Installation and Operation Manual

- Technical Specifications
- Installation and Wiring
- Menu Sequence
- Setup and Configuration
- Service and Commissioning
- Sequence of Operation
- Alarms
- Troubleshooting
### PART OFFERING

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON-ZIP-BASE</td>
<td>ZIP Economizer Base Unit</td>
<td>The ZIP Economizer™ is a modular designed, plug and play economizer control solution. The ZIP offers an extended temperature transflective LCD display, with on board help, providing information every step of the way. Through its superior fault detection and diagnostics (FDD), it troubleshoots faults, initiates alarms, and reconfigures for best operation. Up to 10 alarms are stored as historic alarms and with operating hours, makes troubleshooting and maintenance easier. Base unit designed to provide most common economizer functions; two stages of mechanical cooling, integrated cooling, four change over strategies for free cooling, indoor fan speed and ventilation damper position feedback.</td>
</tr>
<tr>
<td>ECON-ZIP-EM</td>
<td>ZIP Economizer Energy Module</td>
<td>The ZIP Economizer™ Energy Module provides additional I/Os to offer higher control functionalities that will save even more energy. The Energy Module is needed for demand control ventilation, (DCV) indoor fan- 2 speed control, power exhaust fan, remote override for damper positioning, and pre-occupancy purge. The auto-detection and plug and play capability offers quick set up.</td>
</tr>
<tr>
<td>ECON-ZIP-COM</td>
<td>ZIP Economizer Communication Module</td>
<td>The ZIP Economizer™ Communication Module provides remote alarm indication with future capabilities such as data trending and building automation integration.</td>
</tr>
<tr>
<td>ECON-ZIP-10K</td>
<td>ZIP Economizer Temperature Sensor</td>
<td>The ECON-ZIP-10K allows for reliable temperature air readings. The sensor may be used for outdoor air (OAT), return air (RAT), or supply air (SAT) temperature measurements and control, with no configuration required. A minimum of one SAT and one OAT sensor is required for the ZIP Economizer to function. An RAT sensor can be added for differential temperature change over strategy. For best control results, sensors should be placed in the air stream. With the T-Bracket mounting is universal and can be inserted through the ductwork, fan housing or surface mounted.</td>
</tr>
<tr>
<td>ECON-ZIP-TH</td>
<td>ZIP Economizer Temperature and Humidity Sensor</td>
<td>The ECON-ZIP-TH Sensor may be used to measure temperature and humidity in the outdoor or return air stream. The temperature and humidity output is via 2 analog channels that can be independently measured with a multimeter. One sensor is used in the outdoor air intake for single enthalpy changeover strategy. An additional sensor can be added in the return air stream for differential changeover strategy. When using the ECON-ZIP-TH it is not necessary to use a separate temperature sensor ECON-ZIP-10K for OAT or RAT.</td>
</tr>
</tbody>
</table>
### ZIP Packs and Retrofit Kits

<table>
<thead>
<tr>
<th>Model#</th>
<th>Description</th>
<th>Components (# included in kit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON-ZIP-SDTF</td>
<td>Single Dry Bulb with DCV Capability, 2-Speed Fan, Exhaust Fan, and TF Spring Return Actuator (22 in-lbs, 7.5 tons**)</td>
<td>ECON-ZIP-Base, ECON-ZIP-EM, ECON-ZIP-10K (2), TFB24-SR, ECON-ZIP-TF1</td>
</tr>
<tr>
<td>ECON-ZIP-DDTF</td>
<td>Differential Dry Bulb with DCV Capability, 2-Speed Fan, Exhaust Fan, and TF Spring Return Actuator (22 in-lbs, 7.5 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K (3), TFB24-SH, ECON-ZIP-TF1</td>
</tr>
<tr>
<td>ECON-ZIP-SETF</td>
<td>Single Enthalpy with DCV Capability, 2-Speed Fan, Exhaust Fan, and TF Spring Return Actuator (22 in-lbs, 7.5 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K, ECON-ZIP-TH, TFB24-24-SR, ECON-ZIP-LF1</td>
</tr>
<tr>
<td>ECON-ZIP-DETF</td>
<td>Differential Enthalpy with DCV Capability, 2-Speed Fan, Exhaust Fan, and TF Spring Return Actuator (22 in-lbs, 7.5 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K (2), ECON-ZIP-TH, TFB24-LF1</td>
</tr>
<tr>
<td>ECON-ZIP-SELF</td>
<td>Single Enthalpy with DCV Capability, 2-Speed Fan, Exhaust Fan, and LF Spring Return Actuator (35 in-lbs, 12 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K, LF24-SR US, ECON-ZIP-LF1</td>
</tr>
<tr>
<td>ECON-ZIP-SDLF</td>
<td>Single Dry Bulb with DCV Capability, 2-Speed Fan, Exhaust Fan, and LF Spring Return Actuator (35 in-lbs, 12 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K (2), LF24-SR US, ECON-ZIP-LF1</td>
</tr>
<tr>
<td>ECON-ZIP-DDLF</td>
<td>Differential Dry Bulb with DCV Capability, 2-Speed Fan, Exhaust Fan, and LF Spring Return Actuator (35 in-lbs, 12 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K (3), LF24-SR US, ECON-ZIP-LF1</td>
</tr>
<tr>
<td>ECON-ZIP-DLF</td>
<td>Differential Enthalpy with DCV Capability, 2-Speed Fan, Exhaust Fan, and LF Spring Return Actuator (35 in-lbs, 12 tons**)</td>
<td>ECON-ZIP-BASE, ECON-ZIP-EM, ECON-ZIP-10K (2), LF24-SR US, ECON-ZIP-LF1</td>
</tr>
</tbody>
</table>

**Recommended max RTU tonnage.

### Retrofit Kits

<table>
<thead>
<tr>
<th>Model#</th>
<th>Description</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON-ZIP-ACT</td>
<td>Actuator Shaft Adapter allows easy retrofit from Honeywell® black box motors (M7XXX) to Belimo spring return actuator using existing linkage and crank arm assembly.</td>
<td>Shaft M4x8 Screws (4), Locking Nuts (4)</td>
</tr>
<tr>
<td>ECON-ZIP-LF1</td>
<td>Bracket with hole patterns to mount the LF Series actuator, horizontal or vertical position in existing Honeywell black box motor footprint.</td>
<td>ECON-ZIP-ACT ZG-112 Screws</td>
</tr>
<tr>
<td>ECON-ZIP-TF1</td>
<td>Bracket with hole patterns to mount the TF Series actuator, horizontal or vertical position in existing Honeywell black box motor footprint.</td>
<td>ECON-ZIP-ACT ZG-113 Spacers and Screws</td>
</tr>
</tbody>
</table>
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**ECON-ZIP-BASE**

**ZIP Economizer™ Base Module**

**Installation**

You can mount the ZIP Economizer in any orientation; it is recommended that you mount it in a position that will allow full utilization of the LCD and key pad and proper clearance for installation, servicing, wiring, and removal.

Take the overall dimensions of 6.63" [168.5] x 7.12" [181] x 2" [50.8] and mount in the interior of the RTU in a convenient location that you can access. Secure the ZIP utilizing #8 self-tapping screws (included). A minimum of two tabs need to be secured, one which is a top tab. Ideally secure all four tabs. Wire the electrical connection using ¼" female insulated spade connectors to prevent corrosion.

**Technical Data**

- **Power supply:** 24 VAC ± 20%, 50/60 Hz; Class 2 power source
- **Power consumption rating:**
  - 4 VA base control (ECON-ZIP-BASE)
  - 5.5 VA base control with Energy Module (ECON-ZIP-BASE + ECON-ZIP-EM)
  - 5 VA base control with Communication Module (ECON-ZIP-BASE + ECON-ZIP-CM)
  - 6.5 VA base with Energy Module and Communication Module (ECON-ZIP-BASE + ECON-ZIP-EM + ECON-ZIP-COM)
- **Rated impulse voltage:** 330V
- **Connectors:** 1/4" male spade connectors
- **Environmental:** RoHS, conformally coated
- **Software class:** A
- **Control pollution degree:** 3
- **Temperature input signal:** NTC 10 kΩ, Type II
- **Humidity:** 5 to 95% RH non-condensing
- **Humidity input signal:** 0-10 VDC, corresponds to 0 to 100%
- **Housing:** NEMA 1
- **Housing material:** UL94-V0A
- **Ambient temperature range:** -40°F to +158°F (-40°C to +70°C)
- **Storage temperature range:** -40°F to +176°F (-40°C to +80°C)
- **Display:** 2x16 character LCD, LED backlight, transflective
- **Display op. range:** -22°F to +176°F (-30°C to +80°C)
- **Agency listing:** cULus acc. to UL873, CAN/CSA C22.2, No. 24-93
- **Energy code compliant:** ASHRAE 90.1, CA Title 24, NECB

**Dimensions (Inches [mm])**

**Input/Output Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
<th>Electrical Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>R</td>
<td>Supply Hot</td>
<td>24 VAC, ± 20%, 50/60Hz</td>
</tr>
<tr>
<td>Input</td>
<td>G</td>
<td>Fan Signal (occupied)</td>
<td>On/Off, 24 VAC, ± 20%, 50/60Hz</td>
</tr>
<tr>
<td>Input</td>
<td>C</td>
<td>Supply Common</td>
<td>Common</td>
</tr>
<tr>
<td>Input</td>
<td>Y1</td>
<td>Cooling requirement Stage 1</td>
<td>On/Off, 24 VAC, ± 20%, 50/60Hz</td>
</tr>
<tr>
<td>Input</td>
<td>Y2</td>
<td>Cooling requirement Stage 2</td>
<td>On/Off, 24 VAC, ± 20%, 50/60Hz</td>
</tr>
<tr>
<td>Input</td>
<td>W1</td>
<td>Heating requirement Stage 1</td>
<td>On/Off, 24 VAC, ± 20%, 50/60Hz</td>
</tr>
<tr>
<td>Input</td>
<td>SAT</td>
<td>Supply Air Temperature Sensor</td>
<td>Type: 10K NTC (Type II thermistor)</td>
</tr>
<tr>
<td>Input</td>
<td>OAT</td>
<td>Outdoor Air Temperature</td>
<td>Type: 10K NTC (Type II thermistor)</td>
</tr>
<tr>
<td>Input</td>
<td>OAH</td>
<td>Outdoor Air Humidity</td>
<td>0-10 VDC Auto Detection: Sensor present if voltage 0.5V-10V</td>
</tr>
<tr>
<td>Input</td>
<td>RAT</td>
<td>Return Air Temperature</td>
<td>Type: 10K NTC (Type II thermistor)</td>
</tr>
<tr>
<td>Input</td>
<td>RHA</td>
<td>Return Air Humidity</td>
<td>0-10 VDC Auto Detection: Sensor present if voltage 0.5V-10V</td>
</tr>
<tr>
<td>Output</td>
<td>CC1</td>
<td>Compressor 1 RTU Stage 1 Mechanical Cooling Circuitry</td>
<td>100/000 cycles @ inrush current of 3A, normal current 1.5A Impedance for Auto detection @ 24 V: &lt;600 Ω @ 60Hz &lt;800 Ω @ 50Hz</td>
</tr>
<tr>
<td>Output</td>
<td>CC2</td>
<td>Compressor 2 RTU Stage 2 Mechanical Cooling Circuitry</td>
<td>100/000 cycles @ inrush current of 3A, normal current 1.5A Impedance for Auto detection @ 24 V: &lt;600 Ω @ 60Hz &lt;800 Ω @ 50Hz</td>
</tr>
<tr>
<td>Output</td>
<td>Act 1</td>
<td>Actuator supply common</td>
<td>Common</td>
</tr>
<tr>
<td>Output</td>
<td>Act 2</td>
<td>Actuator supply hot</td>
<td>24 VAC, 50/60Hz</td>
</tr>
<tr>
<td>Output</td>
<td>Act 3</td>
<td>Actuator control output</td>
<td>2-10 VDC</td>
</tr>
<tr>
<td>Output</td>
<td>Act 4</td>
<td>Actuator feedback signal</td>
<td>2-10 VDC</td>
</tr>
</tbody>
</table>

*The power consumption is for the control only and does not include connected loads such as actuator, compressors, fans, and sensors. For transformer sizing, the power consumption of these attached components must be included.*

** At low temperature the display has decreased response time. Below -22°F [-30°C] it will not function.
When the thermostat is not equipped with occupancy control, "Fan On" output "G" shall be wired to the ECON-ZIP-BASE.

W1 must be wired for Heat Pump operation if conventional thermostat is used in conjunction with Defrost Board. If Thermostat and RTU use O/B control reversing valve position, O/B must be wired to W1 on ECON-ZIP-BASE.

Existing refrigeration safety devices may exist, consult RTU wiring diagram.

If RTU is not a Heat Pump using a conventional thermostat and it is desired to record heating operation hours, connect W1 to ECON-ZIP-BASE.

Actuators can be mounted in parallel with the ACT3 output from the ZIP Economizer. The ACT5 feedback input should be wired to the Outside Air Damper actuator feedback wire.

Power source should be the same as ECON-ZIP-BASE.

When the thermostat is not equipped with occupancy control, "Fan On" output "G" shall be wired to the ECON-ZIP-BASE.

W1 must be wired for Heat Pump operation if conventional thermostat is used in conjunction with Defrost Board. If Thermostat and RTU use O/B control reversing valve position, O/B must be wired to W1 on ECON-ZIP-BASE.

Existing refrigeration safety devices may exist, consult RTU wiring diagram.

If RTU is not a Heat Pump using a conventional thermostat and it is desired to record heating operation hours, connect W1 to ECON-ZIP-BASE.

Actuators can be mounted in parallel with the ACT3 output from the ZIP Economizer. The ACT5 feedback input should be wired to the Outside Air Damper actuator feedback wire.
Wiring Diagrams

**Differential Dry Bulb**

- Power source should be the same as ECON-ZIP-BASE.
- When the thermostat is not equipped with occupancy control, "Fan On" output "G" shall be wired to the ECON-ZIP-BASE.
- W1 must be wired for Heat Pump operation if conventional thermostat is used in conjunction with Defrost Board.
- If RTU is not a Heat Pump using a conventional thermostat and it is desired to record heating operation hours, connect W1 to ECON-ZIP-BASE.
- Existing refrigeration safety devices may exist, consult RTU wiring diagram.
- W1 must be wired for Heat Pump operation if conventional thermostat is used in conjunction with Defrost Board.
- Actuators can be mounted in parallel with the ACT3 output from the ZIP Economizer. The ACT5 feedback input should be wired to the Outside Air damper actuator feedback wire.

