or 4-20mA	Outside Air Relative Humidity Sensor
8	COM	COM	Outside Air Temperature Sensor or Outside Air Relative Humidity Sensor Common
9	AUX-AI	0-10 vdc, 2-10 vdc or 0-5 vdc	Air Quality Sensor or Pressure Sensor
10	RAT	Type II NTC 10K or 0-10 vdc	Return Air Temperature Sensor
11	RAH	0-10 vdc or 4-20mA	Return Air Relative Humidity Sensor
12	S-COM	COM	24 vac Common
13	S-24V	24 vac	24 vac Power out to sensors
14	ACT-FB	2-10 vdc	Damper Actuator Feedback
15	ACT2-10	2-10 vdc	Damper Actuator Output
16	ACT-COM	COM	Damper Actuator Output Common
17	ACT-24V	24 vac	24 vac Power out to Damper Actuator
18	AUX2-O	24 vac OUT	Configurable: • Cooling Stage 3 Output • Exhaust Fan (1 or 2) • System Alarm output (Title 24)
19	COM	COM	24 vac Common
20	AUX2-1	24 vac IN	Configurable: • Cooling Stage 3 Input • Shut Down • Heat Conventional (W1) • Heat Pump Changeover (reversing valve OB) • Preoccupancy
21	AUX1-O	24 vac OUT	Configurable: • Cooling Stage 3 Output • Exhaust Fan (1 or 2) • System Alarm output (Title 24)
22	COM	COM	24 vac Common
23	AUX1-I	24 vac IN	Configurable: • Cooling Stage 3 Input • Shut Down • Heat Conventional (W1) • Heat Pump Changeover (reversing valve OB) • Preoccupancy
24	OCC	24 vac IN	Occupancy input
25	Y2O	24 vac OUT	Cooling Stage 2 Output to Stage 2 mechanical cooling
26	Y2I	24 vac IN	Cooling Stage 2 input from commercial thermostat
27	Y1O	24 vac OUT	Cooling Stage 1 Output to Stage 1 mechanical cooling
28	Y1I	24 vac IN	Cooling Stage 1 input from commercial thermostat
29	C	COM	24 vac Common
30	R	24 vac	24 vac Power

Connecting Peripheral Devices to the Economizer Controller

Refer to Fig. 36-41 for wiring details.

- Outside Air: Connect to the OAT and COM terminals of the device.
- Return Air (Differential): Connect to the RAT and S-COM terminals of the device.
- Mixed Air: Connect to the MAT and COM terminals of the device.

Mixed or Discharge Air Temperature Sensor

Outside Air Temperature Sensor

Return Air Temperature Sensor

MAT
COM
OAT
OAH
COM
AUX-AI
RAT
RAH
S-COM
S-24V
VFD 0-10
COM
ACT-FB
ACT 2-10
ACT-COM
ACT-24V

Fig. 36 — Temperature Sensor Connection

- Outside Air Relative Humidity: Connect to the OAH and COM terminals of the device.
- Return Air Relative Humidity: Connect to the RAH and S-COM terminals of the device.

Outside Air Relative Humidity Sensor

Return Air Relative Humidity Sensor

MAT
COM
OAT
OAH
COM
AUX-AI
RAT
RAH
S-COM
S-24V
VFD 0-10
COM
ACT-FB
ACT 2-10
ACT-COM
ACT-24V

Fig. 37 — Relative Humidity Sensor Connection

• Outside Combination Temperature/ Humidity: Connect to the OAT, COM, and OAH terminals of the device. • Return Combination Temperature/ Humidity: Connect to the RAT, S-COM, and RAH terminals of the device.	Combo Temperature and Humidity Sensor Combo Temperature and Humidity Sensor MAT COM OAT OAH COM AUX-AI RAT RAH S-COM S-24V VFD 0-10 COM ACT-FB ACT 2-10 ACT-COM ACT-24V

Fig. 38 — Combination Temperature/Humidity Sensor Connection

• Connect to the AUX-AI, S-COM, and S-24V terminals of the device.	Air Quality Sensor or Pressure Sensor COM AUX-AI RAT RAH S-COM S-24V VFD 0-10 COM ACT-FB ACT 2-10 ACT-COM ACT-24V
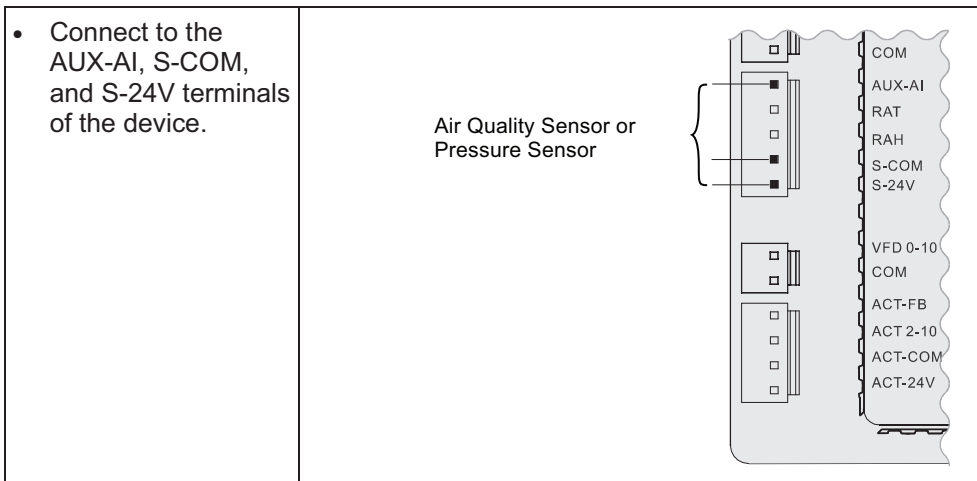
Fig. 39 — CO$_2$/Pressure Sensor Connection

