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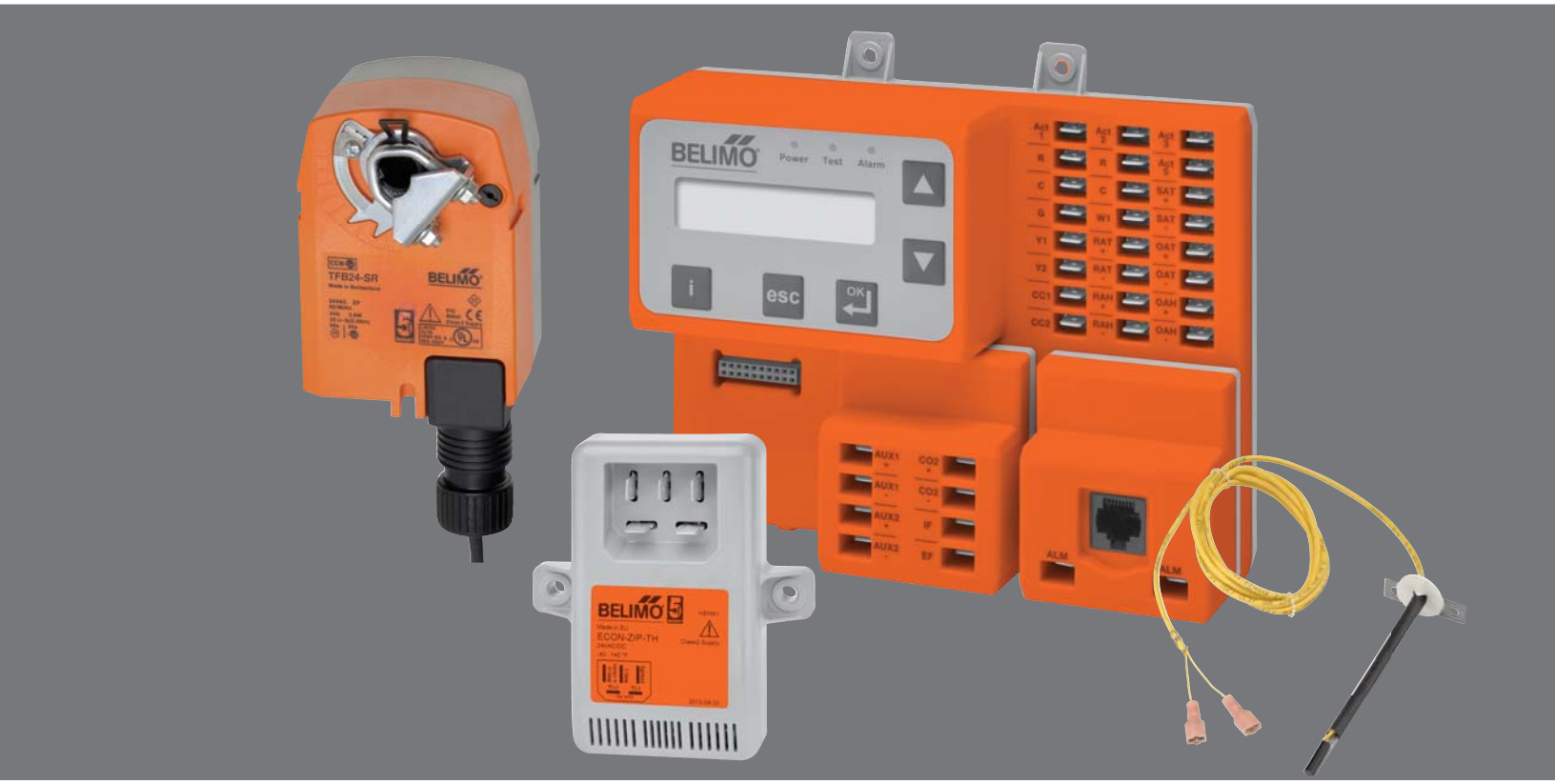
Belimo ZIP Economizer™



Installation and Operation Manual

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

PART OFFERING

	ECON-ZIP-BASE ZIP Economizer Base Unit	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, and damper position feedback.
	ECON-ZIP-EM ZIP Economizer Energy Module	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, 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.
	ECON-ZIP-COM ZIP Economizer Communication Module	The ZIP Economizer™ Communication Module provides remote alarm indication with future capabilities such as data trending and building automation integration.
	ECON-ZIP-10K ZIP Economizer Temperature Sensor	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.
	ECON-ZIP-TH ZIP Economizer Temperature and Humidity Sensor	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 discrete 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.