**Differential Enthalpy**

- Power source should be the same as ECON-ZIP-BASE.
- When the thermostat is not equipped with occupancy control, "Fan On" output "G" shall be wired to the ECON-ZIP-BASE.
- W1 must be wired for Heat Pump operation if conventional thermostat is used in conjunction with Defrost Board.
- If RTU is not a Heat Pump using a conventional thermostat and it is desired to record heating operation hours, connect W1 to ECON-ZIP-BASE.
- Existing refrigeration safety devices may exist, consult RTU wiring diagram.
- Actuators can be mounted in parallel with the ACT3 output from the ZIP Economizer. The ACT5 feedback input should be wired to the Outside Air damper actuator feedback wire.
**ECON-ZIP-EM**

**ZIP Economizer™ Energy Module**

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**Technical Data**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>24 VAC ± 20%, 50/60Hz, class 2 power source</td>
</tr>
<tr>
<td>Power consumption rating*</td>
<td>1.5 VA (ECON-ZIP-EM), 5.5 VA (ECON-ZIP-BASE + ECON-ZIP-EM)</td>
</tr>
<tr>
<td>Connectors</td>
<td>1/4” male spade connectors</td>
</tr>
<tr>
<td>Environmental</td>
<td>RoHS, conformally coated</td>
</tr>
<tr>
<td>Indoor fan speed selection</td>
<td>100,000 cycles @ inrush current of 3A, normal current 1.5A</td>
</tr>
<tr>
<td>Exhaust fan selection</td>
<td>100,000 cycles @ inrush current of 3A, normal current 1.5A</td>
</tr>
<tr>
<td>Supported CO₂ sensor input</td>
<td>0-10 VDC, sensor auto-detection, 0-2000ppm</td>
</tr>
<tr>
<td>Auxiliary input - purge contact</td>
<td>on/off - 24 VAC, 50/60Hz - current load min 10mA</td>
</tr>
<tr>
<td>Auxiliary input - remote potentiometer</td>
<td>2-10VDC</td>
</tr>
<tr>
<td>Humidity</td>
<td>5 to 95% RH non-condensing</td>
</tr>
<tr>
<td>Housing</td>
<td>NEMA 1</td>
</tr>
<tr>
<td>Housing material</td>
<td>UL94-SVA</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>-40°F to +158°F (-40°C to +70°C)</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-40°F to +176°F (-40°C to +80°C)</td>
</tr>
<tr>
<td>Agency listing</td>
<td>cULus acc. to UL873, CAN/CSA C22.2, No. 24-93</td>
</tr>
</tbody>
</table>

*The power consumption is for the control only and does not include connected loads such as actuators, compressors, fans, and sensors. For transformer sizing, the power consumption of these attached components must be included.*

---

**Input/Output Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
<th>Electrical Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>CO₂ +/-</td>
<td>CO₂ sensor input</td>
<td>0-10 VDC Sensor auto-detection</td>
</tr>
<tr>
<td>Output</td>
<td>IF</td>
<td>Indoor fan low speed enable</td>
<td>100,000 cycles @ inrush current of 3A, normal current 1.5A</td>
</tr>
<tr>
<td></td>
<td>EF</td>
<td>Exhaust fan enable</td>
<td>100,000 cycles @ inrush current of 3A, normal current 1.5A</td>
</tr>
<tr>
<td>Input</td>
<td>AUX1 ±</td>
<td>Auxiliary input Purge contact input</td>
<td>On/Off, 24 VAC, 50/60 Hz Current load min. 10mA</td>
</tr>
<tr>
<td>Input</td>
<td>AUX2 ±</td>
<td>Auxiliary input Remote Potentiometer Input</td>
<td>2-10 VDC</td>
</tr>
</tbody>
</table>

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**Dimensions (Inches [mm])**

![Dimensions Diagram]
ECON-ZIP-EM
ZIP Economizer™ Energy Module

Wiring Diagram

Power source should be the same as ECON-ZIP-BASE.

W1 must be wired for Heat Pump operation if conventional thermostat is used in conjunction with Defrost Board.
If Thermostat and RTU use O/B control reversing valve position, O/B must be wired to W1 on ECON-ZIP-BASE.

Not supplied by Belimo.

Sold separately by Belimo.
ECON-ZIP-COM
ZIP Economizer™ Communication Module

Technical Data

<table>
<thead>
<tr>
<th>Power supply</th>
<th>24 VAC ± 20%, 50/60Hz, class 2 power source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption rating*</td>
<td>2.5 VA (ECON-ZIP-COM), 6.5 VA (ECON-ZIP-BASE + ECON-ZIP-COM)</td>
</tr>
<tr>
<td>Connectors</td>
<td>1/4&quot; male spade connectors</td>
</tr>
<tr>
<td>Environmental</td>
<td>RoHS, conformally coated</td>
</tr>
<tr>
<td>Communication interface</td>
<td>RS485 interface, optical isolation max. 1KVDC (for max.1 min), Pin 4: RS485 Com Gnd, Pin 7: RS485 Com A, Pin 8: RS485 Com B</td>
</tr>
<tr>
<td>Supported remote alarm</td>
<td>normal current: 0.5A, inrush current: 1A</td>
</tr>
<tr>
<td>Humidity</td>
<td>5 to 95% RH non-condensing</td>
</tr>
<tr>
<td>Housing</td>
<td>NEMA 1</td>
</tr>
<tr>
<td>Housing material</td>
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Input/Output Specifications

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<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
<th>Electrical Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O</td>
<td>Comm</td>
<td>Communication Interface</td>
<td>RS485 Interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Optical Isolation max. 1k VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(for max. 1min)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pin 4: RS485 Com Gnd, Pin 7: RS485 Com A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pin 8: RS485 Com B</td>
</tr>
</tbody>
</table>

Relay

<table>
<thead>
<tr>
<th>ALM</th>
<th>ALM</th>
<th>Diagnostic Alarm Dry Contact</th>
<th>Relay contact 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Normal current: 0.5A, Inrush current: 1A</td>
</tr>
</tbody>
</table>

Dimensions (Inches [mm])

[Dimensions diagram]
Avoid mounting in areas where acid fumes or other deteriorating vapors can attack the metal parts, or in areas where escaping gas or other explosive vapors are present.

Mount the sensor in a position that will allow for proper clearance for installation, servicing, wiring, and removal.

Using the dimensions as a reference, mount the 10K Sensor on the outside of the dampers to measure outside temperature, or inside the return air duct to measure the return temperature. If mounted outside, the sensor must be placed within hood behind the outdoor air filter. It needs to be protected from direct exposure to water (snow/rain) and direct exposure to sunlight (UV radiation).

Secure the sensor with #8 self-tapping screws (included in kit) using a size 16 or 18 drill.

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### Technical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature output signal</td>
<td>NTC 10k Ohm, Type II</td>
</tr>
<tr>
<td>Connectors</td>
<td>1/4&quot; female spade insulated connectors, 3 ft. cable</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 0.36°F (± 0.2°C)</td>
</tr>
<tr>
<td>Stability drift</td>
<td>less than 0.036°F/yr (0.02°C/yr)</td>
</tr>
<tr>
<td>Material</td>
<td>etched Teflon, plenum-rated &amp; FEP jacketed cable; galvanized t-bracket</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>-67°F to +176°F (-55°C to +80°C)</td>
</tr>
</tbody>
</table>

### Wiring Diagram

![Wiring Diagram](image)

---

### Dimensions in Inches [mm]

![Dimensions Diagram](image)
ECON-ZIP-TH
ZIP Economizer™ Temperature and Humidity Sensor

**Installation**

Avoid mounting in areas where acid fumes or other deteriorating vapors can disintegrate the metal parts of the module’s circuit board, or in areas where escaping gas or other explosive vapors are present.

You must mount the sensor in a position that will allow for proper clearance for installation, servicing, wiring, and removal.

Using the dimensions as a reference, mount the Temperature and Humidity Sensor on the outside of the dampers to measure outside temperature and humidity, or inside the return air duct to measure the return temperature and humidity. If mounted outside, the sensor must be placed within hood behind the outdoor air filter. It needs to be protected from direct exposure to water (snow/rain) and direct exposure to sunlight (UV radiation).

The orientation of the sensor is critical to ensure optimal performance. (Please see figures on recommended orientation.)

Ensure installation matches an approved orientation before securing with #8 self-tapping screws (included in kit).

The electrical connection needs to be wired using appropriate insulated spade connectors, ¼” female, according to the wiring diagram.

### Technical Data

- **Power Supply:** 24 VAC ± 20%, 50/60Hz, Class 2 power source
- **Current Consumption:** Max. 5mA
- **Rated Impulse Voltage:** 800V
- **Connectors:** 1/4” male spade connectors
- **Environmental:** RoHS conformally coated
- **Software Class:** A
- **Control Pollution Degree:** 3
- **Temperature Sensor Type:** NTC 10kOhm
- **Humidity:** 0 to 100% RH
- **Humidity Sensor Type:** 0-10VDC (0 to 100% RH) max load 10kOhm, Class 2 limited energy
- **Housing:** NEMA 1
- **Ambient Temperature Range:** -40°F to +140°F (-40°C to +60°C)
- **Storage Temperature Range:** -40°F to +158°F (-40°C to +70°C)
- **Accuracy:** ± 3% (5-95% RH @ 75°F)
- **Response Time:** <45 seconds @ 40 FPM, 75°F
- **Hysteresis:** <2.5% RH
- **Long Term Stability:** <1% RH/year
- **Agency Listing:** UL60730-1,-2-9,-2-13, UL2043 compliant, CE 2004/108/EC “Electromagnetic compatibility (EMC)”, EN60730-1,-2-9 and-2-13

### Dimensions (Inches [mm])

- 2.76 [70]
- 2.22 [56.4]
- 0.9 [22.9]
- 3.77 [96.7]
- 3.35 [85]

### Input/Output Specifications

#### Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
<th>Electrical Specification</th>
<th>ZIP Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>24V</td>
<td>Supply Hot</td>
<td>24 VAC, ± 20%, 50/60Hz</td>
<td>Same Power Supply R</td>
</tr>
<tr>
<td>Output</td>
<td>T(+/−)</td>
<td>Temperature</td>
<td>Type: 10K NTC (Type II thermistor)</td>
<td>DAT (+/−); RAT (+/−)</td>
</tr>
<tr>
<td>Output</td>
<td>RH(+/−)</td>
<td>Relative Humidity</td>
<td>0-10 VDC</td>
<td>DAH (+/−); RAH (+/−);</td>
</tr>
</tbody>
</table>

---

12
Quick Setup

⚠️ **WARNING Live Electrical Components!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

**Installation**

1. Shut off power to RTU before beginning installation.
2. Note orientation, opening rotation, and spring return rotation of damper assembly. Mount Actuator to Outside Air and Return Damper assembly. To ensure tight outside air shutoff; while tightening actuator clamp push damper closed.
3. Terminate required Inputs and Outputs(I/O): For the ZIP Economizer to function correctly, the following I/O, at a minimum, are required to be terminated, wired, and functioning (R, C, Y1, Y2, G, CC1, SAT, CC1, ACT2, ACT3, ACT5). See wiring diagrams.

**Settings**

“Settings” is the menu displayed when the ZIP Economizer is first powered. Press “OK” to parameterize required settings. Reference above Keypad Key definition instructions and navigate as needed.

**Functions**

1. “Monitor Live Conditions” is used to display settings and live values.
2. “Settings” is used to parameterize the ZIP Economizer. (Note: Devices 1 is for CC1, CC2, EF, IF; Devices 2 is for OAH, RAH)
3. “Present Devices” is used to verify that the ZIP Economizer’s Auto Detected connections are terminated properly. If connected device is not shown, verify wiring. If wiring has continuity and device is verified operational re-enter “Settings” and enable missing device by changing from “Auto” to “Available” or “Installed”.
4. “Alarms” is used to view current and historical alarms and delete inadvertently caused alarms.
5. “Service and Commissioning” submenu is used to operate the RTU in “Manual Mode” or to perform “Acceptance Test”. “Settings” must to be completed to access.
6. “Status” is a display of the current operating mode. It can be accessed by pressing “esc”. The action of pressing any key will drop the user down from Status to the next level, so repeatedly pressing “esc” will toggle the display between Status and Monitor Live Conditions. (Note: If status “Setup incomplete” is displayed the RTU cooling operation will be disabled and additional parameters must be set to achieve “Setup complete”.)

**MMI Keypad**

- **Enter sub menu level.**
- **Start editing a setting.**
- **Store an entered value.**
- **Moves up through the menu on the same level.**
- **Will increase values by one increment at a time.**
- **When setting values holding key down will fast scroll.**
- **Moves down through the menu on the same level.**
- **Will decrease values by one increment at a time.**
- **When setting values holding key down will fast scroll.**
- **Esc**
- **Escape sub menu to next higher level.**
- **Cancel current actions.**
- **Show additional information on the current menu Item when “i” appears in lower right of display.**

**Setup incomplete**
Quick Setup

Required "Settings" Parameters for All Configurations

**Note:** you may enter parameters in any order - eg: Vent min Pos before ZIP Code - If the RTU is a heat pump or uses a 2 speed indoor fan, these parameters should be enabled first, otherwise the logic may go to Setup Complete prematurely.

1. ZIP Code US or Canada (sets the free cooling changeover high limit and temperature units F/C)
   a. When the Zip Code submenu is displayed enter “OK” to begin “US” Zip Code parameterization. If “Canada” Postal Code is desired press the up/down arrow to access.
      i. Press OK to access digit 1 (flashing) then use the up/down arrow to parameterize; enter OK when complete. Repeat until all digits are complete. If a mistake is made press “esc” and repeat from beginning
         [Image 39x507 to 137x528]
      ii. When all Zip Code or Postal Code digits are entered press “esc” to move up a level then press the up/down arrow to access next settings parameter.
   
2. Vent Min Pos (Outdoor Air Damper Ventilation Minimum Position)
   a. When the “Vent Min Pos” submenu is displayed press “OK” to parameterize (flashing).
      [Image 18x666]
   b. Use the up/down arrow to parameterize, press “OK” when complete.
      The actuator will immediately drive the damper to the minimum position.

3. Additional Parameters may require setting. The ZIP Economizer will automatically detect added devices such as a CO2 sensor etc. When the ZIP Economizer detects a new device, it will prompt the user in the Status level; navigate to Settings and parameterize blank fields. If the devices are connected upon first start up their settings will require parameterization then.

4. When all parameters have been set, the ZIP Economizer will show “Setup Complete” if there are still parameters to set, there will be no action. You can verify by pushing esc until status level is reached and it will display “Setup Incomplete”. If this is the case, re-enter settings menu and use up down arrows to find the parameter with blank fields and parameterize as described above.

Setup Complete - Initializing Automatic Mode

1. When all entries have been completed, the ZIP Economizer will switch to Status display and show “Setup Complete”, and will immediately show a “Damper scaling starts in 10secs” and will countdown to 0 (be aware, at 0 the damper will start to move at high speed). A message will scroll saying “Damper scaling for better operation if obstruction is present rescale damper in commissioning menu”. (For detailed instructions on this – please see the section “Service and Commissioning” below. This will open damper to 100% (re-scale control signal if needed). (Note: failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.)