• Connect to the ACT 2-10, ACT-COM, and ACT-24V terminals of the device.	Damper Actuator: Power and 2-10 Vdc VFD 0-10 COM ACT-FB ACT 2-10 ACT-COM ACT-24V
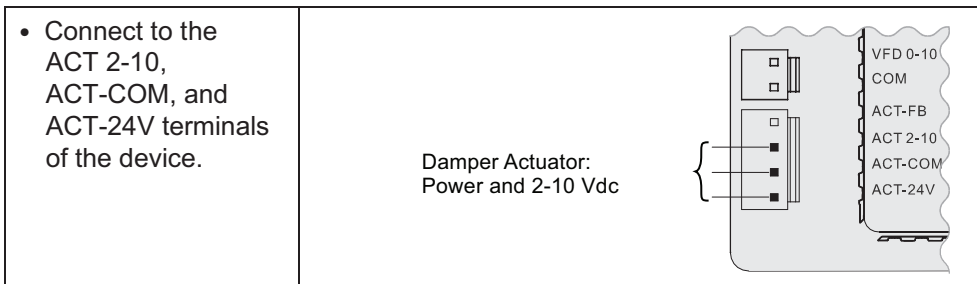
Fig. 40 — Damper Actuator Connection
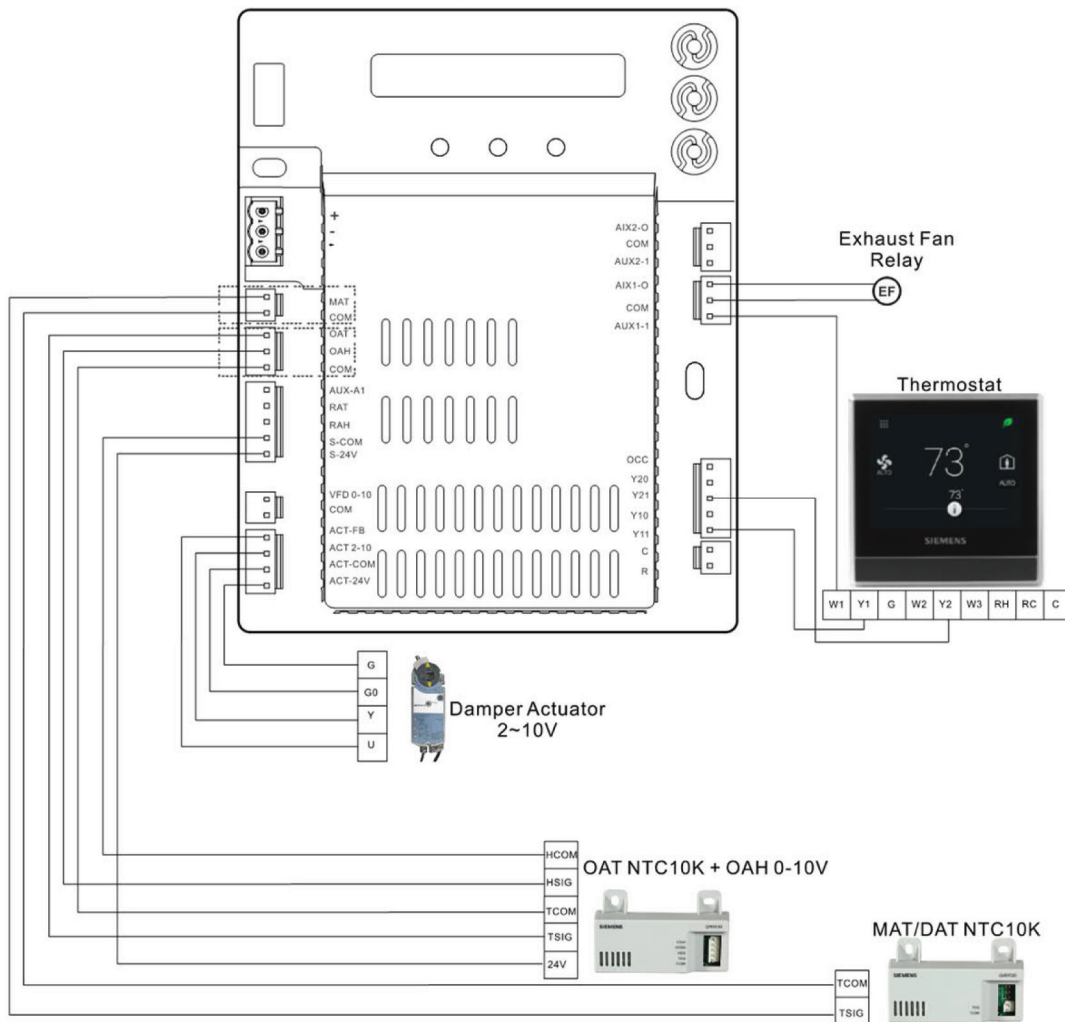
Fig. 41 — Single Dry-Bulb Switchover, Thermostat, Damper Actuator, OAT and MAT Sensors Typical Wiring

SETUP AND CONFIGURATION

IMPORTANT: Before setup and configuration, it is recommended to obtain some location-based values, such as shutoff points, or utilize the location services in the Climatix™ mobile application.

Set up and configure the economizer controller before putting it into usage. This can be accomplished by using the Climatix™ mobile application or the inbuilt display. After sensor, compressor, thermostat, or actuator is connected to the economizer controller, values/statuses are displayed in the Operating section of the mobile application and on the LCD. Users can manually change basic and advanced settings, configure I/Os and test the damper operation and any configured outputs by modifying the corresponding parameter values in the local device or mobile application. See Tables 19-26 for complete list of all parameters on the LCD display. Refer to it during the setup and configuration process.

NOTE: For all units, the controller login is Administrator, and the default controller password is OneBT.

NOTE: Parameters and display menus may display differently/dynamically if different applications are configured. See Tables 19-26.

IMPORTANT: Not all operations are available on the local POL 224. For example, users can only obtain shutoff setpoints and perform cfm commissioning via the Climatix™ mobile application. Setup and configuration on the local device are only recommended if operations from the mobile application are unavailable. Check the mobile application for all operations that can be performed from the mobile application end.

IMPORTANT: By connecting the RS485 port to a PC, all parameters are also readable or writable from PC tools such as Modbus Poll.exe via Modbus®a and Yabe.exe via BACnet™a MSTP (Bps 38400 (default), Bps 9600, Bps 19200, Bps 115200). Note that an external End of Line (EOL) element is required to achieve Baud Rate 115200 at a maximum cable length of 4000 ft (1.2 km).