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ECON-ZIP-BASE

ZIP Economizer™ Base Module

Installation

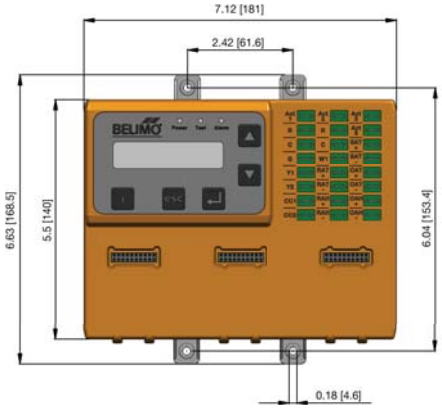
You can mount the ZIP Economizer in any orientation; it is recommended that you mount it in a position that will allow full utilization of the LCD and key pad and proper clearance for installation, servicing, wiring, and removal.

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 minumum 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-COM) 6.5 VA base with Energy Module and Communication Module.
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
Humidity	5 to 95% RH non-condensing
Humidity input signal	0-10 VDC; corresponds to 0 to 100%
Housing	NEMA 1
Housing material	UL94-5VA
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])



ECON-ZIP-BASE

Technical Data

Type	Name	Description	Electrical Specification
Input	R	Supply Hot	24 VAC, ± 20%, 50/60Hz
Input	G	Fan Signal (occupied)	On/Off, 24 VAC, ± 20%, 50/60Hz
Input	C	Supply Common	Common
Input	Y1	Cooling requirement Stage 1	On/Off, 24 VAC, ± 20%, 50/60Hz
Input	Y2	Cooling requirement Stage 2	On/Off, 24 VAC, ± 20%, 50/60Hz
Input	W1	Heating requirement Stage 1	On/Off, 24 VAC, ± 20%, 50/60Hz
Input	SAT ±	Supply Air Temperature Sensor	Type: 10K NTC (Type II thermistor)
Input	OAT ±	Outdoor Air Temperature	Type: 10K NTC (Type II thermistor)
Input	OAH ±	Outdoor Air Humidity	0-10 VDC Auto Detection: Sensor present if voltage 0.5V-10V
Input	RAT ±	Return Air Temperature	Type: 10K NTC (Type II thermistor)
Input	RAH ±	Return Air Humidity	0-10 VDC Auto Detection: Sensor present if voltage 0.5V-10V
Output	CC1	Compressor 1 RTU Stage 1 Mechanical Cooling Circuitry	100'000 cycles @ inrush current of 3A, normal current 1.5A Impedance for Auto detection @ 24 V: <600 Ω @ 60Hz <800 Ω @ 50Hz
Output	CC2	Compressor 2 RTU Stage 2 Mechanical Cooling Circuitry	100'000 cycles @ inrush current of 3A, normal current 1.5A Impedance for Auto detection @ 24 V: <600 Ω @ 60Hz <800 Ω @ 50Hz
Output	Act 1	Actuator supply common	Common
Output	Act 2	Actuator supply hot	24 VAC, 50/60Hz
Output	Act 3	Actuator control output	2-10 VDC
Input	Act 5	Actuator feedback signal	2-10 VDC

* The power consumption is for the control only and does not include connected loads such as actuator, compressors, fans, and sensors. For transfomer 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.