Once scaling is complete, a message will appear saying “Damper scaling successful”. The ZIP will then show “maximum at 80° = 100%” That message will show maximum rotation of the damper. This process ensures the damper is always operating and displayed from 0-100%.

2. Once the message has appeared, the actuator immediately closes the damper and a countdown begins, until the unit starts to operate in Automatic Mode (be aware, when countdown complete, the RTU will respond to thermostat calls which may enable mechanical cooling).

Service and Commissioning (Acceptance Test & Manual Mode)

The ZIP Economizer has built-in commissioning processes found in Acceptance Test.

1. **Economizer Test.** Use “Economizer Test” to verify RTU Integrated Economizer operation. Navigate to the “Service and Commissioning” menu, press “OK”; press the down arrow to access “Acceptance Test”. Press OK again when “Economizer Test” appears. Press “OK” again to confirm running test. Follow prompts during test. This test will open damper to 100%, enable power exhaust fan (if connected), enable 1st stage of Mechanical Cooling, reverse this process and then drive to Vent Min Position. When used with a Belimo actuator, the actuator will speed up to reduce test time.

2. **Manual Mode** is used to override outputs after entering a “Timeout” duration.

3. **Damper Scaling**. The test will re-scale the control signal range to maximum resolution (0-100%) over the calibrated (reduced) angle. When using a Belimo actuator, the actuator will speed up to reduce test time.

   **Note:** Failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.

   **Note:** Additional testing can be found on page 36 of this document.
Before Getting Started

ECON-ZIP-EM and CO₂ sensor can be added during or after initial set up.

1. A CO₂ sensor is needed with the following characteristics:
   a. Output that is 0-10 VDC
   b. Range of 0-2000ppm
2. Attach the Energy Module ECON-ZIP-EM to the ZIP Economizer ECON-ZIP-BASE.

Wiring CO₂ Sensor to ZIP Economizer

1. Wire CO₂ sensor 0-10 VDC output to ECON-ZIP-EM CO₂ sensor input.
2. Wire CO₂ sensor power.
   Note: If RTU transformer VA is sufficient R/C terminals may be used on ZIP Economizer.

Setting PPM range (only required if sensor is configurable for other ranges).

<table>
<thead>
<tr>
<th>Type of Output</th>
<th>Ventilation Rate (cfm/Person)</th>
<th>Analog Output</th>
<th>CO₂ Control Range (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional</td>
<td>Any</td>
<td>0-10V</td>
<td>0-2000</td>
</tr>
</tbody>
</table>

4. Power RTU and enter Settings Menu.
   Note: When the CO₂ sensor is powered and 0-10 VDC is available at CO₂+ and CO₂, the ZIP Economizer will recognize the CO₂ presence and the prompt to set up CO₂ settings.

5. Setting DCV settings.
   a. With single speed indoor fan, only 2 DCV settings are required.
      i. DCV Min Pos – This is the minimum occupied or zero occupancy ventilation rate expressed in damper percent open (Title 24 2013 section 120.1(b)(2); ASHRAE 62.1 Section 6.2.7).
      
         DCV Min Pos

         __% __%

   ii. CO₂ PPM Set Pnt – This is the CO₂ concentration that is desired in the space (Title 24 2013 section 120.1(c)(4), prescribed as 600ppm plus outdoor air CO₂ concentration assumed to be 400ppm = a set point of 1000ppm).

      DCV PPM Set Pnt.

      __PPM

      __%

Operation

The ZIP Economizer logic will control the outside air damper position based on space CO₂ dilution needs. If the CO₂ value is low, the damper shall remain at DCV Min Pos when not in free cooling. When the CO₂ concentration rises above the CO₂ PPM Set Pnt (as the space becomes more populated), then the damper will start to modulate towards Vent Min Pos to maintain level at CO₂ PPM set Pnt. When the CO₂ concentration drops in the space (the space population decreases) the damper will start to modulate back towards DCV Min Pos.

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**Setup and Configuration**

2-Speed Fan Setup

---

**Before Getting Started**

Setting up the ZIP Economizer with Variable Frequency Drive.

1. You will need a VFD rated for supply fan HP.
2. You will need to have a ZIP Economizer ECON-ZIP-BASE and an Energy Module ECON-ZIP-EM.
3. You will also need a separate SPDT relay for integration, and SPST for fan enabling.

**Wiring VFD to ZIP Economizer**

Wire the VFD according to the manufacturer’s instructions. Ensuring line voltage to the drive, and wiring the output of the VFD to motor per diagram.

Verify that the motor rotation is correct. If not, switch 2 of 3 wires from VFD to motor.

1. Locate the VFD Digital Inputs, as well as any pertinent High, Low Speed Designation.

**Example VFD Terminal Designations**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Drive Control Terminal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>Auxiliary output 24 VDC / 250 mA (reference to GND), short circuit protected.</td>
</tr>
<tr>
<td>GND</td>
<td>Auxiliary voltage output common</td>
</tr>
<tr>
<td>DCOM</td>
<td>Digital input common. Jumper to GND.</td>
</tr>
<tr>
<td>DI1</td>
<td>Start/stop. Jumper to +24V.</td>
</tr>
<tr>
<td>DI2</td>
<td>Program to 40 Hz. Wire to SPDT NO contact.</td>
</tr>
<tr>
<td>DI3</td>
<td>Program to 60 Hz. Wire to SPDT NC contact.</td>
</tr>
<tr>
<td>UI4</td>
<td>Safety interlock. Jumper to +24V.</td>
</tr>
</tbody>
</table>

The control circuit inputs to the VFD are 24 VDC signals. This voltage is sourced from the VFD at its terminal strip X1, +24V. The speed inputs are received at X1 terminals (DI--2) for low speed (40Hz) motor operation and (DI--3) for high speed (60Hz) motor operation. When neither input is present, the VFD will shut the fan motor off.

Utilizing the nomenclature from the example VFD Terminal Designations table, pull the following items from the terminal block for Digital Inputs:

2. Connecting them into the following, utilizing the IF connection at the ECON-ZIP-EM.

- Fan enable relay; single pole, single throw

![ECON-ZIP-EM Diagram](image)

3. Power RTU and enter Settings menu.

**Programming Indoor Fan Settings**

When a VFD is added, up to three (3) additional settings will be required.

a. Low Sp Vent Min – When a 2 Speed strategy is used to save energy, an additional Vent Min Pos needs to be entered for low speed operation due to less available static pressure from the fan. This position will be greater than Vent Min Pos, however equal the same measured airflow rate value.

b. Low Sp DCV Min - When a 2 Speed strategy is used to save energy, an additional DCV Min Pos needs to be entered for low speed operation due to less available static pressure from the fan. This position will be greater than DCV Min Pos, however equal the same measured airflow rate value.

c. Low Exh Fan Pos - When a 2 speed strategy is used to save energy, an additional Exh Fan Un Pos needs to be entered for low speed operation due to less available static pressure from the fan. This position will be greater than Exh Fan On Pos, however equal the same measured airflow rate value.

These values should be set to provide the same airflow of outside air (OA) and exhaust as when fan is operating at full speed. Due to less pressure generated by the fan, this value is typically a higher percentage open value.

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Configuring Multiple Actuators

When using the ZIP Economizer on a Rooftop Unit (RTU) that has more than one damper that is not mechanically linked, the ZIP Economizer can drive a maximum of (3) -SR actuators. The actuators must be wired in parallel with the ACT3 output from the ZIP Economizer. The ACT5 feedback input on the ZIP Economizer should be wired to the Outside Air Damper actuator feedback wire.

Wiring for the multiple actuator configuration is shown in the illustration below; please ensure to follow all warnings and cautions listed in the actuator mounting instructions. Any combination of TFB24-SR, LF24-SR, NFB24-SR, and AFB24-SR can be mounted in this arrangement.
Keypad Key Definition

- **Move up through the menu on the same level.** Will increase values by one increment at a time. When setting values holding key down will fast scroll.

- **Move down through the menu on the same level.** Will decrease values by one increment at a time. When setting values holding key down will fast scroll.

- **OK**
  - Enter sub menu level.
  - Start editing a setting.
  - Store an entered value.
  - Escape sub menu to next higher level. Cancel current actions.

- **i**
  - Show additional information on the current menu item when "i" appears in lower right of display.

### Status Line(1)

Example:
- Free Cooling
- Dmp 40% OAT 70F

---

(1) The status line presents the current status of the economizer including contextual information like temperatures, damper position or compressor start / stop requests. Additionally, newly detected sensors, device, and active alarm conditions get shown.

(2) Only displayed after setup has been completed, else navigation jumps over this menu.

(3) Settings is the first menu displayed when the ZIP Economizer is first powered and has not been previously setup.
ZIP Economizer
Menu Sequence Documentation

Settings

Status line

Any key

Monitor Live
Conditions

OK
esc

Settings

Present Devices

OK
esc

Alarm

OK
esc

Service and
Commissioning

esc

Sub menu

1) Only present if device is connected and functioning.
2) Only present after setup has been completed, else navigation jumps over this menu.
3) Only one value displayed at a time.
4) Unit depends on selected temperature scale and is auto selected by US / Canada, ZIP/Postal code, (°F & Btu/lb or °C & kJ/kg).
5) Press esc button from any sub menu item.
6) Press OK to change a setting on lowest menu level into editing mode.
7) Only present during initial setup- see menu table for additional information
8) Only visible when Purge Enable is On.
9) Only displayed with enthalpy configurations.

OK
esc

ZIP Code
xxxxxx

Heat Pump Op
HP(O)=pow=Cool(1)
HP(B)=pow=Heat(1)
HP(W1)=pow=Heat(1)
Off(1)

Compressors
Selected/
Detected
Message(1)

Devices 1
CC1(1) CC2(2) ES(1) f(1)

Devices 2
OAH(1) RAH(1)

Vent Min Pos
xxxx%

DCV Min Pos(1)
xxxx%

DCV PPM Set Point(1)
xxxxppm

2 Speed Fan Op
On(1)
Off(1)

Low Sp Vent Min(1)
xxxx%

Low Sp DCV Min(1)
xxxx%

Exh Fan On Pos(1)
xxxx%

Low Exh Fan Pos(1)
xxxx%

Temp Unit
°F(1)
°C(1)

Purge Enable
On(1)
Off(1)

Purge Dmp Set(1)
xxxx%

Remote Dmp Ctrl
On(1)
Off(1)

High Limit
Modification(1)

SAT Y2 Limit
On(1)
Off(1)

Fan 2Speed
auto(1)
not available(1)
available(1)

Compressor Qty
auto(1)
1(1)
2(1)

Exh Fan Install
auto(1)
not installed(1)
installed(1)

OAH Sensor
Auto(1)
not installed(1)
installed(1)

RAH Sensor
Auto(1)
not installed(1)
installed(1)

Economizing
disabled due to
sensor error(1)

Fixed dry bulb
Differential dry bulb
Fixed enthalpy +
Fixed dry bulb
Diff enthalpy +
Fixed dry bulb

High Limit
xx°F
xx°C
xx.xBtu/lb
xx.xkJ/kg

High Limit
xx°F
xx°C

© Belimo Aircontrols (USA), Inc.
**Present Devices**

**Status line**

- Monitor Live Conditions
- Settings
- Present Devices
- Alarm
- Service and Commissioning

**Sub menu**

- Compressor 1
- Compressor 2
- Exh Fan Install
- Fan 2 Speed
- CO2 Sensor
- OAH Sensor
- OAT Sensor
- RAH Sensor
- RAT Sensor
- SAT Sensor
- Energy Module
- Connected
- Not Connected
- Com Module
- Connected
- Not Connected

1) Only displayed if device is connected and functioning.
2) Only displayed after setup has been completed, else navigation jumps over this menu.
3) Only one value below 1st row is displayed on 2nd row at any one time.
4) Press esc button from any sub menu item.
Alarms

Status line

Monitor Live Conditions  Settings  Present Devices  Alarm  Service and Commissioning

Sub menu

Current Alarms  Historic Alarms  Delete Alarms

- ONLY displayed if an alarm exists.
- Only displayed when historic alarms exist.
- Only displayed if there is any alarm to delete.
- Only displayed after setup has been completed, else navigation jumps over this menu.
- Press esc button from any sub menu item.
Status line “Manual Mode”

1) Only displayed if acceptance test or manual mode is active. If not displayed navigation jumps over this entry.
2) Only displayed after setup has been completed.
3) Only displayed if device is connected and functioning.
4) Press OK to change value.
Economizer Test

Status line

Return to Automatic
Monitor Live Conditions
Settings
Present Devices
Alarm
Service and Commissioning

Acceptance Test

(1) Only displayed if acceptance test or manual mode is active. If not present navigation jumps over this entry. Must press OK to return to automatic.
(2) Only displayed after setup has been completed.
(3) Only displayed if a compressor is running. During this test the compressor (CC1) will run for 60 seconds.
(4) Only displayed if compressor not yet started.
(5) Only displayed if exhaust fan is present.
(6) During the damper stroke, it will scale the damper 0-100%. If the rotation is less than 90° there will be up to a 90 second delay till you are asked to confirm damper opening.
Ventilation Test

Status line
“Acceptance Test”

- Return to Automatic
- Monitor Live Conditions
- Settings
- Present Devices
- Alarm
- Service and Commissioning

You may use the Settings menu & Monitor menu to set & verify Ventilation rate push ok to go to menus esc to quit

Push ok disable Econominator OK

RTU Test

Status line
“Acceptance Test”

- Return to Automatic
- Monitor Live Conditions
- Settings
- Present Devices
- Alarm
- Service and Commissioning

You may now Perform RTU Test
Push esc to return to auto

Push ok disable DCV
Push ok disable Econominator

OK

OK

OK

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DCV Test

Status line
“Acceptance Test”

Monitor Live Conditions ➔ Settings ➔ Present Devices ➔ Alarm ➔ Service and Commissioning

Acceptance Test

Up/Down arrow past other tests

Push OK to run DCV Test
Push ESC to run Manual Mode

DCV Test

DCV Dmp xxx% CO2 xxxx

Push OK to disable Economizer

Push OK to return to Automatic

Any key

Damper Scaling

Status line

Monitor Live Conditions ➔ Settings ➔ Present Devices ➔ Alarm ➔ Service and Commissioning

Acceptance Test ➔ Manual Mode

Damper Scaling

Damper scaling for better operation if obstruction is present. Rescale damper in commissioning menu.

Damper scaling successful

Maximum at XX° = 100%

Unit starts in XX sec

Any key

(1) Only displayed if acceptance test or manual mode is active. If not present navigation jumps over this entry. Must press OK to return to automatic.

(2) Only displayed after setup has been completed.

(3) Only displayed if device is connected and functioning.