NOTE(S):

a. Third-party trademarks and logos are the property of their respective owners.

Table 19 — Status Display

PARAMETER	DESCRIPTION	VALUE
1FREECOOL	Indicates if the system can use outdoor air for free cooling.	YES NO
1ECON ENAB	Indicates if outdoor air is being used for the first stage of cooling.	
1OCCUPIED	Indicates if the space is occupied. If users choose **ALWAYS** for **6OCC** when configuring I/Os, then the parameter value is **YES**; if users keep the default selection **T-STAT** for **6OCC** and the controller receives 24-v signal from OCC input, then the value is **YES**. Otherwise, the value is **NO**.	
1Y1-IN	Y1-In call from thermostat for Cooling Stage 1.	ON OFF
1Y1-OUT	Y1-Out signal to compressor for Cooling Stage 1.	
1Y2-IN	Y2-In call from thermostat for Cooling Stage 2.	
1Y2-OUT	Y2-Out signal to compressor for Cooling Stage 2. **Dynamic item:** Appears only if Y2-Out terminal is configured.	
1AUX1-I	Aux1-In signal. **Dynamic item:** Appears only if Aux1-In terminal is configured.	
1AUX1-O	Aux1-Out signal. **Dynamic item:** Appears only if Aux1-Out terminal is configured.	
1AUX2-I	Aux2-In signal. **Dynamic item:** Appears only if Aux2-In terminal is configured.	
1AUX2-O	Aux2-Out signal. **Dynamic item:** Appears only if Aux2-Out terminal is configured.	
1COMP STAGE	Indicates compressor current stage.	Off 1 2 3
1HEAT ENAB	Indicates if heating is enabled.	YES NO
1MIX AIR LOW	Indicates if the anti-freeze protection function is enabled for a mixed air temperature sensor. If the detected air temperature is lower than the anti-freeze protection setpoint (3FRZ PROT), then the parameter value is **YES**. Otherwise, it is **NO**.	
1MAT PRES	Indicates the present value of the mixed air temperature (MAT) sensor. **Dynamic item:** Appears only if **MAT** or **AUTO** is selected for **3DIF T LOC** under Advanced Settings Table.	The corresponding detected value is displayed on the LCD.
1LAT PRES	Indicates the present value of the leaving air temperature (LAT) sensor. **Dynamic item:** Appears only if **LAT** or **AUTO** is selected for **3DIF T LOC**.	
1OAT PRES	Indicates the present value of the outdoor air temperature (OAT) sensor. **Dynamic item:** Appears only if an OAT sensor is configured.	
1OAH PRES	Indicates the present value of the outdoor air relative humidity (OAH) sensor. **Dynamic item:** Appears only if an OAH sensor is configured.	
1RAT PRES	Indicates the present value of the return air temperature (RAT) sensor. **Dynamic item:** Appears only if a RAT sensor is configured.	
1RAH PRES	Indicates the present value of the return air relative humidity (RAH) sensor. **Dynamic item:** Appears only if a RAH sensor is configured.	
1CO2 PRES	Indicates the present value of the CO_2 sensor. **Dynamic item:** Appears only if a CO_2 sensor is configured.	
1DCV STATUS	Indicates the demand controlled ventilation (DCV) status. **Dynamic item:** Appears only if a CO_2 sensor is configured. Displays ON if the measured CO_2 concentration value is above the DCV setpoint and OFF if below the DCV setpoint.	ON OFF
1FAN SPD LV	Indicates the current fan speed status (low, medium or high). If a one-speed fan is connected and configured, then this item is invisible. **Dynamic item:** Appears only if "**6FAN**" is configured as "**2SPEED**" under I/O Configuration Table.	L H
1ACT OUT	Indicates current position of damper actuator in V.	The corresponding detected value is displayed on the LCD.
1ACT FB	Indicates feedback signal of damper actuator in V.	
1ACT POS	Indicates current position of damper actuator in % Open.	
1ACT CNT	Indicates number of times actuator has cycled (1 cycle = 180 degrees of movement in any direction). Resettable via HMI item **8ACT CNT RESET** under Enter Running State Table.	
1EQUIP	Indicates the equipment type. If **HP(O)** or **HP(B)** is chosen for **6AUX1-I**, then the parameter value is **HP(O)** or **HP(B)** respectively. If neither is chosen, then the value is **CON RTU**.	HP(O) HP(B) CON RTU
1INS	Indicates the installation date of the economizer controller. If the installation date is incorrect, then press Enter to change and confirm month, date, and year.	—