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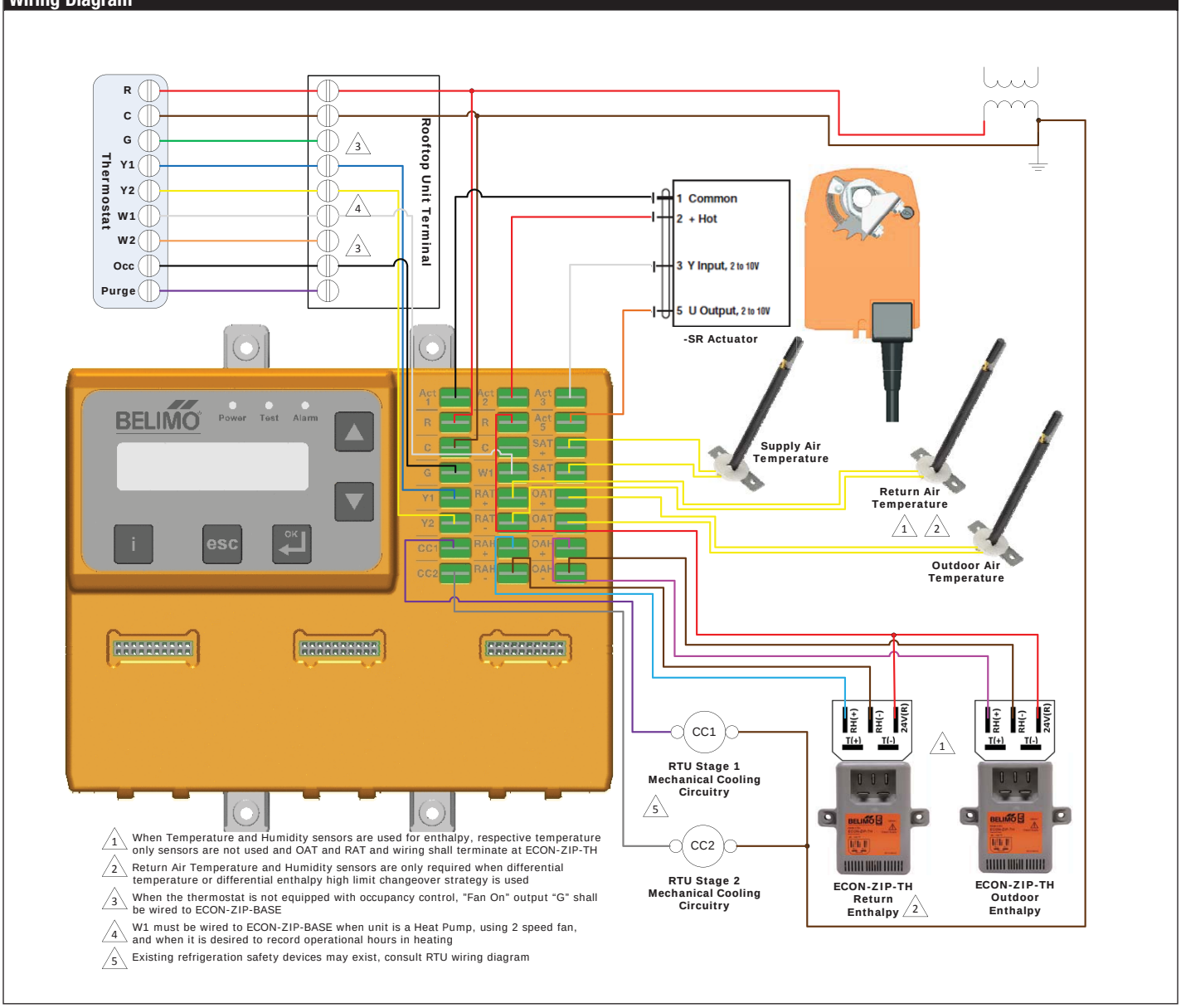
Wiring Diagram



1. When Temperature and Humidity sensors are used for enthalpy, respective temperature only sensors are not used and OAT and RAT and wiring shall terminate at ECON-ZIP-TH
2. Return Air Temperature and Humidity sensors are only required when differential temperature or differential enthalpy high limit changeover strategy is used
3. When the thermostat is not equipped with occupancy control, "Fan On" output "G" shall be wired to ECON-ZIP-BASE
4. W1 must be wired to ECON-ZIP-BASE when unit is a Heat Pump, using 2 speed fan, and when it is desired to record operational hours in heating
5. Existing refrigeration safety devices may exist, consult RTU wiring diagram