(4) Only displayed after setup has been completed.
## Settings

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Parameter</th>
<th>Default</th>
<th>Range</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zip Code(^1)</td>
<td>US</td>
<td>00000</td>
<td>5 Digit Num</td>
<td>Setting of either US or Canada code required for Economizer Operation. Setting the ZIP code automatically configures the economizer high limit change over temperature to comply with local energy code. If the user desires a different high limit value, this can be modified in the “settings” menu under “high limit modification”.</td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>00000</td>
<td>6 Digit Alpha/Num</td>
<td>Setting of either US or Canada code required for Economizer Operation. Setting the ZIP code automatically configures the economizer high limit change over temperature to comply with local energy code. If the user desires a different high limit value, this can be modified in the “settings” menu under “high limit modification”.</td>
</tr>
<tr>
<td>Heat Pump Op</td>
<td>Heat Pump Op</td>
<td>Off</td>
<td></td>
<td>If the RTU that the economizer is installed in, is a heat pump, then this value shall be set to one of the following: (O) = Reversing valve powered for cooling. (B) = Reversing valve powered for heating. (W1) = Standard thermostat, reversing valve controlled by internal RTU defrost board.</td>
</tr>
<tr>
<td>Compressor Qty(^2)</td>
<td>Number of Compressors</td>
<td>Auto(^2)</td>
<td>No compressor detected Compressor 1 detected Compressor 2 but no Compressor 1 detected Compressors 1 and 2 detected Compressors 1 and 2 selected Compressor 1 selected</td>
<td>Message appears only during initial setup. If No Compressor is detected, verify wiring, check continuity, if all is correct, push OK to set quantity. If only 1 compressor is detected, and there are 2 installed verify wiring, check continuity, if all is correct, push OK to set quantity.</td>
</tr>
<tr>
<td>Devices 1 CC1, CC2, IF, EF, (as connected)</td>
<td>Fan 2 Speed(^4)</td>
<td>Auto(^2)</td>
<td>Auto, Available, Not Available</td>
<td>Allows for 2 speed indoor fan control circuit (IF) to be automatically detected when wired. If circuit is not automatically detected, the functionality can be manually enabled by choosing “available.” If there is a desire to disable functionality for any reason, the operator can choose “not available” and the operation of the economizer will function as if the device is not installed or configured.</td>
</tr>
<tr>
<td></td>
<td>Compressor Qty(^2)</td>
<td>Auto(^2)</td>
<td>Auto, 1, 2</td>
<td>Allows for up to 2 compressor circuits (CC1, CC2) to be automatically detected when wired. If circuit is not automatically detected, the functionality can be manually enabled by setting compressor Qty to 1 or 2.</td>
</tr>
<tr>
<td></td>
<td>Exh Fan Install(^4)</td>
<td>Auto(^2)</td>
<td>Auto, Installed, Not Installed</td>
<td>Allows for exhaust fan control circuit (EF) to be automatically detected when wired. If circuit is not automatically detected, the functionality can be manually enabled by choosing “available.” If there is a desire to disable functionality for any reason, the operator can choose “not available” and the operation of the economizer will function as if the device is not installed or configured.</td>
</tr>
<tr>
<td>Devices 2 OAH, RAH, (as connected)</td>
<td>OAH(^6)</td>
<td>Auto(^2)</td>
<td>Auto, Installed, Not Installed</td>
<td>Allows for the Outside Air Humidity Sensor to be automatically detected when wired for enthalpy change over strategy. If the sensor is not automatically detected, the humidity sensor can be manually enabled by choosing “installed.” If there is a desire to disable functionality for any reason, the operator can choose “not installed”, and the operation of the economizer will function as if the device is not installed or configured.</td>
</tr>
<tr>
<td></td>
<td>RAH(^2)</td>
<td>Auto(^2)</td>
<td>Auto, Installed, Not Installed</td>
<td>Allows for the Return Air Humidity Sensor to be automatically detected when wired for differential enthalpy change over strategy. If the sensor is not automatically detected, the humidity sensor can be manually enabled by choosing “installed.” If there is a desire to disable functionality for any reason, the operator can choose “not installed,” and the operation of the economizer will function as if the device is not installed or configured.</td>
</tr>
</tbody>
</table>

\(^1\) ZIP Code is required for Economizer Operation. Setting the ZIP code automatically configures the economizer high limit change over temperature to comply with local energy code. If the user desires a different high limit value, this can be modified in the “settings” menu under “high limit modification”.

\(^2\) Compressor Qty can be manually enabled by choosing “available.” If there is a desire to disable functionality for any reason, the operator can choose “not available” and the operation of the economizer will function as if the device is not installed or configured.

\(^4\) Fan 2 Speed and Exh Fan Install can be manually enabled by choosing “available.” If there is a desire to disable functionality for any reason, the operator can choose “not available” and the operation of the economizer will function as if the device is not installed or configured.

\(^6\) OAH can be manually enabled by choosing “installed.” If there is a desire to disable functionality for any reason, the operator can choose “not installed” and the operation of the economizer will function as if the device is not installed or configured.
### ZIP Economizer

#### Menu Structure Tables

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Parameter</th>
<th>Default</th>
<th>Range</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent Min Pos&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Vent Min Pos</td>
<td>_ _ %</td>
<td>0-100%</td>
<td>Setting the minimum position required for Economizer Operation. This is where the outdoor damper minimum position is set. This is the position that the damper will travel to during occupied periods (when terminal G on economizer is powered). The amount of outdoor air is different per application. Please consult local ventilation codes. This setting is typically related to a calculation that determines amount of fresh air for building area and people (Vbz = Ventilation Breathing Zone per ASHRE 62.1). Actual airflow at a given position should be verified by field measurement.</td>
</tr>
<tr>
<td>DCV Min Pos&lt;sup&gt;b&lt;/sup&gt;</td>
<td>DCV Min Pos</td>
<td>_ _ %</td>
<td>0% - Vent Min Pos %</td>
<td>This is the Demand Control Ventilation minimum position. The DCV min pos is a value always less than the design ventilation position. This is the position that the damper will travel to during occupied periods (when terminal G on economizer is powered) when the measure CO2 Value is below the DCV PPM Set Pnt. The amount of outdoor air is different per application. Please consult local ventilation codes. This setting is typically related to a calculation that determines amount of fresh air for building area (Ra = outdoor airflow rate required per unit area per ASHRE 62.1) to allow continue flushing of VOCs during occupied periods. Actual airflow at a given position should be verified by field measurement.</td>
</tr>
<tr>
<td>DCV PPM Set Pnt&lt;sup&gt;c&lt;/sup&gt;</td>
<td>DCV PPM Set Pnt</td>
<td>_ _ ppm</td>
<td>500 - 2000 ppm</td>
<td>This is the CO2 concentration that is desired to maintain in the space. When the CO2 sensor measures a concentration below this value, the damper control point will be reset and the damper will modulate towards DCV Min Pos. When the measured CO2 level increases above this value, the damper will start to modulate towards the Vent Min Pos to lower the CO2 in the space.</td>
</tr>
<tr>
<td>2 Speed Fan Op</td>
<td>2 Speed Fan Operation</td>
<td>Off</td>
<td>On, Off</td>
<td>If the unit is factory installed with 2 speed fan capability, then this setting must be set to On to provide proper ventilation.</td>
</tr>
<tr>
<td>Low Sp Vent Min&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Low Sp Vent Min</td>
<td>_ _ %</td>
<td>&quot;Vent Min Pos&quot; % - 100%</td>
<td>When a 2 Speed strategy is used to save energy, an additional Vent Min Pos needs to be entered for low speed operation due to less available static pressure from the fan. This position will be greater than Vent Min Pos, however equal the same measured airflow rate value.</td>
</tr>
<tr>
<td>Low Sp DCV Min&lt;sup&gt;e&lt;/sup&gt;</td>
<td>Low Sp DCV Min</td>
<td>_ _ %</td>
<td>&quot;DCV Min Pos&quot; % - &quot;Low Sp Vent Min&quot; %</td>
<td>When a 2 Speed strategy is used to save energy, an additional DCV Min Pos needs to be entered for low speed operation due to less available static pressure from the fan. This position will be greater than DCV Min Pos, however equal the same measured airflow rate value.</td>
</tr>
<tr>
<td>Exh Fan On Pos&lt;sup&gt;f&lt;/sup&gt;</td>
<td>Exh Fan On Pos</td>
<td>_ _ %</td>
<td>0 - 100%</td>
<td>This is where the desired enable point for exhaust fan operation is set. As the outdoor damper increases or decrease past this position, the exhaust fan will be turned on or off.</td>
</tr>
<tr>
<td>Low Exh Fan Pos&lt;sup&gt;g&lt;/sup&gt;</td>
<td>Low Exh Fan Pos</td>
<td>_ _ %</td>
<td>0 - 100%</td>
<td>When a 2 Speed strategy is used to save energy, an additional Exh Fan On Pos needs to be entered for low speed operation due to less available static pressure from the fan. This position will be greater than Exh Fan On Pos, however equal the same measured space pressure.</td>
</tr>
<tr>
<td>Temp Unit</td>
<td>Temp Unit</td>
<td>°F</td>
<td>°F, °C</td>
<td>Allows the user to select Fahrenheit or Celsius temperature display. When the ZIP Economizer is set up with a Canadian Postal Code, the units are default to °C.</td>
</tr>
<tr>
<td>Purge Enable&lt;sup&gt;h&lt;/sup&gt;</td>
<td>Purge Control</td>
<td>Off</td>
<td>On, Off</td>
<td>This is where Pre-Occupancy purge control is enabled. Pre-Occupancy purge is a requirement in some codes to ventilate the building just prior to normal occupancy times. The function removes VOCs that have gathered in the building during unoccupied period when the Outside air damper is normally closed. Purge Control requires using the expansion energy module and a thermostat or other time driven control that will enable supply fan and provide 24V to Aux 1 during the desired purge period. Setting of “Purge Dmp Set” is required for the function to work.</td>
</tr>
<tr>
<td>Purge Dmp Set&lt;sup&gt;i&lt;/sup&gt;</td>
<td>Purge Dmp Set</td>
<td>_ _ %</td>
<td>0% - &quot;Vent Min Pos&quot; %</td>
<td>This determines the position that the damper will open to during Pre-Occupancy purge. This position is usually based what will achieve the desired number of air changes.</td>
</tr>
<tr>
<td>Remote Dmp Ctrl&lt;sup&gt;j&lt;/sup&gt;</td>
<td>Remote Dmp Ctrl</td>
<td>Off</td>
<td>On, Off</td>
<td>This is where an optional outdoor air damper position override can be enabled. Input into AUX2 is 2-10 VDC (2V damper closed - 10V 100% open). This function overrides all other damper position settings Except: not in Automatic, G not energized FP.</td>
</tr>
<tr>
<td>Menu Item</td>
<td>Parameter</td>
<td>Default</td>
<td>Range</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------</td>
<td>--------------------</td>
<td>------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>High Limit</td>
<td>High Limit Dry Bulb</td>
<td>ZIP Code Dependent</td>
<td>60-80°F</td>
<td>If the High Limit Change Over Setpoint that was determined by the ZIP Code setup is deemed to be not desirable for the application, then it can be modified here. With Differential Enthalpy, temperature can also be changed; offsets cannot. Note: a modification may result in less energy savings and non compliance with local energy code.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16-27°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Limit Fixed Entalp &amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 BTU/lb 47 kJ/kg</td>
<td>25-28 BTU/lb 40-52 kJ/kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZIP Code Dependent</td>
<td>60-80°F</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16-27°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Limit Diff Entalp &amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 BTU/lb 52 kJ/kg</td>
<td>25-30 BTU/lb 40-52 kJ/kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZIP Code Dependent</td>
<td>60-80°F</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16-27°C</td>
<td></td>
</tr>
<tr>
<td>SAT Y2 Limit</td>
<td>SAT Y2 Limit</td>
<td>On</td>
<td>On, Off</td>
<td>SAT Y2 Limit is an energy saving function that prevents 2nd stage to get engaged when the Supply Air Temperature is at 56.5°F or below. When &quot;On&quot; there will be 4 min delay from the time Y2 is on until the 2nd stage compressor will be enabled allowing 1st stage to try to satisfy SAT requirement. When &quot;off&quot;, 2nd stage is not limited and compressor delay is 10 seconds. This function saves energy by having one stage of cooling satisfy space cooling requirements.</td>
</tr>
</tbody>
</table>

1. Required setting for Economizer operation. If the value is not set, outputs of the economizer such as compressors will not operate regardless of thermostat call.
2. Attached Devices will be automatically detected and the related functionality will be enabled. When devices are detected, they will appear in the Present Devices menu and the Setup Settings menu will also automatically configure to display parameter to setup. For example, when an Exhaust Fan (EF) is detected, the “Exh Fan On Pos” will show in the menu and will require setup.
3. At least 1 compressor is required (auto detected or chosen) for economizer to function.
4. Requires the Energy Module connected and the accessory component powered, wired, and terminated to the Energy Module.
5. Only visible when Humidity Sensor is present.
6. Requires the Energy Module connected, 2 speed fan installed, and the accessory component or device powered, wired, and terminated to the Energy Module. 2 Speed Fan can be enabled in settings menu.
7. Not visible when differential dry bulb or differential enthalpy change over strategies are used.
8. Only present at initial setup.
## Monitor Live Conditions

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Parameter Range</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Supply Air Temp   | -40.0 to 158.0°F
                 | -40.0 to 70.0°C | Displays live SAT at the discharge of the evaporator coil.         |
| Outdoor Temp      | -40.0 to 158.0°F
                 | -40.0 to 70.0°C | Displays live OAT within outside air hood at damper inlet.          |
| Outdoor Humid d   | 5.0 to 100.0 %  | Displays live OAH within outside air hood at damper inlet.           |
| Outdoor Enth d    | 0.0 to 50.0 Btu/lb
                 | 0.0 to 116.3 kJ/kg | Displays calculated Enthalpy based on measured OAT and OAH.         |
| Return Air Temp   | -40.0 to 158.0°F
                 | -40.0 to 70.0°C | Displays live RAT within return duct at damper inlet.               |
| Return Air Humid  | 5.0 to 100.0 %  | Displays live RAH within return duct at damper inlet.                |
| Return Air Enth 2 | 0.0 to 50.0 Btu/lb
                 | 0.0 to 116.3 kJ/kg | Displays calculated Enthalpy based on measured RAT and RAH.          |
| CO2 Level 4       | 250.0 - 2000.0 PPM | Displays the PPM level of the CO2 sensor used for DCV.               |
| Damper Pos        | 0 to 100%       | Displays damper position based on feedback from actuator (Act 5).    |