Table 20 — Parameter Settings — Basic

PARAMETER	DESCRIPTION	RANGE	DEFAULT
2 TEMP OFF	Temperature shutoff setpoint can be obtained automatically if a smartphone or tablet is connected to the network provided by a Wi-Fi/WLAN stick plugged into the economizer controller and the Climatix™ mobile application is installed on the phone or tablet. This can also be a manually defined setpoint.	48...80°F, increment by 1	63°F
2ENTH OFF	Enthalpy shutoff setpoint can be obtained automatically if a smartphone or tablet is connected to the network provided by a Wi-Fi/WLAN stick plugged into the economizer controller and the Climatix™ mobile application is installed on the phone or tablet. This can also be a manually defined setpoint. **Dynamic item:** Appears only if an OAH sensor is configured.	22...30 Btu/lbm, increment by 1	28 Btu/lbm
2DVC	Demand controlled ventilation setpoint can be obtained automatically if a smartphone or tablet is connected to the network provided by a Wi-Fi/WLAN stick plugged into the economizer controller and the Climatix™ mobile application is installed on the phone or tablet. This can also be a manually defined setpoint. **Dynamic item:** Appears only if a CO_2 sensor is configured.	300...2000PPM, increment by 100	1100PPM
2FAN L ACT	Damper minimum position when fan runs at a low speed. **Dynamic item:** Appears only if "**6FAN**" is configured as "**2SPEED**" under I/O Configuration Table.	2...10V	3.6V
2FAN H ACT	Damper minimum position when fan runs at a high speed. **Dynamic item:** Appears only if "**6FAN**" is configured as "**1SPEED**" or "**2SPEED**".	2...10V, increment by 0.1	2.8V
2VENTMAX L	DCV maximum position when fan runs at a low speed. **Dynamic item:** Appears only if a CO_2 sensor is configured and "**6FAN**" is configured as "**2SPEED**".	2...10V, increment by 0.1	3.6V
2VENTMAX H	DCV maximum position when fan runs at a high speed. **Dynamic item:** Appears only if a CO_2 sensor is configured and "**6FAN**" is configured as "**1SPEED**" or "**2SPEED**".	2...10V, increment by 0.1	2.8V
2VENTMIN L	DCV minimum position when fan runs at a low speed. **Dynamic item:** Appears only if a CO_2 sensor is configured and "**6FAN**" is configured as "**2SPEED**".	2...10V, increment by 0.1	3.1V
2VENTMIN H	DCV minimum position when fan runs at a high speed. **Dynamic item:** Appears only if a CO_2 sensor is configured and "**6FAN**" is configured as "**2SPEED**".	2...10V, increment by 0.1	2.3V
CFM COMM	Air Flow Chart: **CFM commissioning** can only be initiated from the Climatix™ mobile application. When **CFM commissioning** is in progress, the local device reads "**CFM COMM**".	—	—
2DEGREES	Temperature unit (°F or °C).	—	°F
2FAN	Fan cfm.	100...50,000cfm, increment by 100	5000 cfm
2EX1 L	Exhaust Fan 1 low-speed parameter setting. **Dynamic item:** Appears only if: • Exhaust Fan 1 is configured. • "**6FAN**" is configured as "**2SPEED**".	0...100%, increment by 1	65%
2EX1 M	Exhaust Fan 1 medium-speed parameter setting. **Dynamic item**: Appears only if: • Exhaust Fan 1 is configured.	0...100%, increment by 1	60%
2EX1 H	Exhaust Fan 1 high-speed parameter setting. **Dynamic item:** Appears only if: • Exhaust Fan 1 is configured. • "**6FAN**" is configured as "**2SPEED**".	0...100%, increment by 1	50%
2EX2 L	Exhaust Fan 2 low-speed parameter setting. **Dynamic item:** Appears only if: • Exhaust Fan 2 is configured. • "**6FAN**" is configured as "**2SPEED**".	0...100%	80%
2EX2 M	Exhaust Fan 2 medium-speed parameter setting. **Dynamic item:** Appears only if: • Exhaust Fan 2 is configured.	0...100%, increment by 1	78%
2EX2 H	Exhaust Fan 2 high-speed parameter setting. **Dynamic item:** Appears only if: • Exhaust Fan 2 is configured. • "**6FAN**" is configured as "**2SPEED**".	0...100%, increment by 1	75%
2THL	Temperature high limitation. **Dynamic item:** Appears only if an RAT sensor is configured.	0...100%, increment by 1	83%
2EHL	Enthalpy high limitation. **Dynamic item:** Appears only if an RAH sensor is configured.	22...30 Btu/lbm, increment by 1	33 Btu/lbm
2FAN DLY	Cooling delay via increasing fan speed.	0...30 min, increment by 1	5 min.

Table 21 — Parameter Settings — Advanced

PARAMETER	DESCRIPTION	VALUE/RANGE	DEFAULT
3FREEZE POS	Anti-freeze protection damper position (closed or minimum).	CLO MIN	CLO
3STG3 DLY	Highest stage cooling delay time.	0...240m; increment by 5	15m
3SD ACT POS	Damper position during shutdown (open or closed).	CLO OPN	CLO
3DIF T LOC	MAT sensor location: • Choose **MAT** if the sensor is installed before the DX (Direct Expansion) coil. • Choose **LAT** if the sensor is installed after the DX coil. • Choose **AUTO** to let the economizer controller automatically detect the location.	MAT LAT AUTO	LAT
3LAT LOW	Low limit of leaving air temperature. **Dynamic item:** Appears only if **LAT** or **AUTO** is selected for **3DIF T LOC**.	35...65°F, increment by 1	45°F
3LAT HIGH	High limit of leaving air temperature. **Dynamic item:** Appears only if **LAT** or **AUTO** is selected for **3DIF T LOC**.	70...180°F, increment by 1	80°F
3OAT CAL	OAT sensor calibration.	–2.5...2.5°F, increment by 0.5	0°F
3RAT CAL	RAT sensor calibration. **Dynamic item:** Appears only if an RAT sensor is configured.	–2.5...2.5°F, increment by 0.5	—
3OAH CAL	OAH sensor calibration. **Dynamic item:** Appears only if an OAH sensor is configured.	–10...10%, increment by 0.5	10%
3RAH CAL	RAH sensor calibration. **Dynamic item:** Appears only if an RAH sensor is configured.		
3MAT CAL	MAT or LAT sensor calibration.	–2.5...2.5°F, increment by 0.5	0°F
3MAT SET	Setpoint of MAT or LAT sensor.	38...70°F, increment by 1	53°F
3FRZ PROT	Anti-freeze protection setpoint of MAT sensor.	35...55°F, increment by 1	45°F
3OAT LOCK	OAT lockout setpoint for anti-freeze protection.	–45...80°F, increment by 1	32°F