***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 diagram above.

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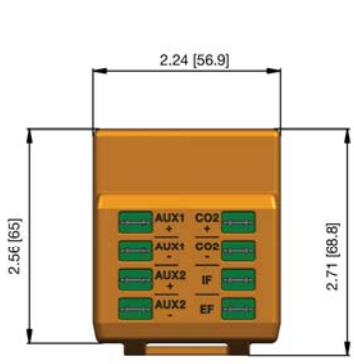
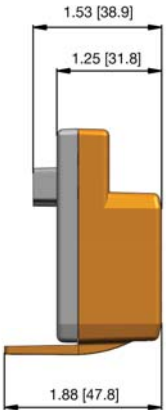
5 YEAR WARRANTY

Technical Data	
Power supply	24 VAC ± 20%, 50/60Hz, class 2 power source
Power consumption rating*	1.5 VA (ECON-ZIP-EM), 5.5 VA (ECON-ZIP-BASE + ECON-ZIP-EM)
Connectors	1/4" male spade connectors
Environmental	RoHS, conformally coated
Indoor fan speed selection	100'000 cycles @ inrush current of 3A, normal current 1.5A
Exhaust fan selection	100'000 cycles @ inrush current of 3A, normal current 1.5A
Supported CO2 sensor	0-10 VDC, sensor auto-detection
Auxiliary input - purge contact	on/off - 24 VAC, 50/60HZ - current load min 10mA
Auxiliary input - remote potentiometer	2-10VDC
Humidity	5 to 95% RH non-condensing
Housing	NEMA 1
Housing material	UL94-5VA
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)
Agency listing	cULus acc. to UL873, CAN/CSA C22.2, No. 24-93

*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.

Dimensions (Inches [mm])





ECON-ZIP-EM

Technical Data			
Type	**Name**	**Description**	**Electrical Specification**
Input	CO2 +/-	CO2 sensor input	0-10 VDC Sensor auto-detection
Output	IF	Indoor fan low speed enable	100'000 cycles @ inrush current of 3A, normal current 1.5A Impedance for Auto detection @24 V: <600 Ω @ 60Hz <800 Ω @ 50Hz
Output	EF	Exhaust fan enable	100'000 cycles @ inrush current of 3A, normal current 1.5A Impedance for Auto detection @ 24 V: <600 Ω @ 60Hz <800 Ω @ 50Hz
Input	AUX1 ±	Auxiliary input Purge contact input	On/Off, 24 VAC, 50/60 Hz Current load min. 10mA
Input	AUX2 ±	Auxiliary input Remote Potentiometer Input	2-10 VDC