**Compressor 1**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Displayed when there is no Y1 call and Mech Cooling available or when there is no Y2 call during Free Cooling.</td>
</tr>
<tr>
<td>On</td>
<td>Displayed when there is a Y1 call during Mech Cooling or when there is a Y2 call during Free Cooling and damper is at 100% (Integrated Cooling).</td>
</tr>
<tr>
<td>Stop xxxsec</td>
<td>Displayed when a Y1 call in Mech Cooling or a Y2 call in Integrated Cooling is removed, and minimum on time has not elapsed.</td>
</tr>
<tr>
<td>Start xxxsec</td>
<td>Displayed when there is a Y1 call in Mech Cooling or when there is a Y2 call in Integrated Cooling, and the minimum off time has not elapsed.</td>
</tr>
<tr>
<td>Off DXLL</td>
<td>Displayed when there is a Y1 call during Free Cooling or may be displayed when there is a Y2 call and not in Integrated Cooling.</td>
</tr>
<tr>
<td>Off EcoPotential</td>
<td>Displayed during Free Cooling or during Integrated Cooling.</td>
</tr>
<tr>
<td>Off LCLO</td>
<td>Displayed during Free Cooling or during Integrated Cooling.</td>
</tr>
</tbody>
</table>

**Compressor 2**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Displayed when there is no Y2 call and Mech Cooling available.</td>
</tr>
<tr>
<td>On</td>
<td>Displayed when there is a Y2 call during Mech Cooling and SAT Y2 Limit is not active or minimum on / off time active.</td>
</tr>
<tr>
<td>Stop xxxsec</td>
<td>Displayed when there is a Y2 call in Mech Cooling and minimum on time has not elapsed.</td>
</tr>
<tr>
<td>Start xxxsec</td>
<td>Displayed when there is a Y2 call in Mech Cooling and the minimum off time has not elapsed.</td>
</tr>
<tr>
<td>Off EcoPotential</td>
<td>Displayed during Free Cooling or during Integrated Cooling.</td>
</tr>
<tr>
<td>Off Checking SAT</td>
<td>Displayed when there is a Y2 call in Mech Cooling and SAT Y2 Limit is on and SAT is being evaluated.</td>
</tr>
<tr>
<td>Off DXLL</td>
<td>Displayed when there is a Y2 call in Mech Cooling and SAT Y2 Limit is on and SAT has been verified below the limit.</td>
</tr>
<tr>
<td>Off SAT OK</td>
<td>Displayed when there is a Y2 call in Mech Cooling and SAT Y2 Limit is on and SAT has been verified below the limit.</td>
</tr>
</tbody>
</table>

**Fan Speed 4,6**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/High</td>
<td>Displays the current commanded fan speed of the Indoor 2 Speed Fan.</td>
</tr>
</tbody>
</table>

**Exhaust Fan 4**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off</td>
<td>Displays the status of the of the Exhaust Fan.</td>
</tr>
</tbody>
</table>

**G**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off</td>
<td>Displays Occupied / Fan signal from room control.</td>
</tr>
</tbody>
</table>

**Y1**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off</td>
<td>Displays Cooling stage 1 request from room control.</td>
</tr>
</tbody>
</table>

**T2**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off</td>
<td>Displays Cooling stage 2 request from room control.</td>
</tr>
</tbody>
</table>

**W1**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off</td>
<td>Displays Heating request from room control.</td>
</tr>
</tbody>
</table>

**Climate Zone**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 4C, 5A, 5B, 6A, 6B, 7, 8</td>
<td>Displays the Climate Zone for the U.S. ASHRAE 90.1 standard.</td>
</tr>
<tr>
<td>1 to 16</td>
<td>Displays the Climate Zone for California Title 24.</td>
</tr>
<tr>
<td>6, 7, 8</td>
<td>Displays the Climate Zone for Canada NECB.</td>
</tr>
<tr>
<td>Menu Item</td>
<td>Parameter Range</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
</tbody>
</table>
| **Economizer Operation by**       | **(displays high limit change over strategy**<br>**based on detected**<br>**connected sensors)** | **Fixed dry bulb**  
**Fixed enthalpy + Fixed dry bulb**  
**Diff enthalpy + Fixed dry bulb**  
**Differential dry bulb**  
**OAE>RAE**<br>**O∆>RA enthalpy differential**  
**Econ High Limit**<br>**xx Temp (°F - °C)**  
**xx Enthalpy (Btu/lb - kJ/kg)**  
**US/Canada Zip Code/Postal Code**  
**Run Time Comp 1**<br>**Hours**  
**Run Time Comp 2**<br>**Hours**  
**Run Time Econ**<br>**Hours**  
**Run Time Mech**<br>**Hours**  
**Run Time DCV**<br>**Hours**  
**Run Time Integra**<br>**Hours**  
**Run Time Vent**<br>**Hours**  
**Run Time Heating**<br>**Hours**  
**Run Time Unoccup**<br>**Hours**  
**Run Time FP**<br>**Hours**  
**Firmware**<br>**xx.xxxxx** | **Displayed when only OAT sensor connected (ECON-ZIP-10K).**  
**Displayed when an OAT and OAH sensor connected (ECON-ZIP-TH).**  
**Displayed when an OAT and OAH sensor used but either value is not present.**  
**Displayed when an OAT and RAT sensor are connected (two ECON-ZIP-10K).**  
**This is the economizer to mechanical cooling change over high limit set by ZIP Code / Postal Code and connected sensor choice.**  
**Displays the ZIP Code / Postal Code entered in Settings.**  
**Displays the operating time when CC1 is powered to enable compressor 1 to operate (this includes Integrated Cooling periods). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the operating time when CC2 is powered to enable compressor 2 to operate (when 2 stages are available). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the operating time when in Free Cooling. (Does not include Integrated Cooling periods). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the totaled time when CC1 and CC2 have been powered. Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the time when energy is saved by resetting the damper position within range from Vent Min Pos (ECOM) DCV Min Pos (DCVM). (Note: in DCV Heating and mechanical cooling is possible). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the operating time when in Free Cooling with Damper at 100% and CC1 is powered to enable compressor 1 to operate. Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the operating time when in Occupied state and Ventilation mode is active (G is On). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the operating time when in Heating (W1 is On). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the operating time when in Unoccupied state (G is Off). Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays the Operating time when in Freeze Protection. Logged time can be reset through menu for seasonal maintenance, equipment repairs, or for other individual needs.**  
**Displays software revision version.** |
Sequence of Operation

**States**

**Virgin State**

The ZIP Economizer comes shipped from the factory in this state. "Setup Incomplete" will be displayed. No control will occur until setup is completed.

**Automatic State** – all of the following strategies and operational modes are available in this state. A minimum of two pieces of information (in level 2 Settings menu) must be entered before the ZIP Economizer will go into Automatic State:

- The appropriate ZIP code must be entered.
- The minimum damper position setpoint (Vent Min Pos) percentage must be entered.

When in Automatic State, the G input terminal is used to monitor a remote occupancy contact, time clock and/or indoor fan signal. When the G terminal is energized, the ZIP Economizer will operate in Occupied (damper will move to the proper ventilation position). Otherwise, the ZIP Economizer will operate in Unoccupied.

**Strategies**

**Compressor Protection and Energy Savings**

**DXLL (Supply Air Low Temperature Protection in Mechanical Cooling)**

This strategy is activated automatically when in Mechanical Cooling Mode depending on supply air temperature. Timers, temperature dead bands and SAT Y2 Limit setting all interact with this strategy.

- SAT < 45°F: All compressor stages disabled.
- 45°F ≤ SAT < 47°F: Compressor stages may or may not be enabled based on whether or not SAT is rising or falling.
- SAT ≥ 47°F and SAT Y2 Limit=Off: Both compressor stages enabled.
- 47°F ≤ SAT < 56.5°F and SAT Y2 Limit=On: 1st stage compressor enabled.
- SAT ≥ 56.5°F: Both compressor stages enabled.

**SAT Y2 Limit**

This strategy inhibits the 2nd stage compressor from coming on prematurely based on SAT temperature and time.

- IF Y2 is energized
  - AND Compressor 1 has been running for less than 4 minutes
  - AND Supply Air Temp is less than or equal to its required setpoint + 1.5°F (56.5°F)
  THEN Compressor 2 will not be allowed to come on

**LCLO (Low Ambient Compressor Lockout)**

This strategy inhibits compressor operation at low outdoor air temperatures.

- IF OAT falls below the low limit (50°F)
  - AND not in Heat Pump Mode
  THEN Compressor 1 and Compressor 2 will be disabled.
- IF OAT rises 2°F above the low limit (52°F)
  - OR in Heat Pump Mode
  THEN Compressor 1 and Compressor 2 will be enabled.

**Minimum On and Minimum Off Time**

This strategy prevents the compressors from "short-cycling”.

- IF any Compressor is energized
  THEN run it at least 180 seconds EXCEPT when entering Brownout Mode when compressors will be shut off immediately.
- IF any Compressor is de-energized
  THEN keep it off for at least 180 seconds

**Not Simultaneous ON/Not Simultaneous OFF**

On RTUs with 2 compressors this strategy is used to prevent both compressors from coming on at the same instant to keep electrical demand down.

- Compressors 1, 2 are kept from switching on together by a 10 second time delay.
- IF SAT Y2 Limit is set to “On” compressor 2 is delayed by 240 seconds to evaluate if the single compressor already operating can bring SAT less than or equal to setpoint +1.5°F (56.5°F).
- Compressors 1, 2 are kept from switching off together by a 5 second time delay EXCEPT when entering Brownout when compressors will be shut off immediately.

**Brownout Protection**

Input power (24 VAC) is monitored.

- IF input voltage drops to 75%
  AND it stays below there for 30 seconds
  THEN Brownout will be enabled.
- IF input voltage rises to 85%
  AND it stays there for 300 seconds
  THEN Brownout will be disabled.

Under Brownout conditions the current operating mode will be maintained EXCEPT Mechanical Cooling and Integrated Cooling (where compressors are utilized).

Instead of Mechanical Cooling it will go to Ventilation, DCV or Unoccupied. Instead of Integrated Cooling it will go to Free Cooling.

This strategy prevents compressor operation during brownout conditions. Compressors will be turned off immediately (bypassing minimum on/off timers).

**Random On Delay after Power Up**

After a power blackout or any power restore, compressors will go through a random time delay before allowing them to operate. This random timer is between 30-180 seconds. This helps the electrical network to come back up without excessive demand from multiple RTUs and compressors coming back on after the blackout.

**Freeze Protection**

See freeze protection Mode of Operation below.
High Limit Changeover

(Four possibilities depending on installed sensors)

Note: Economizing is enabled based on one of the following and becomes active in Free Cooling and Integrated Cooling.

Single Dry Bulb Changeover

- If only an OAT sensor is connected, it will be analyzed against the reference Outdoor Air changeover temperature value (based on entered ZIP code).
  - IF OAT is ≤ 2°F below the reference value
    THEN economizing will be enabled.
  - IF OAT is above the reference value
    THEN economizing will be disabled.

Differential Dry Bulb Changeover

- Must have OAT and RAT sensors connected. OAT and RAT will be analyzed against each other and the OAT will be analyzed against the reference differential temperature high limit (based on entered ZIP code).
  - IF OAT is ≤ 2-8°F below the RAT (Value Climate Zone Dependent) AND OAT is ≤ 2°F below the reference differential temp high limit DTHL
    THEN economizing will be enabled.
  - IF OAT is greater than or equal to 0-6°F below the RAT (Value Climate Zone Dependent) OR the OAT is greater than the reference differential temp high limit DTHL
    THEN economizing will be disabled.

Single Enthalpy Changeover

- Must have OAH (RH) and OAT sensors connected. Outdoor air enthalpy (Outdoor Enth) will be calculated. They will be analyzed against the reference values as follows:
  - IF Outdoor Enth is ≤ 2 btu/lb less than the reference enthalpy high limit (default is 28 btu/lb – 2 btu/lb = 26 btu/lb) AND OAT is ≤ 2°F below the reference temperature high limit ETHL (based on entered ZIP code)
    THEN economizing will be enabled.
  - IF Outdoor Enth is greater than reference enthalpy high limit (default is 28 btu/lb) OR OAT is greater than the reference temperature high limit ETHL (based on entered ZIP code)
    THEN economizing will be disabled.

Differential Enthalpy Changeover

- Must have OAH, OAT, RAH and RAT sensors connected. Outdoor Air Enthalpy and Return Air Enthalpy will be calculated.
  - IF Outdoor Enth is ≤ 2.5 btu/lb less than Return Air Enth AND Outdoor Enth is ≤ 2 btu/lb less than the reference differential enthalpy high limit DEHL (30 btu/lb) AND OAT is ≤ 2°F below the reference differential temperature high limit DTHL (based on entered ZIP code)
    THEN economizing will be enabled.

- If Outdoor Air Enthalpy is ≤ 1 btu/lb less than Return Air Enthalpy OR Outdoor Air Enthalpy is greater than reference enthalpy high limit DEHL (30 btu/lb) OR OAT is greater than reference differential temperature high limit (based on entered ZIP code)
  THEN economizing will be disabled.

Operational Modes

Free Cooling

- Outdoor air ambient conditions are analyzed by one of the 4 changeover strategies above (Single or Differential Dry Bulb; Single or Differential Enthalpy) and has been deemed suitable for “free” cooling.
  - Y1 is energized indicating a call for stage 1 cooling.
  - Y2 is de-energized.
  - W1 is de-energized.
  - G input could be energized or de-energized (occupied or unoccupied state).
  - Compressor 1 is on.
  - Compressor 2 is off.
  - Fan Speed could be energized (low speed, when OAT is below 50°F) or de-energized (high speed) for indoor fan.
  - Exhaust Fan could be running or not based on % damper open position.
  - Damper Pos output is modulated between the respective current minimum damper position setpoint and 100% open to attempt to maintain SAT setpoint (55°F). When OAT is at 55°F the damper will be fully open to outside air. As outdoor air continues to rise above 55°F, SAT will rise with it.

Integrated Cooling

- Outdoor air ambient conditions are analyzed by one of the four changeover strategies above (Single or Differential Dry Bulb; Single or Differential Enthalpy) and has been deemed suitable for “free” cooling.
  - Y1 is energized indicating a call for stage 1 cooling.
  - Y2 is energized indicating a call for stage 2 cooling.
  - W1 is de-energized.
  - G input could be energized or de-energized (occupied or unoccupied state).
  - Compressor 1 is on.
  - Compressor 2 is off.
  - Fan Speed is de-energized (indoor fan is operating on high speed).
  - Exhaust Fan is on.
  - Damper Pos output is fixed at 100% (fully open to outdoor air).

Note: Outdoor Damper must be fully open for 60 seconds before mechanical cooling will be enabled.
Mechanical Cooling

- Outdoor air ambient conditions are analyzed by one of the 4 changeover strategies above (Single or Differential Dry Bulb; Single or Differential Enthalpy) and has been deemed NOT suitable for “free” cooling.
- Y1 is energized indicating a call for stage 1 cooling.
- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.
- W1 is de-energized.
- G input could be energized or de-energized (occupied or unoccupied state).
- Compressor 1 is on.
- Compressor 2 may or may not be on based on thermostat call for stage 2 cooling.
- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos output is at Vent Min Pos if indoor fan is on high speed. Output is at Low SP Vent Min if indoor fan is on low speed.