Table 22 — Parameter Settings — I/O Configurations

PARAMETER	DESCRIPTION	VALUE	DEFAULT
6OCC	Configures if occupancy status receives signal from the connected thermostat or is displayed as ALWAYS in the economizer controller.	T-STAT ALWAYS	T-STAT
6AUX1-I	Auxiliary DI-1. Configurable as: • None • Cooling stage 3 (Y3) from thermostat • Heat Conventional (W1) from thermostat • Heat pump (reversing valve O) • Heat pump (reversing valve B) • Pre-occupancy signal from thermostat • Shutdown signal from unit	NONE Y3 IN W1 HP(O) HP(B) PREOCC SHUTDWN	W1
6AUX2-I	Auxiliary DI-2. Configurable as: • None • Cooling stage 3 (Y3) from thermostat • Heat stage 1 (W1) from thermostat • Heat pump (reversing valve O) • Heat pump (reversing valve B) • Pre-occupancy signal from thermostat • Shutdown signal from unit **NOTE:** Whichever is chosen for 6AUX1-I does not appear in the list of 6AUX2-I.	NONE Y3 IN W1 HP(O) HP(B) PREOCC SHUTDWN	NONE
6OAT SIG	Configures signal type of OAT sensor.	0-10V NTC10K	NTC10K
6RAT SIG	Configures signal type of RAT sensor.	0-10V NTC10K NONE	NONE
6OAH SIG	Configures signal type of OAH sensor.	0-10V 4-20mA NONE	NONE
6RAH SIG	Configures signal type of RAH sensor.		
6MAT SIG	Configures signal type of MAT or LAT sensor.	0-10V NTC10K	NTC10K
6AUX-AI1	Auxiliary AI-1. Configurable as: • CO_2 sensor • Static pressure (temporarily for CFM commissioning) sensor • None	PRESSURE CO2 NONE	NONE
6X-AI1 SIG	Configures CO_2 sensor type.	0-10V 2-10V 0-5V	0-10V
6CO2 Rng L	Configures the low limit of CO_2 measuring range.	0...500; increment by 10	0
6C02 Rng H	Configures the high limit of CO_2 measuring range.	1000...3000; increment by 50	2000
6AUX-AI2	Choose **ACT FB** if feedback signal is available from the connected damper actuator. Otherwise, choose **NONE**.	ACT FB NONE	ACT FB
6Y2O	Choose **COOL 2** if Cooling Stage 2 is available (another compressor is connected to the Economizer). Otherwise, choose **NONE**.	COOL 2 NONE	COOL 2

Table 22 — Parameter Settings — I/O Configurations (cont)

PARAMETER	DESCRIPTION	VALUE	DEFAULT
6AUX1-O	Auxiliary DO-1. Configurable as: • None • Cooling stage 3 output • Exhaust fan (1 or 2) • Alarm output to thermostat (Title 24)	NONE Y3O EXHAUST ALARM	EXHAUST
6AUX2-O	Auxiliary DO-2. Configurable as: • None • Cooling stage 3 output • Exhaust fan (1 or 2) • Alarm output to thermostat (Title 24) **NOTE:** Of all but Exhaust Fan, whichever is chosen for 6AUX1-O does not appear in the list of 6AUX2-O.	NONE Y3O EXHAUST ALARM	ALARM
6FAN	Configures fan speeds of the variable speed supply fan.	1SPEED 2SPEED	2SPEED
6RS485	Switch between MSTP and Modbus.	MSTP MODBUSSLV	MSTP

Table 23 — Alarm Parameters[a,b]

PARAMETER	DESCRIPTION
NO ALARM	No alarm is activated.
4MAT SEN ALARM	MAT sensor has failed, gone out of range or become disconnected.
4CO2 SEN ALARM	CO_2 sensor has failed, gone out of range or become disconnected.
4OAT SEN ALARM	OAT sensor has failed, gone out of range or become disconnected.
4OAH SEN ALARM	OAH sensor has failed, gone out of range or become disconnected.
4RAT SEN ALARM	RAT sensor has failed, gone out of range or become disconnected.
4RAH SEN ALARM	RAH sensor has failed, gone out of range or become disconnected.
4FREEZE ALARM	Anti-freeze notification when MAT sensor is below anti-freeze protection setpoint.
4RTU SHUTDOWN	Notification of Shutdown Active when SHUTDWN is chosen for 6AUX1-I or 6AUX2-I.
4ACTUATOR ALARM	Actuator gets disconnected or has failed.
4ACT UNDER V	Voltage received by the actuator is below expected range.
4ACT OVER V	Voltage received by the actuator is above expected range.
4ACT STALLED	Damper actuator stopped before achieving commanded position.
4ACT SLIPPING	Damper actuator slips after reaching commanded position.
4NOT ECON	Not Economizing when it should.
4ECON SHOULDNT	Economizing when it should not.
4EXCESS OA	Excess outdoor air. Outside air intake is significantly higher than it should be.
4LLA ALARM	Leaving air temperature is lower than the low limit (3LAT LOW).
4HLA ALARM	Leaving air temperature is higher than the high limit (3LAT HIGH).
4HEAT ALARM	Economizer heating error.
4COOL ALARM	Economizer cooling error.

NOTE(S):

a. All alarms are dynamic items. An alarm appears only if a related symptom mentioned above is detected.
b. An alarm activation triggers a general alarm, then the configured system alarm output (AUX1-O or AUX2-O) is activated. If there is no alarm, then NO ALARM is displayed on the HMI.

Table 24 — Test Commands

PARAMETER	DESCRIPTION
7DAMPER MIN POS	Press Enter to test if the economizer controller can drive damper to minimum position.
7DAMPER CLOSE	Press Enter to test if the economizer controller can drive damper to 100% Closed.
7DAMPER OPEN	Press Enter to test if the economizer controller can drive damper to 100% Open.
7DAMPER ALL	Press Enter to perform all the above tests.
7DAMPER	Press Enter to test if the economizer controller can drive damper to the selected voltage.
7Y1O	Press Enter to test if the economizer controller can turn on or off the first stage of cooling (close or open relay Y1O).
7Y2O	Press Enter to test if the economizer controller can turn on or off the second stage of cooling (close or open relay Y2O).
7AUX1-O	Press Enter to test AUX1-O connection (close or open relay AUX1-O).
7AUX2-O	Press Enter to test AUX2-O connection (close or open relay AUX2-O).

Table 25 — Enter Running State

PARAMETER	DESCRIPTION
8RUN STATE	Change to Running State. Press Enter to confirm the change.
8ENTER RUN?	Confirm the change to Running State.
8FACTORY DEF	Perform factory reset. Press Enter to confirm the reset. (This action resets the controller password to default: OneBT.)
8DEF CONFIRM?	Confirm the factory resetting.
8ACT CNT RESET	Damper count reset.
8VER x.x.x	Firmware version information such as 0.1.10.

