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BELIMO®
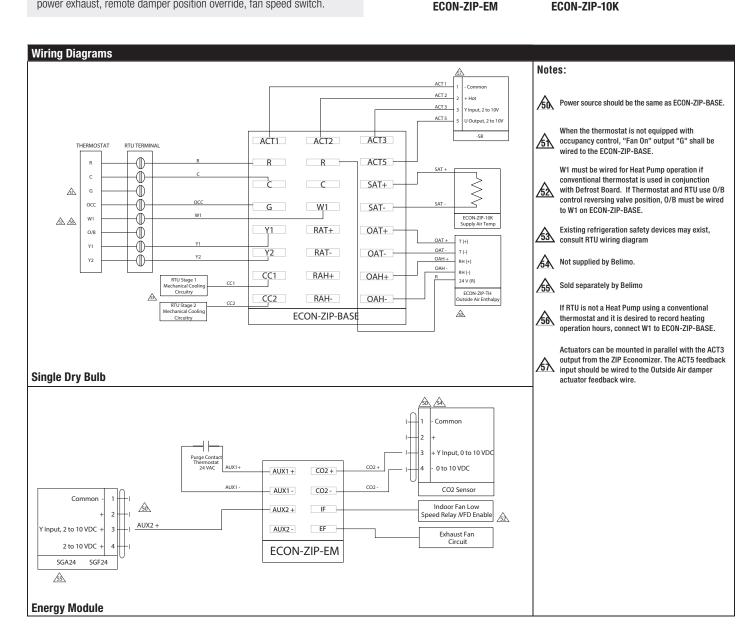
ECON-ZIP-SELF; ZIP PACK

ECON-ZIP-SELF; ZIP PACK

Single Enthalpy with DCV Capability and LF
Spring Return Actuator

Application

This kit offers all the components to retrofit an economizer on a direct expansion RTUs up to 7.5 tons while utilizing single enthalpy changeover strategy. In this, the ZIP Economizer will calculate outdoor air enthalpy and be analyzed against the referenced enthalpy high limit, and the referenced temperature high limit. One outside temperature & humidity sensor will be place on the outside damper, and one temperature sensor the other in the supply duct. That high limit changeover temperature and enthalpy value is adjustable.

When the included energy module is used (ECON-ZIP-EM), the following options become available: demand control ventilation, pre occupancy purge, power exhaust, remote damper position override, fan speed switch.

Contains:

ECON-ZIP-BASE

ECON-ZIP-TH

LF24-SR and Retrofit Kit

ECON-ZIP-EM

ECON-ZIP-10K

Wiring Diagrams

Single Dry Bulb

Notes:

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

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

△52 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.

△53 Existing refrigeration safety devices may exist, consult RTU wiring diagram

△54 Not supplied by Belimo.

△55 Sold separately by Belimo

△56 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.

△57 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.

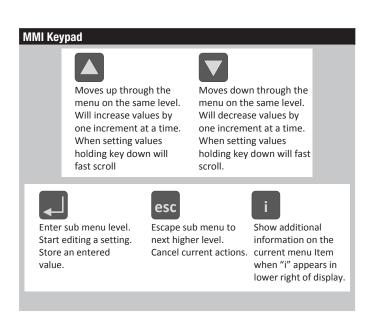**Energy Module**

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, OAT, SAT, ACT1, ACT2, ACT3, ACT5). See wiring diagrams.
4. Sensor configuation: The ZIP Economizer automatically detects sensors attached and automatically configures for single dry bulb, single enthalpy, differential dry bulb and differential enthalpy.

MMI Keypad

▲

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.

↵

Enter sub menu level. Start editing a setting. Store an entered value.

esc

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.

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.

```
Settings
                  i
```

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".)**

```
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 paramaters 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

      > US
      > 89436

      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).

      > Vent Min Pos
      > __%   i

   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 auto-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.

Settings

Menu Item	Parameter	Default	Range	Notes
Zip Code[1]	US	00000	5 Digit Num	**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".
	Canada	000000	6 Digit Alpha/Num	**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".
Heat Pump Op	Heat Pump Op	Off	Off HP (O) = pow = Cool HP (B) = pow = Heat HP (W1) = pow = Heat	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.
Compressor Qty[8]	Number of Compressors	Auto[2]	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	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.
Devices 1 CC1, CC2, IF, EF, (as connected)	Fan 2 Speed[4]	Auto[2]	Auto, Available, Not Available	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.
	Compressor Qty[3]	Auto[2]	Auto, 1, 2	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.
	Exh Fan Install[4]	Auto[2]	Auto, Installed, Not Installed	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.
Devices 2 OAH, RAH, (as connected)	OAH[5]	Auto[2]	Auto, Installed, Not Installed	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.
	RAH[5]	Auto[2]	Auto, Installed, Not Installed	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.

Menu Item	Parameter	Default	Range	Notes
Vent Min Pos[1]	Vent Min Pos	_ _%	0-100%	**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.
DCV Min Pos[4]	DCV Min Pos	_ _%	0% - Vent Min Pos %	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 CO_2 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.
DCV PPM Set Pnt[4]	DCV PPM Set Pnt	_ _ppm	500 - 2000 ppm	This is the CO_2 concentration that is desired to maintain in the space. When the CO_2 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 CO_2 level increases above this value, the damper will start to modulate towards the Vent Min Pos to lower the CO_2 in the space.
2 Speed Fan Op	2 Speed Fan Operation	Off	On Off	If the unit is factory installed with 2 speed fan capability, then this setting must be set to On to provide proper ventilation.
Low Sp Vent Min[6]	Low Sp Vent Min	_ _%	"Vent Min Pos" % - 100%	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.
Low Sp DCV Min[6]	Low Sp DCV Min	_ _%	"DCV Min Pos" % - "Low Sp Vent 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.
Exh Fan On Pos[4]	Exh Fan On Pos	_ _%	0 - 100%	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.
Low Exh Fan Pos[6]	Low Exh Fan Pos	_ _%	0 - 100%	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.
Temp Unit	Temp Unit	°F	°F, °C	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.
Purge Enable[4]	Purge Control	Off	On, Off	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.
Purge Dmp Set[4]	Purge Dmp Set	_ _%	0% - "Vent Min Pos" %	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.
Remote Dmp Cntrl[4]	Remote Dmp Cntrl	Off	On, Off	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.

Menu Item	Parameter	Default	Range	Notes
High Limit Modification	High Limit Dry Bulb	ZIP Code Dependent	60-80°F 16-27°C	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.
	High Limit Fixed Enthalpy[5]	28 BTU/lb 47 kJ/kg	25-28 BTU/lb 40-52 kJ/kg	
		ZIP Code Dependent	60-80°F 16-27°C	
	High Limit Diff Enthalpy	30 BTU/lb 52 kJ/kg	25-30 BTU/lb 40-52 kJ/kg	
		ZIP Code Dependent	60-80°F 16-27°C	
SAT Y2 Limit	SAT Y2 Limit	On	On, Off	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 "On" 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 "off", 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.

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.