DCV

- Outdoor air may or may not be suitable “for free cooling”; however still utilizing fresh air for cooling.
- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.
- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.
- W1 may or may not be energized depending on thermostat call for heating.
- G input is energized indicating occupied state.
- Compressor 1 may or may not be on depending on thermostat call for stage 1 cooling.
- Compressor 2 may or may not be on depending on thermostat call for stage 2 cooling.
- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos – Minimum outdoor damper position will be modulated based on CO2 levels. If indoor fan is on high speed and CO2 levels are high, minimum damper position will be at Vent Min Pos; if CO2 levels are low, minimum damper position will be at DCV Min Pos. As CO2 levels fluctuate, minimum damper position will modulate between these 2 minimum settings. If indoor fan is on low speed, the two minimum damper settings reference will change to Low SP Vent Min and Low SP DCV Min respectively.

Possible Co-existing Modes of Operation: DCV, Heating.

Ventilation

- Outdoor air may or may not be suitable “for free cooling”.
- Y1 is de-energized.
- Y2 is de-energized.
- W1 is de-energized.
- G input is energized indicating occupied state of operation.
- Compressor 1 is off.
- Compressor 2 is off.
- Fan Speed will be energized (indoor fan is operating on low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos output is at Low SP Vent Min.

Possible Co-existing Modes of Operation: DCV, Heating.

Heating

- Outdoor air may or may not be suitable “for free cooling”.
- Y1 is off (unless RTU is a heat pump).
- Y2 is off (unless RTU is a heat pump).
- W1 is energized.
- G input may or may not be energized (occupied or unoccupied state).
- Compressor 1 is de-energized (unless Heat Pump Op in Settings menu is turned on).
- Compressor 2 is de-energized (unless Heat Pump Op in Settings menu is turned on).
- Fan Speed will be de-energized (indoor fan is operating on high speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos output is at Vent Min Pos or damper in DCV mode.

Unoccupied

- Outdoor air may or may not be suitable “for free cooling”.
- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.
- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.
- W1 may or may not be energized depending on thermostat call for stage 1 heating.
- G input is de-energized (unoccupied state).
- Compressor 1 may or may not be on depending on thermostat call for stage 1 cooling.
- Compressor 2 may or may not be on depending on thermostat call for stage 2 cooling.
- Fan Speed may or may not be energized (indoor fan is operating on high or low speed or not at all). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos output is closed to Outdoor Air.

Possible Co-existing Modes of Operation: Free Cooling, Integrated Cooling, Mechanical Cooling, Heating, or Purge.
Freeze Protection

- Outdoor air is suitable "for free cooling".
- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.
- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.
- W1 may or may not be energized depending on thermostat call for stage 1 heating.
- G input is energized indicating occupied state of operation.
- Compressor 1 is de-energized.
- Compressor 2 is de-energized.
- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos output is modulated from minimum to closed to maintain discharge air setpoint.

Possible Modes of Operation: Heating, Free Cooling and Ventilation.

Energy Module Option Functions

Purge

(Purge Control in Settings Menu must be turned on to enable and 24 VAC applied to AUX1)

- Outdoor air may or may not be suitable "for free cooling".
- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.
- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.
- W1 may or may not be energized depending on thermostat call for stage 1 heating.
- G input may or may not be energized (occupied or unoccupied state).
- Compressor 1 may or may not be energized depending on thermostat call for stage 1 cooling.
- Compressor 2 may or may not be energized depending on thermostat call for stage 2 cooling.
- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions.
- Exhaust Fan is off.
- Damper Pos output goes to value set in Purge Dmp Set.

Possible Co-existing Modes of Operation: Mechanical Cooling, Heating.

ZIPEconomizer

Method of Operation

Damper Override

- IF Remote Dmp Cntrl is turned on (enabled) in Settings menu
  AND G powered
  THEN Damper Pos will go to the value of the signal input (0-10 VDC) at AUX2.

Note: If outdoor air is suitable for "free cooling" and damper is override to closed position, there will be no cooling.

Indoor 2 Speed Fan

<table>
<thead>
<tr>
<th>Thermostat Signal</th>
<th>Economizing Available</th>
<th>OAT</th>
<th>Energy Module Fan Relay</th>
<th>Fan Speed</th>
<th>ZIP Econ / RTU Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>G, Y1, not Y2</td>
<td>No</td>
<td>N/A</td>
<td>Closed</td>
<td>Low</td>
<td>1 Stage DX</td>
</tr>
<tr>
<td>G, Y1, not Y2</td>
<td>Yes</td>
<td>&gt;50F</td>
<td>Open</td>
<td>High</td>
<td>Economizing</td>
</tr>
<tr>
<td>G, Y1, not Y2</td>
<td>Yes</td>
<td>&lt;50F</td>
<td>Closed</td>
<td>Low</td>
<td>Economizing</td>
</tr>
<tr>
<td>G, Y1, Y2</td>
<td>No</td>
<td>N/A</td>
<td>Open</td>
<td>High</td>
<td>2 Stage DX</td>
</tr>
<tr>
<td>G, Y1, Y2</td>
<td>Yes</td>
<td>N/A</td>
<td>Open</td>
<td>High</td>
<td>Integrated</td>
</tr>
<tr>
<td>G, W1</td>
<td>No</td>
<td>N/A</td>
<td>Open</td>
<td>High</td>
<td>Heating</td>
</tr>
<tr>
<td>G, W1</td>
<td>Yes</td>
<td>N/A</td>
<td>Open</td>
<td>High</td>
<td>Heating</td>
</tr>
<tr>
<td>G, not Y1, not W1</td>
<td>No</td>
<td>N/A</td>
<td>Closed</td>
<td>Low</td>
<td>Ventilation</td>
</tr>
<tr>
<td>G, not Y1, not W1</td>
<td>Yes</td>
<td>N/A</td>
<td>Closed</td>
<td>Low</td>
<td>Ventilation</td>
</tr>
<tr>
<td>not G, not Y1</td>
<td>No</td>
<td>N/A</td>
<td>Open</td>
<td>Off</td>
<td>Unoccupied</td>
</tr>
<tr>
<td>not G, not Y1</td>
<td>Yes</td>
<td>N/A</td>
<td>Open</td>
<td>Off</td>
<td>Unoccupied</td>
</tr>
</tbody>
</table>

When indoor fan is on high speed, the high speed fan minimum damper position setpoints Vent Min Pos and DCV Min Pos will be referenced as the minimums for damper control.

When indoor fan is on low speed, the low speed fan minimum damper position setpoints Low Sp Vent Min and Low Sp DCV Min will be referenced as the minimums for damper control.

Note: Indoor fan speed will operate according to the above table whether in Occupied or Unoccupied.

Note: If RTU equipped with fan speed switching relays from the factory, an Energy Module is not required to set up 2 Speed Fan. See 2 Speed Fan Op in settings menu for more information.
**Exhaust Fan**

(Operates only in Free Cooling and Integrated Cooling.)

**Note:** In theory, if Exh Fan On Pos/Low Exh Fan Pos for damper % is set very low, then Exhaust Fan could also run in other modes (Ventilation, Mechanical, DCV).

- Control of the exhaust fan is damper position dependent. Damper setpoint for enable/disable of the exhaust fan is Indoor Fan Speed dependent (High Speed Damper Setpoint = Exh Fan On Pos; Low Speed Damper Setpoint = Low Exh Fan Pos).
- IF Damper Pos is 10% greater than Exh Fan On Pos/ Low Exh Fan Pos
  THEN Exhaust Fan will be energized.
- IF Damper Pos is 10% less than Exh Fan On Pos/ Low Exh Fan Pos
  OR Damper Pos is less than 5% open
  THEN Exhaust Fan will be de-energized.

Example: If Exh Fan On Pos is set at 45%, when damper opens to 55%, exhaust fan will turn on. When damper closes to 35%, exhaust fan will turn off.

**Service and Commissioning**

**Manual Mode**

This menu is available after Setup has been completed. This is selected in Level 2 menu Service and Commissioning. This supports the commissioning phase allowing all connected RTU components (except for the room thermostat) to be tested by manually commanding them through the keypad interface. To prevent RTU safety lockout and possible equipment damage, ensure the RTU indoor fan is running! Return to Automatic will occur automatically between 1-8 hours (adjustable) unless Return to Automatic is selected.

**Note:** Damper will move at high speed.

**Note:** Compressors, exhaust fan1 and indoor 2 speed fan2 minimum on or minimum off time does NOT apply in this test state. They will be turned on and off immediately based on the entered command. Also, exhaust fan1 will not be turned on automatically based on damper position in this mode, but it can be manually commanded.

**Damper Scaling**

If there was a mechanical failure or adjustment that prevented proper damper scaling from virgin to automatic, it can be rescaled. “Damper scaling starts in 10secs” and will countdown to 0. A message will scroll saying “Damper scaling for better operation if obstruction is present rescate damper in commissioning menu”. (For detailed instructions on this – please see the section “Service and Commissioning” below. This will open damper to 100% (re-scale control signal if needed). (Note: failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.)

Once scaling is complete, a message will appear saying “Damper scaling successful”. The ZIP will then show “maximum at 80° = 100%” That message will show maximum rotation of the damper. This process ensures the damper is always operating and displayed from 0-100%.

**Acceptance Test (Four possible options)**

This menu is available after Setup has been completed. This complies with the California Title 24 Mechanical Testing and has four tests. To prevent RTU safety lockout and possible equipment damage, ensure the RTU indoor fan is running!

**Economizer Test (NA7.5.4)**

- This is an automatic functional and verification test that moves the damper 100% open/100% closed/and minimum position and switches on CC1 and EF1 (if available). It leads one through the test step by step in accordance with California Title 24 test form.

  **Note:** 1 minute minimum on time; 1 minute minimum off time for compressor applies in this test to prevent damage from short cycling. Exhaust fan1 does turn on based on damper position in this test.

  **Note:** Damper will move at high speed.

**Ventilation Test (NA7.5.1.2)**

- This is a manual test that allows adjustment to the damper minimum position (Vent Min Pos) in the Settings menu for verification of ventilation rates.

  **Note:** Damper minimum position must be commanded to get damper to go to minimum position in this mode!

Example: Prior to going into this test, let’s say Vent Min Pos is set for 20%. After going into this test you still must go into Settings/Vent Min Pos and change the value by at least 1%, then you can change back to 20%. If you don’t create a change of value for Vent Min Pos the damper will not move off fully closed position in this test. The new Vent Min Pos setting you enter will be stored and used when you return to automatic.

**RTU Test (NA7.5.2)**

- This is a manual test used to test the following signals from the thermostat to the RTU:
  - G powered (Occupied) — damper is at minimum position (Vent Min Pos); otherwise the damper goes closed to outdoor air (Unoccupied).
  - Y1 powered — CC1 is energized; otherwise CC1 is de-energized.
  - Y2 powered — CC2 is energized; otherwise CC2 is de-energized.

  **Note:** 1 minute minimum on time; 1 minute minimum off time applies in this test mode to prevent damage from short cycling compressors.

  - W1 powered — Heating is enabled.

**DCV Test (NA7.5.5)***

- This is a manual test used for the following:
  - CO2 input will be used to modulate minimum damper position between DCV Min Pos and Vent Min Pos as CO2 levels vary below and above (respectively) the CO2 Setpoint.

All of the above tests can be aborted by selecting Return to Automatic in the Level 2 menu.

**End of Sequences**

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* Only available with Energy Module Option. If no Energy Module exists associated menu options will not be displayed.

* Subject to Compressor Protection Strategies as noted earlier.

* The following modes listed below take display priority on the ZIP MMI when co-existing with this mode.

* This could possibly happen if W1 and Y1 are energized together calling for heating and cooling at the same time (provided that RTU is not configured as a Heat Pump). An alarm will be generated.

* Minimum on/off times must be observed before compressor will be commanded.

* “G” must be energized to run test.
## Alarm from Sequences - MMI Display

<table>
<thead>
<tr>
<th>ID</th>
<th>Alarm Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OAT Sensor out of range economizing is disabled</td>
</tr>
<tr>
<td>2</td>
<td>OAT Sensor not detected economizing is disabled</td>
</tr>
<tr>
<td>3</td>
<td>OAH Sensor out of range economizing is disabled</td>
</tr>
<tr>
<td>4</td>
<td>OAH Sensor not detected economizing is disabled</td>
</tr>
<tr>
<td>5</td>
<td>OAH Sensor out of range operation by diff temp</td>
</tr>
<tr>
<td>6</td>
<td>OAH Sensor not detected operation by diff temp</td>
</tr>
<tr>
<td>7</td>
<td>RAT Sensor out of range operation by OAT dry bulb</td>
</tr>
<tr>
<td>8</td>
<td>RAT Sensor not detected operation by OAT dry bulb</td>
</tr>
<tr>
<td>9</td>
<td>RAT Sensor out of range operation by OAH enthalpy</td>
</tr>
<tr>
<td>10</td>
<td>RAT Sensor not detected operation by OAH enthalpy</td>
</tr>
<tr>
<td>11</td>
<td>RAH Sensor out of range operation by OAH enthalpy</td>
</tr>
<tr>
<td>12</td>
<td>RAH Sensor not detected operation by OAH enthalpy</td>
</tr>
<tr>
<td>13</td>
<td>RAH Sensor detected but OAH Sensor not detected</td>
</tr>
<tr>
<td>14</td>
<td>RAH Sensor detected but RAT Sensor not detected</td>
</tr>
<tr>
<td>15</td>
<td>SAT Sensor out of range economizing is disabled</td>
</tr>
<tr>
<td>16</td>
<td>SAT Sensor not detected economizing is disabled</td>
</tr>
<tr>
<td>17</td>
<td>Y2 present without Y1 single stage</td>
</tr>
<tr>
<td>18</td>
<td>SAT drop for CC1 insufficient cooling system problem</td>
</tr>
<tr>
<td>19</td>
<td>SAT drop for CC2 insufficient cooling system problem</td>
</tr>
<tr>
<td>20</td>
<td>Damper Pos value missing</td>
</tr>
<tr>
<td>21</td>
<td>SAT should be lower</td>
</tr>
<tr>
<td>22</td>
<td>Damper is stuck</td>
</tr>
<tr>
<td>23</td>
<td>Energy Module is missing module functions disabled</td>
</tr>
<tr>
<td>24</td>
<td>Exhaust fan not detected</td>
</tr>
<tr>
<td>25</td>
<td>Compressor 1 not detected</td>
</tr>
<tr>
<td>26</td>
<td>Compressor 2 not detected</td>
</tr>
<tr>
<td>27</td>
<td>2 Speed fan not detected</td>
</tr>
<tr>
<td>28</td>
<td>CO2 Sensor not detected DCV functions disabled</td>
</tr>
<tr>
<td>29</td>
<td>CO2 Sensor out of range DCV functions disabled</td>
</tr>
<tr>
<td>30</td>
<td>Heat and Cool both present</td>
</tr>
<tr>
<td>Fault Detection</td>
<td>Problem</td>
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<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>OAT sensor out of range</td>
<td>Sensor is returning a value that is out of the predetermined range</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>OAT sensor not detected</td>
<td>Sensor previously installed is not detected or sensor has not been installed</td>
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</tr>
<tr>
<td>OAH sensor out of range</td>
<td>Sensor is returning a value that is out of the predetermined range - Single Enthalpy</td>
</tr>
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<tr>
<td>OAH sensor not detected</td>
<td>Sensor previously installed is not detected or sensor has not been installed - Single Enthalpy</td>
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<tr>
<td>RAT sensor out of range</td>
<td>Sensor is returning a value that is out of the predetermined range - Differential Temperature</td>
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<td></td>
</tr>
<tr>
<td>RAT sensor not detected</td>
<td>Sensor is returning a value that is out of the predetermined range - Differential Temperature</td>
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<td></td>
<td></td>
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<tr>
<td>RAH sensor out of range</td>
<td>Sensor is returning a value that is out of the predetermined range</td>
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<tr>
<td>RAH sensor not detected</td>
<td>Sensor previously installed is not detected</td>
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<tr>
<td>Fault Detection</td>
<td>Problem</td>
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<tr>
<td>-----------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
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<tr>
<td>RAH sensor detected but OAH sensor not detected</td>
<td>Sensor previously installed is not detected or sensor has not been installed - Differential Enthalpy</td>
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<tr>
<td>SAT sensor out of range</td>
<td>Sensor is returning a value that is out of the predetermined range</td>
</tr>
<tr>
<td>SAT sensor not detected</td>
<td>Sensor previously installed is not detected or sensor has not been installed</td>
</tr>
<tr>
<td>Y2 present without Y1</td>
<td>Call for Y2 without call for Y1</td>
</tr>
<tr>
<td>SAT drop for CC1 or CC2 insufficient</td>
<td>SAT sensor determined that temperature downstream of evaporator did not drop by at least 5°F after 4 min of CC1 or CC2 being energized</td>
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<tr>
<td>Damper Pos value missing</td>
<td>Economizer is not sensing feedback from actuator</td>
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<tr>
<td>SAT should be lower</td>
<td>When damper is greater than 85% open, and in free cooling, SAT sensor determined that temperature is not within 10°F of OAT</td>
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<tr>
<td>Damper is stuck</td>
<td>Feedback signal is not within range of commanded position</td>
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</tbody>
</table>
## Fault Detection and Diagnostics (FDD) Table