Table 26 — Enter Configuration State and Restart

PARAMETER	DESCRIPTION
5CONFIG STATE	Change to Configuration State. Press Enter to confirm the change.
5ENTER CONFIG?	Confirm the change to Configuration State.
5RESTART	Restart the economizer controller. Press Enter to confirm the restart.
5CONF RESTART	Confirm the restart.

START-UP

Cooling with EconomizerONE System

For Occupied mode operation of EconomizerONE system, there must be a 24-v signal at terminals R and OCC (provided through PL6-3 from the unit's IFC coil). Removing the signal at OCC places the EconomizerONE control in Unoccupied mode. See Table A in Appendix A — "Troubleshooting" on page 31 for damper position control and other troubleshooting.

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

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

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

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

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

If accessory power exhaust is installed, then the power exhaust fan motors will be energized by the economizer control as the dampers open above the EXH1 SET setpoint and will be energized as the dampers close below the EXH1 SET setpoint. Damper movement from full closed to full open (or vice versa) will take between 1-1/2 and 2-1/2 minutes.

Heating with EconomizerONE System

During Occupied mode operation, indoor fan operation will be accompanied by economizer dampers moving to Minimum Position setpoint for ventilation. If indoor fan is off, then dampers will close. During Unoccupied mode operation, dampers will remain closed unless a DCV demand is received. When the room temperature calls for heat (W1 closes), the heating controls are energized.

Refer to Appendix A "Troubleshooting" on page 31, Appendix B "SEQUENCE OF OPERATION EXAMPLES" on page 32, and Appendix C "MODBUS/BACNET ADDRESSES" on page 35 for Troubleshooting operation issues.

APPENDIX A — TROUBLESHOOTING

Table A — Operating Issues and Concerns

SYMPTOM	REASON	SOLUTION
An alarm is displayed on the LCD	Sensor, damper, or the whole working system may not work properly	Check sensor, damper, or the whole working system following the detailed alarm information.
DAC LED is blinking RED	Damper slippage	Check whether the damper works properly.
DAC LED is blinking RED quickly	Damper unplugged	Check whether the damper is connected.
DAC LED is OFF	Terminal ACT-FB is configured but there is no available feedback signal	Check whether the feedback signal is connected; check if ACT-FB is faulty.
Economizer controller has no alarm, but the Free Cooling LED will not turn on when the OA seems to be suitable for Free Cooling	Shutoff SP setting error	Shutoff temperature and/or enthalpy set point is incorrectly set up. Consult an HVAC professional to set up the shutoff set point correctly.
	OA temp is too low	The OA temperature is too low; therefore, there is no cooling demand. This could possibly enable anti-freeze protection.
	OA temp is too high or too humid	In DIFF mode, even though OA temperature is lower than RA temperature, if both OA and RA temperatures exceed the high limit, then Free Cooling turns off. In Differential Enthalpy control mode, even though OA enthalpy is lower than RA enthalpy, if both OA and RA enthalpy exceed the high limit, then Free Cooling turns off.
Economizer controller/mechanical cooling is not operating	No input power	Use a multi-meter to check whether there is 24 vac ± 25% (18-30 vac) at the POWER terminals. If there is no voltage or if the voltage is significantly low, then check the transformer output voltage at the RTU. If 24-v is not present at the transformer secondary side, then check the primary line voltage to the transformer. If the line voltage is not present at the transformer primary side, then check the primary power to the RTU, fuses, circuit breaker, and so on.
	Brownout	If voltage is below 17-v, then the economizer controller may be in Brownout Protection mode. This mode disables all of the relay outputs. When the power is 19 vac or higher, the economizer controller and RTU operate normally.
	Y1/Y2 signal is missing from the thermostat	Mechanical cooling does not run until there is cooling demand (Y1/Y2 Active). Check the wiring from Y1I and Y2I terminals to the commercial thermostat. 24-v should be present between Y1I/Y2I and Y1O/Y2O respectively.
	24 vac~ and 24 vac ⊥ are incorrectly wired	24 vac power supply has polarity when all devices are powered by the same 24 vac transformer; reversing polarity may cause a short circuit that can damage the system. Follow the transformer polarity mark, check the wiring of 24-v~ (or G or 24-v+), and ensure that they are tied to the same polar of 24 vac power supply; while checking the wiring of ⊥ (or G0 or 24-v- or COM), ensure that they are all tied to another polar of 24 vac power supply.
Firmware Update Failure	Application file is damaged, operation is incorrect, and/or USB flash disk does not work properly.	Reload a BIN file, restart the controller, update firmware following "Firmware Update" on page 20, or change a USB flash disk. Contact service provider if failure still exists.
Free Cooling LED is solid RED	Sensor, damper, or whole working system may not work properly	Check sensor, damper, or the whole working system following the detailed alarm information.
Free Cooling LED is blinking RED	Not economizing when it should	Check the whole economizer working system, such as the sensor, damper, and thermostat.
Incorrect controller password error on mobile application	The password has changed from default	Performing a factory reset on the controller will reset the password to OneBT.
RS485 communication failure	RS485 signal or configuration error	Check wiring, configuration, Baud Rate (using mobile application), and other network communication parameters.
Sensor LED is blinking RED	Excess outdoor air	Check the whole economizer working system, such as the sensor, damper, and thermostat.
Sensor LED is solid RED	Mixed Air (MA) sensor error	Check the MA sensor. It must be either a Type II NTC 10K or 0-10 vdc sensor.
	Outside Air (OA)/Return Air (RA) sensor error	Check the wiring and signal of the OA sensor. If in Differential (DIFF) mode, also check the RA sensor. The following sensor signals are valid: Type II NTC 10K or 0-10 vdc temperature. 0-10 vdc or 4-20 mA humidity.
	Air temperature failure/fault	Check the air temperature sensor signal. The valid signal must be Type II NTC 10K or 0-10 vdc.
Sensor LED is OFF	CO_2 sensor error	Check CO_2 sensor connection, sensor signal (under range or over range), and sensor signal type.
Sensor LED is YELLOW	Humidity sensor error	Check humidity sensor connection, sensor signal (under range or over range), and sensor signal type.
Wi-Fi connection failure	Wi-Fi/WLAN stick error or wrong user name and password	Unplug and re-plug in the Wi-Fi/WLAN stick, enter a correct user name and password, restart the controller, or replace the Wi-Fi/WLAN stick. If the Wi-Fi/WLAN stick is POL903.00/100, then the default user name and password are Siemens-WLAN-Stick and SIBPAdmin. DNS name is siemens.wlanstick. Contact Application Engineering for information on this accessory.