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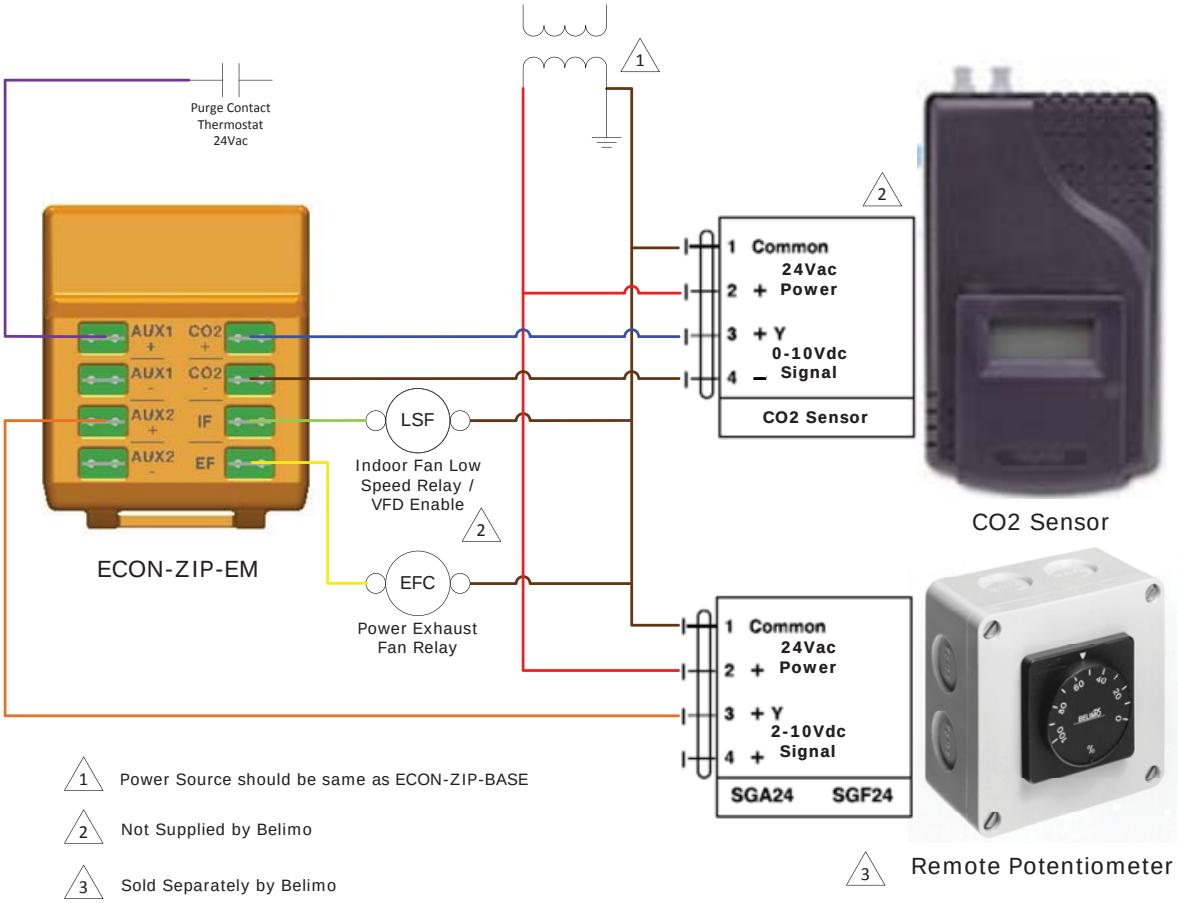
Wiring Diagram



1 Power Source should be same as ECON-ZIP-BASE

2 Not Supplied by Belimo

3 Sold Separately by Belimo

4 If the RTU has a 2 speed fan (IF wired), then W1 on the ECON-ZIP-BASE needs to be wired as well, since the fan shall not run in part load when heating.

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ECON-ZIP-COM

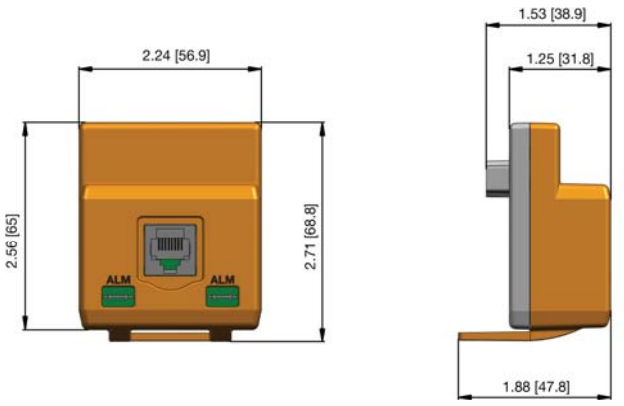
ZIP Economizer™ Communication Module

5 YEAR WARRANTY

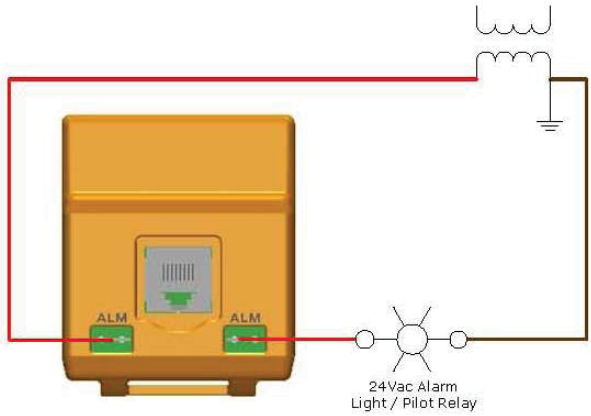
Technical Data	
Power supply	24 VAC ± 20%, 50/60Hz, class 2 power source
Power consumption rating*	2.5 VA (ECON-ZIP-COM), 6.5 VA (ECON-ZIP-BASE + ECON-ZIP-COM)
Connectors	1/4" male spade connectors
Environmental	RoHS, conformally coated
Communication interface	RS485 interface, optical isolation max. 1kVDC (for max.1 min), Pin 4: RS485 Com Gnd, Pin 7: RS485 Com A, Pin 8: RS485 Com B
Supported remote alarm	normal current: 0.5A, inrush current: 1A
Humidity	5 to 95% RH non-condensing
Housing	NEMA 1
Housing material	UL94-5VA
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)
Agency listing	cULus acc. to UL873, CAN/CSA C22.2, No. 24-93

*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.