<table>
<thead>
<tr>
<th>Fault Detection</th>
<th>Problem</th>
<th>Diagnostic Action (in addition to alarm stored / transmitted)</th>
<th>Potential Cause</th>
<th>CA Fault Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Module is missing</td>
<td>Expansion module previously installed is not detected</td>
<td>• Logic reconfigured to ignore devices attached to Energy Module, although maintains settings in memory&lt;br&gt;• Menu reconfigured to remove devices&lt;br&gt;• If CO2 sensor attached, lowest minimum position is Vent Min Pos&lt;br&gt;• Functionality for pre-occupancy purge, power exhaust, remote damper override, DCV, and low speed fan control not available</td>
<td>• Module was not installed tight initially and became loose&lt;br&gt;• Module was intentionally removed</td>
<td>N/A</td>
</tr>
<tr>
<td>Exhaust fan not detected</td>
<td>Power exhaust fan control circuit is not detected</td>
<td>• Logic reconfigured to ignore exhaust fan operation, although maintains settings in memory</td>
<td>• EF intentionally removed, not deleted&lt;br&gt;• Exhaust fan relay coil failure&lt;br&gt;• Wire harness broken</td>
<td>N/A</td>
</tr>
<tr>
<td>Compressor 1 not detected</td>
<td>Control circuit connected to CC1 is not detected</td>
<td>• 1st stage of mechanical cooling is impossible&lt;br&gt;• Integrated cooling is impossible&lt;br&gt;• Logic and FDD dependent on 1st stage is disabled</td>
<td>• Compressor safety open (LP, HP, current)&lt;br&gt;• Compressor contactor coil failure&lt;br&gt;• Damage to wire increasing resistance&lt;br&gt;• Wire harness broken</td>
<td>N/A</td>
</tr>
<tr>
<td>Compressor 2 not detected</td>
<td>Control circuit connected to CC2 is not detected</td>
<td>• 2nd stage of mechanical cooling is impossible&lt;br&gt;• Logic and FDD dependent on 2nd stage is disabled</td>
<td>• Compressor safety open (LP, HP, current)&lt;br&gt;• Compressor contactor coil failure&lt;br&gt;• Damage to wire increasing resistance&lt;br&gt;• Wire harness broken&lt;br&gt;• Only 1 compressor in unit, wiring inadvertently terminated at CC2, not deleted</td>
<td>N/A</td>
</tr>
<tr>
<td>2 Speed fan not detected</td>
<td>Control circuit connected to IF is not detected</td>
<td>• Logic reconfigured to high speed fan operation only, although maintains settings in memory</td>
<td>• Low speed fan control circuit failure&lt;br&gt;• Wire harness broken&lt;br&gt;• Damage to wire increasing resistance&lt;br&gt;• Wire harness broken</td>
<td>N/A</td>
</tr>
<tr>
<td>CO2 sensor not detected</td>
<td>Sensor previously installed is not detected</td>
<td>• Logic reconfigured to ignore DCV configuration, although maintains settings in memory&lt;br&gt;• Menu reconfigured to remove DCV associated entities&lt;br&gt;• Lowest minimum position is Vent Min Pos</td>
<td>• CO2 sensor loses power&lt;br&gt;• Wire harness broken&lt;br&gt;• CO2 sensor electronics failure</td>
<td>E</td>
</tr>
<tr>
<td>CO2 sensor out of range</td>
<td>Sensor is returning a value that is not within 250-2200 ppm range</td>
<td>• Logic reconfigured to ignore DCV configuration, although maintains settings in memory&lt;br&gt;• Menu reconfigured to remove DCV associated entities&lt;br&gt;• Lowest minimum position is Vent Min Pos</td>
<td>• CO2 sensor out of calibration&lt;br&gt;• Wire harness broken&lt;br&gt;• CO2 sensor electronics failure</td>
<td>E</td>
</tr>
<tr>
<td>Heat and cool both present</td>
<td>Signal present on both Y1 and W1 at the same time</td>
<td>• Logic dependencies requiring W1 are disabled&lt;br&gt;• Allows Y1 call to be processed</td>
<td>• Miswired thermostat&lt;br&gt;• Thermostat failure&lt;br&gt;• Wire harness short&lt;br&gt;• RTU is a heat pump, but “Heat Pump Op” not set to on in settings menu</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### California Title 24 Fault Detection & Diagnostics Fault Categories

A. Air temperature sensor failure/fault.
B. Not economizing when it should.
C. Economizing when it should not.
D. Damper not modulating.
E. Excess outdoor air.

Refer to California Energy Commission (CEC) 2013 Building Energy Efficiency Standard/2013 Title 24/Part 6/Section 120.2