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APPENDIX B — SEQUENCE OF OPERATION EXAMPLES

Table B — Fixed Dry-Bulb without DCV (CO$_2$ Sensor) — 2-Speed Fan

THERMOSTAT			ECONOMIZER					
CONTROL MODE		OCCUPIED	OA GOOD TO ECONOMIZE?	Y1I	Y2I	Y1O	Y2O	DAMPER POSITION
CONVENTIONAL	Cooling	Yes	N/A	Off	Off	Off	Off	Min Pos L
			Yes	On	Off	Off	Off	Min Pos L to 100%
				On	On, <15 mins	On	Off	Min Pos H to 100%
				On	On, >15 mins	On	On/Off[a,b]	Min Pos H to 100%
			No	On	Off	On	Off	Min Pos L
				On	On	On	On	Min Pos H
	Heating	Yes	N/A	Off	Off	Off	Off	Min Pos H
	Cooling	No	N/A	Off	Off	Off	Off	Closed
			Yes	On	Off	Off	Off	Closed to 100%
				On	On, <15 mins	On	Off	Closed to 100%
				On	On, >15 mins	On	On/Off[a,b]	Closed to 100%
			No	On	Off	On	Off	Closed
				On	On	On	On	Closed
	Heating	No	N/A	Off	Off	Off	Off	Closed
HEAT PUMP	Cooling	Yes	N/A	Off	Off	Off	Off	Min Pos L
			Yes	On	Off	Off	Off	Min Pos L to 100%
				On	On, <15 mins	On	Off	Min Pos H to 100%
				On	On, >15 mins	On	On/Off[a,b]	Min Pos H to 100%
			No	On	Off	On	Off	Min Pos L
				On	On	On	On	Min Pos H
	Heating	Yes	N/A	Off	Off	Off	Off	Min Pos H
				On	Off	On	Off	Min Pos H
				On	On	On	On	Min Pos H
	Cooling	No	N/A	Off	Off	Off	Off	Closed
			Yes	On	Off	Off	Off	Closed to 100%
				On	On, <15 mins	On	Off	Closed to 100%
				On	On, >15 mins	On	On/Off[a,b]	Closed to 100%
			No	On	Off	On	Off	Closed
				On	On	On	On	Closed
	Heating	No	N/A	Off	Off	Off	Off	Closed
				On	Off	On	Off	Closed
				On	On	On	On	Closed

NOTE(S):

a. If Y2I is **ON** for more than a set time (15 minutes by default) and the OAT is greater than MAT setpoint (3MATSET), then Relay 2 energizes to allow Y2 pass-through to enable Cooling Stage 2.

b. Configure **3STG3 DLY** under Advanced Settings on page 28 to change to another set time.

Table C — Fixed Dry-Bulb with DCV (CO_2 Sensor) — 2-Speed Fan In Conventional Mode

THERMOSTAT			ECONOMIZER							
CONTROL MODE		OCCUPIED	OA GOOD TO ECONOMIZE?	CO_2	Y1I	Y2I	Y1O	Y2O	DAMPER POSITION	EF (1 or 2)[a]
CONVENTIONAL	Cooling	No	N/A	N/A	Off	Off	Off	Off	Closed	Off
		Yes	N/A	>SP[b]	Off	Off	Off	Off	VENT MIN L to VENT MAX L	On/Off[c]
				≤ SP	Off	Off	Off	Off	VENT MIN L	Off
		No	Yes	N/A	On	Off	Off	Off	Closed to Fully Open (100%)	On
					On	On	On	On/Off[d]	Fully open (100%)	On
		Yes	Yes	>SP	On	Off	Off	Off	VENT MIN L to 100%	On
				>SP	On	On	On	On/Off[d]	VENT MIN H to 100%	On
				≤ SP	On	Off	Off	Off	VENT MIN L or 100%	On
				≤ SP	On	On	On	On/Off[d]	VENT MIN H or 100%	On
		No	No	N/A	On	Off	On	Off	Closed	Off
					On	On	On	On		
		Yes	No	>SP	On	Off	On	Off	VENT MIN L to VENT MAX L	On/Off[c]
				>SP	On	On	On	On	VENT MIN H to VENT MAX H	On/Off[c]
				≤ SP	On	Off	On	Off	VENT MIN L	Off
				≤ SP	On	On	On	On	VENT MIN H	Off
	Heating	No	N/A	N/A	Off	Off	Off	Off	Closed	Off
		Yes	N/A	≤ SP	Off	Off	Off	Off	VENT MIN H	Off
				>SP	Off	Off	Off	Off	VENT MIN H to VENT MAX H	On/Off[c]
HEAT PUMP	Cooling	Yes	N/A	>SP	Off	Off	Off	Off	VENT MIN L to VENT MAX L	On/Off[c]
				≤ SP	Off	Off	Off	Off	VENT MIN L	Off
		Yes	Yes	>SP	On	Off	Off	Off	VENT MIN L to 100%	On
				>SP	On	On	On	On/Off[d]	Fully open (100%)	On
				≤ SP	On	Off	Off	Off	VENT MIN L to 100%	On
				≤ SP	On	On	On	On/Off[d]	Fully open (100%)	On
		Yes	No	>SP	On	Off	On	Off	VENT MIN L to VENT MAX L	On/Off[c]
				>SP	On	On	On	On	VENT MIN H to VENT MAX H	On/Off[c]

NOTE(S):
a. Exhaust Fan — one or two exhaust fans can be connected to the economizer controller.
b. Setpoint — Demand controlled ventilation setpoint.
c. The controller energizes Exhaust Fan Relay 1 and Exhaust Fan Relay 2 if the damper position reaches Exhaust Fan 1 parameter setting and Exhaust Fan Relay 2 parameter setting respectively.
d. If Y2I is **ON** for less than a set time (15 minutes by default), then Relay 2 is OFF. If Y2I is **ON** for more than a set time and the OAT is greater than MAT setpoint (3MAT SET), then Relay 2 energizes to allow Y2 pass-through to enable Cooling Stage 2.