Dimensions (Inches [mm])



Wiring Diagram



ECON-ZIP-COM

Technical Data			
Type	**Name**	**Description**	**Electrical Specification**
I/O	Comm	Communication Interface	RS485 Interface Optical Isolation max. 1k VDC (for max. 1min) Pin 4: RS485 Com Gnd Pin 7: RS485 Com A Pin 8: RS485 Com B
Relay	ALM	Diagnostic Alarm	Relay contact 24 V Normal current: 0.5A Inrush current: 1A

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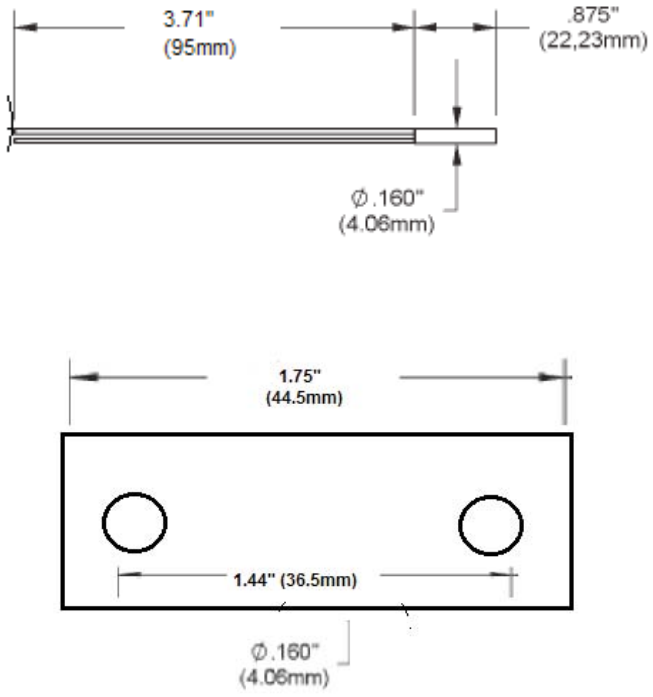
5 YEAR WARRANTY

Technical Data

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

Dimensions in Inches [mm]



Installation

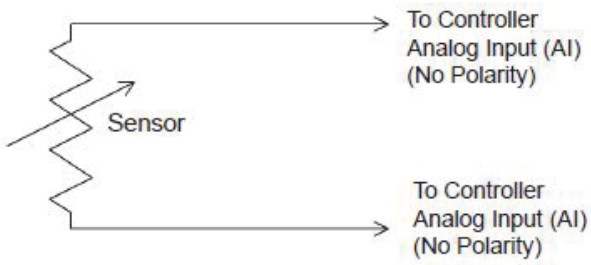
Avoid mounting in areas where acid fumes or other deteriorating vapors can attack the metal parts, or in areas where escaping gas or other explosive vapors are present.

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.

Wiring Diagram



ECON-ZIP-10K

ZIP Economizer Connection Points
SAT (+/-)
OAT (+/-)
RAT (+/-)

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ECON-ZIP-TH

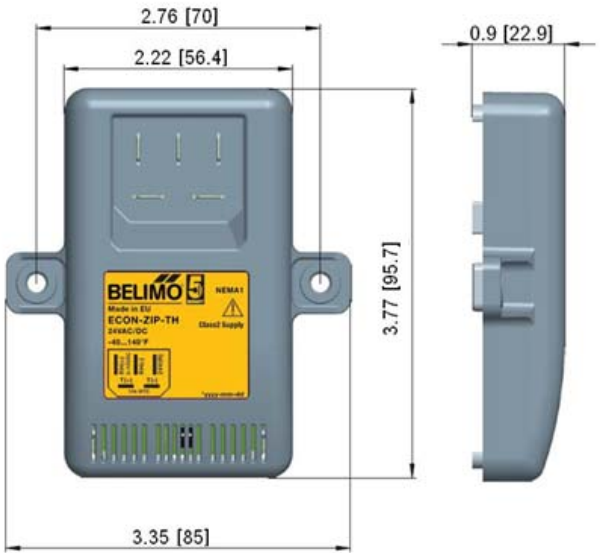
ZIP Economizer™ Temperature and Humidity Sensor