California Title 24 FDD Certification Number BZE1245
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No input power</td>
<td>Using a voltmeter set to read AC voltage, verify that there is 24 VAC +/- 20% (19 VAC – 29 VAC) as measured at the “R” and “C” terminals on the ZIP-ECON-BASE terminal strip on the base unit. If no voltage, check transformer output voltage at RTU. If 24 volts not present, check primary input power to transformer. If voltage present, check transformer circuit breaker, and check transformer for open coil. If no voltage present, check primary input power to RTU, fuses, disconnect, circuit breaker.</td>
<td>Setup not complete</td>
</tr>
<tr>
<td>Setup not complete</td>
<td>If the display reads “Setup Incomplete”, then not all of the required setup parameters values for minimum damper position and zip code have not been entered. Enter required information in Settings menu. See setup information.</td>
<td>Brownout</td>
</tr>
<tr>
<td>Brownout</td>
<td>If voltage is below 19 volts, then the ZIP Economizer may be in Brownout Protection mode. This mode disables the compressors to protect them from low voltage operation damage. When the power is back to normal the Economizer and RTU will operate normally (see Brownout below).</td>
<td>In acceptance test or manual mode</td>
</tr>
<tr>
<td>No input power</td>
<td>Using a voltmeter set to read AC voltage, verify that there is 24 VAC +/- 20% (19 VAC – 29 VAC) as measured at the “R” and “C” terminals on the ZIP-ECON-BASE terminal strip on the base unit. If no voltage, check transformer output voltage at RTU. If 24 volts not present, check primary input power to transformer. If voltage present, check transformer circuit breaker, and check transformer for open coil. If no voltage present, check primary input power to RTU, fuses, disconnect, circuit breaker.</td>
<td>There are No Characters Displayed on the ZIP Economizer</td>
</tr>
<tr>
<td>Ambient temperature below display range</td>
<td>Below this value, the display may not be clearly visible. It should still control properly even though the display may be blank below this temperature.</td>
<td>The Display Shows “Brownout”</td>
</tr>
<tr>
<td>Input voltage is below 18VAC / connected load is too much for transformer</td>
<td>Using a voltmeter set to read AC voltage, verify that that the voltage is low. If the voltage is low check primary voltage into the RTU. If primary voltage is below the rated RTU voltage as listed on nameplate or product documentation, the primary power is in a brownout state. If voltage is within specified range, it is possible that the load on the transformer is larger than VA rating. Verify connected current, if OK, consider replacing transformer.</td>
<td>The Display Shows “Setup Incomplete”</td>
</tr>
<tr>
<td>The initial setup of the ZIP Economizer has not completed</td>
<td>The ZIP Economizer requires parametrizing of specific settings prior to operation of the economizer or compressors. As a minimum the Vent Min Pos and ZIP Code / Postal Code need to have a value set and entered. If additional devices are attached (e.g. CO2, EF,...) then additional parametrizing is required.</td>
<td>Additional devices have been added after initial setup</td>
</tr>
<tr>
<td>Some additional devices that may be added at anytime during the life of the ZIP Economizer will require additional setup. Upon connection of these devices the economizer will notify that the device has been detected and will prompt setup. Until setup is complete, the ZIP Economizer will function as if the devices are not there. Proceed to Settings menu and look for menu items that have a blank value, press OK and enter value. Once all values have been parametrized, the ZIP Economizer will function as intended.</td>
<td>Display shows “OAT sensor out of range economizing is disabled”</td>
<td>Sensor is returning a value that is outside the predetermined range. This disables the economizer functions and outdoor air damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10k type 2 Thermistor Table values to measured values to the value of a temperature instrument. If values are significantly different, replace sensor.</td>
</tr>
<tr>
<td>Sensor is not present/not detected. This disables the economizer functions and damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10k type 2 Thermistor Table value to measured value to the value of a temperature instrument. If value is close, determine if there is any intermediate wiring. If so, check continuity. If all checks are good, attach sensor to ZIP-ECON-BASE and see if it is detected. If not detected, try another 10k type 2 sensor. If still not detected, replace ZIP-ECON-BASE.</td>
<td>Display shows “OAT Sensor not detected economizing is disabled”</td>
<td>Sensory is returning a value that is out of the predetermined range. This disables the economizer functions and outdoor air damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10k type 2 Thermistor Table value to measured value to the value of a temperature instrument. If values are significantly different, replace sensor.</td>
</tr>
<tr>
<td>If the economizer was originally set for enthalpy high limit changeover, then the economizer will not function without a valid OAH signal. The valid range for reading an OAH sensor for auto detection is 0.6VDC (6%RH) to (100%RH) up to 11.0 VDC. Using a voltmeter set to read AC input voltage at TH sensor terminal R, verify that there is 24 VAC +/- 20% (19 VAC – 29 VAC). If input voltage is not with in range, verify input voltage at ECON-ZIP-BASE terminals R and C, if also out of range, troubleshoot RTU control circuit. If the input voltage is within range, remove wires from RH+ and RH- and measure across the two terminal using voltmeter set to DC. If DC output voltage is not within valid range above, replace sensor.</td>
<td>Display shows “OAH Sensor out of range economizing is disabled”</td>
<td>Sensor is returning a value that is outside the predetermined range. This disables the economizer functions and outdoor air damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10k type 2 Thermistor Table value to measured value to the value of a temperature instrument. If values are significantly different, replace sensor.</td>
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<td>Display shows “OAH Sensor not detected economizing is disabled”</td>
<td>Sensor is returning a value that is outside the predetermined range. This disables the economizer functions and outdoor air damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10k type 2 Thermistor Table value to measured value to the value of a temperature instrument. If values are significantly different, replace sensor.</td>
</tr>
<tr>
<td>Problem</td>
<td>Possible Cause</td>
<td>Action</td>
</tr>
<tr>
<td>---------</td>
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<tr>
<td><strong>There is No Free Cooling</strong></td>
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<tr>
<td>Display shows “SAT sensor out of range economizing disabled”</td>
<td>Sensor is returning a value that is out of the predetermined range. This disables the economizer functions and outdoor air damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnecting sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10K type 2 Thermistor Table values to measured values – the value of a temperature instrument. If values are significantly different, replace sensor.</td>
<td></td>
</tr>
<tr>
<td>Display shows “SAT sensor not detected economizing disabled”</td>
<td>Sensor is not present/not detected. This disables the economizer functions and damper will return/remain at minimum position. This is a mandatory sensor and must be functional! Repair or replace. Verify sensor value by disconnecting sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10K type 2 Thermistor Table value to measured value to the value of a temperature instrument. If value is close, determine if there is any intermediate wiring. If so, check continuity. If all checks are good, attach sensor to ZIP-ECON-BASE and see if it is detected. If not detected, try another 10k type 2 sensor. If still not detected, replace ZIP-ECON-BASE.</td>
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<tr>
<td>The ZIP Economizer is in another operating mode</td>
<td>Check Status screen for current operating mode or state. Please see sequence description for more information.</td>
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<tr>
<td><strong>OAT sensor</strong></td>
<td>Please see troubleshooting action under Problem &quot;There is No Free Cooling&quot;.</td>
<td></td>
</tr>
<tr>
<td><strong>SAT sensor</strong></td>
<td>Please see troubleshooting action under Problem &quot;There is No Free Cooling&quot;.</td>
<td></td>
</tr>
<tr>
<td><strong>OAH sensor</strong></td>
<td>When operating in single enthalpy limit configuration, Please see troubleshooting action under Problem &quot;There is No Free Cooling&quot;, otherwise see below.</td>
<td></td>
</tr>
<tr>
<td><strong>OAH Sensor. Display shows “OAH sensor not detected operation by diff temp”</strong></td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on differential dry bulb using RAH sensor to monitor space humidity to ensure it is not getting too high. The valid range for reading an OAH sensor for auto detection is 0.6VDC (6%RH) to (100%RH) up to 11.0 VDC. Using a voltmeter set to read AC input voltage at TH sensor terminal R, verify that there is 24 VAC +/- 20% (19 VAC – 29 VAC). If input voltage is not within range, check continuity of wiring between ECON-ZIP-TH sensor and ECON-ZIP-BASE, If voltage is present, remove wires from RH+ and RH- and measure across the two terminal using voltmeter set to DC. If DC output voltage is within valid range above, check continuity of RH+ and RH- output wires between ECON-ZIP-TH sensor and ECON-ZIP-BASE. If continuity OK, go to settings menu and submenu Devices 2. Verify that display for OAH is Auto or Installed. If Auto, change to Installed and see if Alarm disappears or a value OAH value is displayed in Monitor Live Conditions menu. Also can try to Delete alarm and see if sensor is again auto detected.</td>
<td></td>
</tr>
<tr>
<td><strong>OAH Sensor. Display shows “RAH sensor detected but OAH sensor not detected”</strong></td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on differential dry bulb using RAH sensor to monitor space humidity to ensure it is not getting too high.</td>
<td></td>
</tr>
<tr>
<td><strong>RAT sensor</strong></td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on single OAT dry bulb. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10K type 2 Thermistor Table value to measured value to the value of a temperature instrument. If value is close, determine if there is any intermediate wiring. If so, check continuity. If all checks are good, attach sensor to ZIP-ECON-BASE and see if it is detected. If not detected, try another 10k type 2 sensor. If still not detected, replace ZIP-ECON-BASE.</td>
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</tr>
<tr>
<td><strong>RAT Sensor. Display shows “RAT sensor not detected operation by OAT dry bulb”</strong></td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on single RAH dry bulb. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10K type 2 Thermistor Table value to measured value to the value of a temperature instrument. If value is close, determine if there is any intermediate wiring. If so, check continuity. If all checks are good, attach sensor to ZIP-ECON-BASE and see if it is detected. If not detected, try another 10k type 2 sensor. If still not detected, replace ZIP-ECON-BASE.</td>
<td></td>
</tr>
<tr>
<td><strong>RAT Sensor. Display shows “RAT sensor not detected operation by OAH enthalpy”</strong></td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on single OAH enthalpy. Verify sensor value by disconnection sensor leads from ZIP-ECON-BASE and measure resistance with Ohm meter across sensor leads and compare to 10K type 2 Thermistor Table value to measured value to the value of a temperature instrument. If value is close, determine if there is any intermediate wiring. If so, check continuity. If all checks are good, attach sensor to ZIP-ECON-BASE and see if it is detected. If not detected, try another 10k type 2 sensor. If still not detected, replace ZIP-ECON-BASE.</td>
<td></td>
</tr>
<tr>
<td><strong>RAT Sensor. Display shows “RAH sensor detected but RAT sensor not detected”</strong></td>
<td>This configuration is not allowed. You need an RAT sensor for differential enthalpy high limit changeover. Verify that RAT sensor installed and correctly wired. Troubleshoot as above for RAT.</td>
<td></td>
</tr>
<tr>
<td><strong>RAH Sensor. Display shows “RAH sensor out of range operation OAH enthalpy”</strong></td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on single OAH. The valid range for reading an RAH sensor for auto detection is 0.6VDC (6%RH) to (100%RH) up to 11.0 VDC. Using a voltmeter set to read AC input voltage at TH sensor terminal R, verify that there is 24 VAC +/- 20% (19 VAC – 29 VAC). If input voltage is not within range, verify input voltage at ECON-ZIP-BASE terminals R and C, if also out of range, troubleshoot RTU control circuit. If the input voltage is within range, remove wires from RH+ and RH- and measure across the two terminal using voltmeter set to DC. If DC output voltage is not within valid range above, replace sensor. If sensor was intentionally disconnected then go to: Alarm, Delete Alarms, select the alarm. When prompted to, press enter to permanently delete, press OK.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The table above provides troubleshooting actions for various sensor-related issues in an economizer system, specifically addressing the scenario where there is no free cooling detected. Each issue is categorized into different sensor types (OAT, SAT, OAH, etc.) and their respective actions are detailed to help diagnose and resolve the problems efficiently.
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Sensor is Not Detected or Out of Range</td>
<td>RAH Sensor. Display shows “RAH sensor not detected operation by DAH enthalpy”</td>
<td>Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on single enthalpy. The valid range for reading an RAH sensor for auto detection is 0.66VDC (6%RH) to (100%RH) up to 11.0 VDC. Using a voltmeter set to read AC input voltage at TH sensor terminal R, verify that there is 24 VAC +/- 20% (19 VAC to 29 VAC). If input voltage is not present, check continuity of wiring between ECON-ZIP-TH sensor and ECON-ZIP-BASE. If voltage is present, remove wires from RH+ and RH- and measure across the two terminal using voltmeter set to DC. If DC output voltage is within valid range above, check continuity of RH+ and RH- output wires between ECON-ZIP-TH sensor and ECON-ZIP-BASE. If continuity OK, go to settings menu and submenu Devices 2. Verify that display for RAH is Auto or Installed. If Auto, change it to Installed and see if Alarm disappears or a value RAH value is displayed in Monitor Live Conditions menu. Also can try to Delete alarm and see if sensor is again auto detected. If sensor was intentionally disconnected then go to: Alarm, Delete Alarms, select the alarm. When prompted to, press enter to permanently delete, press OK.</td>
</tr>
<tr>
<td>Alarm “Y2 Present Without Y1”</td>
<td>Potential wiring or thermostat problem</td>
<td>Thermostat input to ZIP Economizer has energized Y2 (2nd stage cooling) and has not energized Y1 (1st stage cooling). This configuration is not allowed. The economizer will recognize this and will treat Y2 signal as if it is Y1 and will energized 1st stage cooling (Mechanical or Free Cooling). Check to see if wires are reversed between thermostat and economizer input. Verify continuity to see if circuit could be open or wire could be broken. Test to see thermostat 1st stage relay is closing (Y1 has 24 VAC). Make sure there are no jumpers between R and Y2.</td>
</tr>
<tr>
<td>Alarm “Heat and Cool Both Present”</td>
<td>Potential wiring or thermostat problem</td>
<td>This alarm indicates that 24 VAC is at both terminal Y1 and W1 on the ZIP-ECON-BASE. Check for wiring problems. Note: this alarm is disabled when Heat Pump operation has been turned to On in Settings menu.</td>
</tr>
<tr>
<td>Alarm “SAT Drop for CC1 Insufficient Cooling System Problem”</td>
<td>Potential compressor, refrigerant, or supply fan problem</td>
<td>The ZIP Economizer reads the SAT value just before energizing 1st stage mechanical cooling. After compressor has started and 4 minutes have elapsed, SAT value is again checked. If SAT has not dropped by at least 5°F then this alarm is generated. Some possibilities are: • Filters or coils are dirty or blocked – inspect. • SAT sensor in location where are is not mixed - perform temperature traverse. • Indoor fan is inoperable - check relay, belt, motor, bearings. • Condenser fan is inoperable - check relay, motor, head pressure control. • Compressor is faulty (internal damage) - check amperage, pressures. • Contact energizes but compressor is out on internal/external overload. • High voltage problem to compressor - check wiring, phases, contactor. • Circuit 1 is low on refrigerant - check charge. • Cycle power</td>
</tr>
<tr>
<td>Alarm “SAT Drop for CC2 Insufficient Cooling System Problem”</td>
<td>Potential compressor, refrigerant, or supply fan problem</td>
<td>The ZIP Economizer reads the SAT value just before energizing 2nd stage mechanical cooling. After compressor has started and 4 minutes have elapsed, SAT value is again checked. If SAT has not dropped by at least 5°F then this alarm is generated. Troubleshoot as above for 1st stage.</td>
</tr>
<tr>
<td>Alarm “SAT Should Be Lower”</td>
<td>Potential damper, linkage, or actuator problem</td>
<td>When in Free Cooling and damper still open, If the SAT is not within 10°F or the OAT, then this alarm will be generated. Exception when the damper is modulated to obtain the SAT setpoint of 55°F. Some possibilities are: • Check damper linkages. • Check actuator clamp / interface between damper is secure. • Check that damper blades secured to damper shaft properly. • Check that both outside air damper and return damper stroke properly. • Check that return damper closes tightly when outdoor damper is full open. • Check that OAT sensor is in the airflow path and not subjected to solar radiation. • Check that SAT sensor is in a location that airflow is mixed.</td>
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<tr>
<td>Alarm “Damper Pos Value Missing”</td>
<td>Actuator or wiring problem</td>
<td>The connected actuator must have a feedback wire terminated at ACT5 on the ECON-ZIP-BASE. The range should be between 2-10 VDC. Verify voltage with multimeter. Remove feedback wire and check voltage between terminal C and the feedback wire. If no voltage, replace actuator.</td>
</tr>
<tr>
<td>Alarm “Damper is Stuck”</td>
<td>Damper or linkage problem</td>
<td>The feedback from the actuator is used to determine the position of the damper. If the ZIP Economizer commands the damper to drive open to a designated % and the feedback measured does not achieve the commanded value, then this alarm will be generated. • Check damper linkages. • Check that actuator limit stop not adjusted to smaller angle.</td>
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<tr>
<td>Alarm “Compressor 1 Not Detected”</td>
<td>CC1 output circuit is open</td>
<td>If the damper rotation is less than 85% and the Economizer Test has not been run to scale the output to the damper travel, this alarm may occur.</td>
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### Troubleshooting ZIP Economizer

#### Problem | Possible Cause | Action
--- | --- | ---
Alarm “Compressor 1 Not Detected” | Compressor safety open | Check Low Pressure control.  
Compressor contactor coil bad | Check High Pressure control.  
Check Compressor Current protector.  
Inability to auto detect | Check that there is resistance through the coil and compare to min requirements in technical document.  
If all items above have been verified good and circuit continuous, then in Settings menu under Devices 1, change Compressor Qty from Auto to 1 or 2 to match number of compressors in the RTU. Once the Qty selected, the alarm will clear, the user must verify the compressor does enable when it is supposed too.

**There is No Integrated Cooling**

#### Problem | Possible Cause | Action
--- | --- | ---
Potential damper, linkage, actuator problem, or wiring problem | In order for the ZIP Economizer to enter into Integrated Cooling mode, the damper must be close to full open (> 85%) and Y2 must be enabled. See sequence of operation for more information. Check damper and linkage components as addressed above. Check Y2 signal.

• Damper rotation not scaled If the damper rotation is less than 85% and the Economizer Test has not been run to scale the output to the damper travel, then Integrated cooling will not ever occur.

• SAT Y2 limit If the SAT Y2 Limit is on in Settings menu, then Integrated Cooling will be disabled when SAT is below the specified temperature. See sequence of operation for more information.

• In time delay There is a time delay after the damper reaches open till 2nd stage Integrated Cooling can occur. See sequence of operation for more information.

Alarm “Energy Module not detected as installed” | ZIP Economizer cannot detect the ZIP-ECON-EM, which was previously detected as installed | The following functions (if they were utilized) will be disabled:  
• Purge.  
• Remote damper override potentiometer.  
• CO2 sensing and Demand Control Ventilation.  
• Low Speed indoor fan control.  
Full unplug per mounting instructions. Check plug and socket for any debris. Clean carefully if necessary. Re-install Energy Module per IOM manual instructions until you hear a snap indicating it is locked into place. If this does not resolve problem, replace ZIP-ECON-EM.

**Alarm “Exhaust Fan Not Detected”**

#### Problem | Possible Cause | Action
--- | --- | ---
Energy Module not detected | Check that the Energy Module is Connected in the “Present Devices” menu. If not troubleshoot as above.

Wiring or exhaust fan relay problem | When the ZIP Economizer is first powered, it detects the presence of the Exhaust Fan control circuit. If the circuit is detected as open, this alarm will be generated. Check all wiring, connectors, and relay coil. Check that there is resistance through the coil and compare to min requirements in technical document.

Inability to auto detect | If the two potential problems above have been verified, then there may be a problem with auto detecting. In “Settings” menu under Devices 1, verify the set value is Auto or Installed. If set on Auto try setting value to Installed. Once Installed, the alarm will clear, the user must verify the fan does enable as the damper passes the Exhaust Fan On Pos.

**Alarm “2 Speed Fan Not Detected”**

#### Problem | Possible Cause | Action
--- | --- | ---
Energy Module not detected | Check that the Energy Module is Connected in the “Present Devices” menu. If not troubleshoot as above.

Wiring or indoor fan relay problem | When the ZIP Economizer is first powered, it detects the presence of the Indoor Fan control circuit. If the circuit is detected as open, this alarm will be generated. Check all wiring, connectors, and relay coil. Check that there is resistance through the coil and compare to min requirements in technical document.

Inability to auto detect | If the two potential problems above have been verified, then there may be a problem with auto detecting. In “Settings” menu under Devices 1, verify the set value is Auto or Available. If set on Auto try setting value to Available. Once set to Available, the alarm will clear, the user must verify proper operation of IF output.

**Alarm “CO2 Sensor Not Detected. DCV Functions Disabled”**

#### Problem | Possible Cause | Action
--- | --- | ---
Energy Module not detected | Check that the Energy Module is Connected in the “Present Devices” menu. If not troubleshoot as above.

Wiring or CO2 sensor problem | When the ZIP Economizer is first powered, it detects the presence of power from the CO2 sensor. If the input signal at CO2 input from Energy Module is missing and has been previously detected. DCV will be disabled. The damper will return to Vent Min Pos. If the voltage input to CO2+ and CO2- is < 0.5 VDC then this alarm will occur. Check the following:  
• Verify CO2 Sensor is set to 0-2000ppm working range - 0VDC (0ppm) to 10VDC (2000ppm).  
• Verify that 24 VAC power is available at sensor. If not, correct. If so, continue below.  
• Validate reading of CO2 at sensor with a calibrated instrument.  
• Check to see that sensor output voltage is correct (0.005 x actual ppm reading). Example: a measured CO2 reading at the sensor is 1000ppm. Voltage output from sensor should be .005 x 1000 = 5 VDC.  
• Verify wiring continuity between sensor and ZIP-ECON-EM input CO2+ CO2-.

**Alarm “CO2 Sensor Out of Range. DCV Functions Disabled”**

#### Problem | Possible Cause | Action
--- | --- | ---
Wiring or CO2 sensor problem | When the ZIP Economizer is first powered, it detects the presence of power from the CO2 sensor. If the input signal at CO2 input from Energy Module is out of range and has been previously detected. DCV will be disabled. The damper will return to Vent Min Pos. If the voltage input to CO2+ and CO2- is < 1.25 VDC (250 ppm) or > 11 VDC (2200ppm) then this alarm will occur. Troubleshoot as above “CO2 Sensor not detected”.

---

**Disclaimer**:  
The information provided is for reference only and may not be up-to-date. For the latest details, please consult the official documentation or contact the manufacturer. The content is subject to change. © Belimo Aircontrols (USA), Inc.
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