Table C — Fixed Dry-Bulb with DCV (CO$_2$ Sensor) — 2-Speed Fan In Conventional Mode (cont)

THERMOSTAT			ECONOMIZER							
CONTROL MODE		OCCUPIED	OA GOOD TO ECONOMIZE?	CO$_2$	Y1I	Y2I	Y1O	Y2O	DAMPER POSITION	EF (1 OR 2)[a]
HEAT PUMP	Cooling	Yes	No	≤ SP	On	Off	On	Off	VENT MIN L	Off
				≤ SP	On	On	On	On	VENT MIN L	Off
	Heating		N/A	>SP	Off	Off	Off	Off	VENT MIN H to VENT MAX H	On/Off[b]
				>SP	On	Off	On	Off	VENT MIN H to VENT MAX H	On/Off[b]
				>SP	On	On	On	On	VENT MIN H to VENT MAX H	On/Off[b]
				≤ SP	Off	Off	Off	Off	VENT MIN H	Off
				≤ SP	On	Off	On	Off	VENT MIN H	Off
				≤ SP	On	On	On	On	VENT MIN H	Off
	Cooling	No	N/A	N/A	Off	Off	Off	Off	Closed	Off
		No	Yes	N/A	On	Off	Off	Off	Closed to 100%	On
					On	On	On	On/Off[c]	100%	On
		No	No	N/A	On	Off	On	Off	Closed	Off
					On	On	On	On	Closed	Off
	Heating	No	N/A	N/A	Off	Off	Off	Off	Closed	Off
					On	Off	On	Off	Closed	Off
					On	On	On	On	Closed	Off

NOTE(S):
a. Configure **3STG3 DLY** under Advanced Settings to change to another set time.
b. The controller energizes Exhaust Fan Relay 1 and Exhaust Fan Relay 2 if the damper position reaches Exhaust Fan 1 parameter setting and Exhaust Fan Relay 2 parameter setting respectively.
c. If Y2I is **ON** for less than a set time (15 minutes by default), then Relay 2 is OFF. If Y2I is **ON** for more than a set time and the OAT is greater than MAT setpoint (3MAT SET), then Relay 2 energizes to allow Y2 pass-through to enable Cooling Stage 2.

APPENDIX C — MODBUS/BACNET ADDRESSES

REGNO (ADR+1)	FUNCTION CODE	REGISTER-NAME	PARAMETER IN HMI	BACNET ADDRESS
1001	04 Read Input Register	OATP	1OAT PRES	AV:347
1003	04 Read Input Register	RATP	1RAT PRES	AV:348
1005	04 Read Input Register	OAHP	1OAH PRES	AV:351
1007	04 Read Input Register	RAHP	1RAH PRES	AV:365
1009	04 Read Input Register	MATP	1MAT PRES	AV:349
1011	04 Read Input Register	DP	N/A; Corresponding BACnet object name is DP and analog value is 367.	AV:367
1013	04 Read Input Register	CO2P	1CO2 PRES	AV:366
1015	04 Read Input Register	4DAFB	1ACT POS	AV:350
1017	04 Read Input Register	4DAPP	N/A; Corresponding BACnet object name is 4DAPP and analog value is 316.	AV:316
1019	04 Read Input Register	AO_2_1	N/A; Corresponding BACnet object name is AO_2_1 and analog output is 11. Related HMI item: 1VFD SPD	AO:11
1021	04 Read Input Register	1DCV	2DCV	AV:339
1023	04 Read Input Register	2MTS	3MAT SET	AV:357
1025	04 Read Input Register	2ERV	2ERV SET	AV:346
1027	04 Read Input Register	2FRZ	3FRZ PROT	AV:358
1029	04 Read Input Register	2CF	2FAN	AV:95
1031	04 Read Input Register	1TSO	2TEMP OFF	AV:489
1033	04 Read Input Register	1ESO	2ENTH OFF	AV:490
1035	04 Read Input Register	ControlMode	N/A; Corresponding BACnet object name is ControlMode and analog value is 329	AV:329
1201	04 Read Input Register	4OCC	1OCCUPIED	BV:209
1202	04 Read Input Register	4Y1I	1Y1-IN	BV:210
1203	04 Read Input Register	4Y2I	1Y2-IN	BV:208
1204	04 Read Input Register	1AUX1-I	1AUX1-I	BV:219
1205	04 Read Input Register	1AUX2-I	1AUX2-I	BV:217
1206	04 Read Input Register	4Y1O	1Y1-OUT	BV:211
1207	04 Read Input Register	4Y2O	1Y2-OUT	BV:213
1208	04 Read Input Register	1AUX1-O	1AUX1-O	BV:218
1209	04 Read Input Register	1AUX2-O	1AUX2-O	BV:229
1210	04 Read Input Register	4FRE	1FREECOOL	BV:262
1211	04 Read Input Register	4ECO	1ECON ENAB	BV:257
1212	04 Read Input Register	4HEAT	1HEAT ENAB	BV:261
1213	04 Read Input Register	5GeneralAlarm	NO ALARM	BV:245
1501	03 Read Holding Register 16 Write Multiple Registers	1DCV	2DCV	SEE 1021ABOVE
1503	03 Read Holding Register 16 Write Multiple Registers	2MTS	3MAT SET	SEE 1023 ABOVE
1505	03 Read Holding Register 16 Write Multiple Registers	2ERV	2ERV SET	SEE 1025 ABOVE
1507	03 Read Holding Register 16 Write Multiple Registers	2FRZ	3FRZ PROT	SEE 1027 ABOVE
1509	03 Read Holding Register 16 Write Multiple Registers	2CF	2FAN	SEE1029 ABOVE
1511	03 Read Holding Register 16 Write Multiple Registers	1TSO	2TEMP OFF	SEE 1031 ABOVE
1513	03 Read Holding Register 16 Write Multiple Registers	1ESO	2ENTH OFF	SEE 1033 ABOVE

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