5 YEAR WARRANTY

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% 35-65% rH @ 75°F ± 5% 0-34%, 66-100% rH @ 75°F
Response Time	<45 seconds @ 40 FPM, 75°F
Hysterisis	<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 [cm])



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.

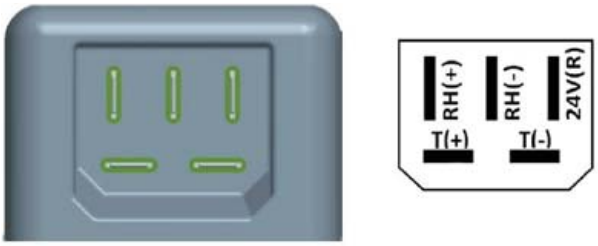
Using the dimensions as a reference, mount the Temperature and Humidity Sensor on the outside of the dampers to measure outside temperature and humidity, or inside the return air duct to measure the return temperature and humidity. If mounted outside, the sensor must be placed within hood behind the 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 the orientation 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.

Wiring



ECON-ZIP-TH

Technical Data

Type	Name	Description	Electrical Specification	ZIP Connections
Input	24V	Supply Hot	24 VAC, ± 20%, 50/60Hz	Same Power Supply
Output	T(+/-)	Temperature	Type: 10K NTC (Type II thermistor)	OAT (+/-); RAT (+/-); SAT (+/-)
Output	RH(+/-)	Relative Humidity	0-10 VDC	OAH (+/-); RAH (+/-);

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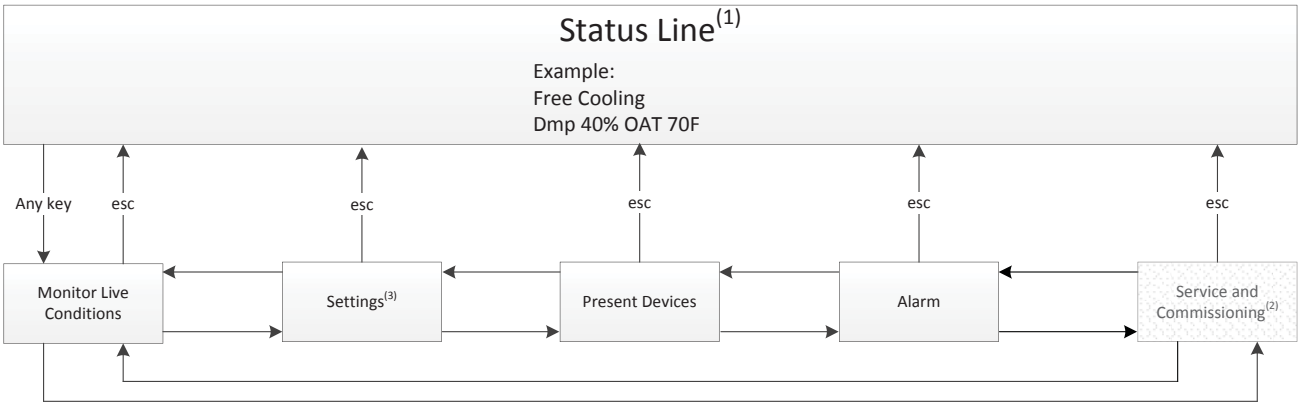
Menu Flow

Keypad Key Definition

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.	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



(1) The status line presents the current status of the economizer including contextual information like temperatures, damper position or compressor start / stop requests.
Additionaly, 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 is first powered.

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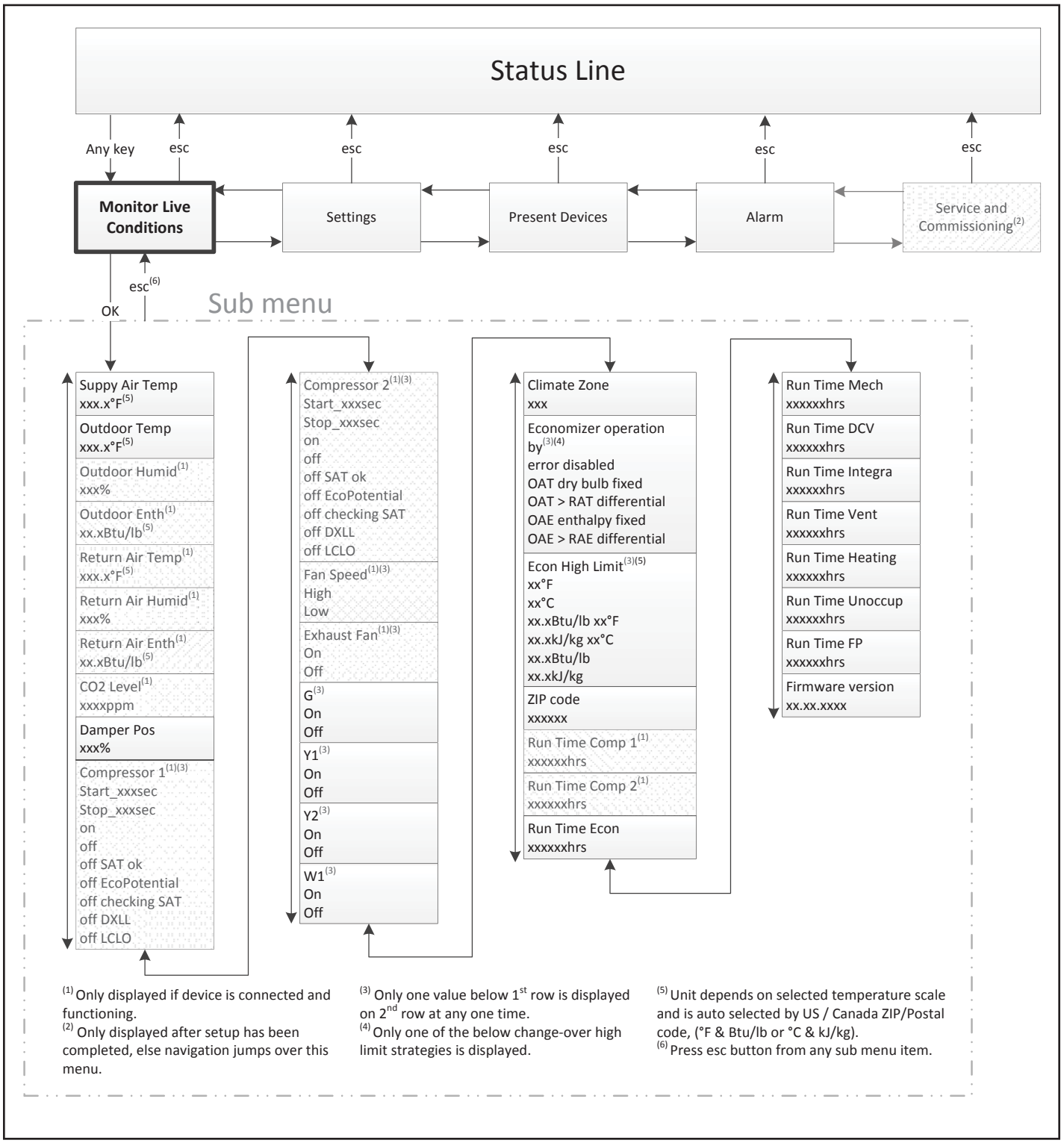

(1) Only displayed if device is connected and functioning.
(2) Only displayed after setup has been completed, else navigation jumps over this menu.
(3) Only one value below 1st row is displayed on 2nd row at any one time.
(4) Only one of the below change-over high limit strategies is displayed.
(5) Unit depends on selected temperature scale and is auto selected by US / Canada ZIP/Postal code, (°F & Btu/lb or °C & kJ/kg).
(6) Press esc button from any sub menu item.

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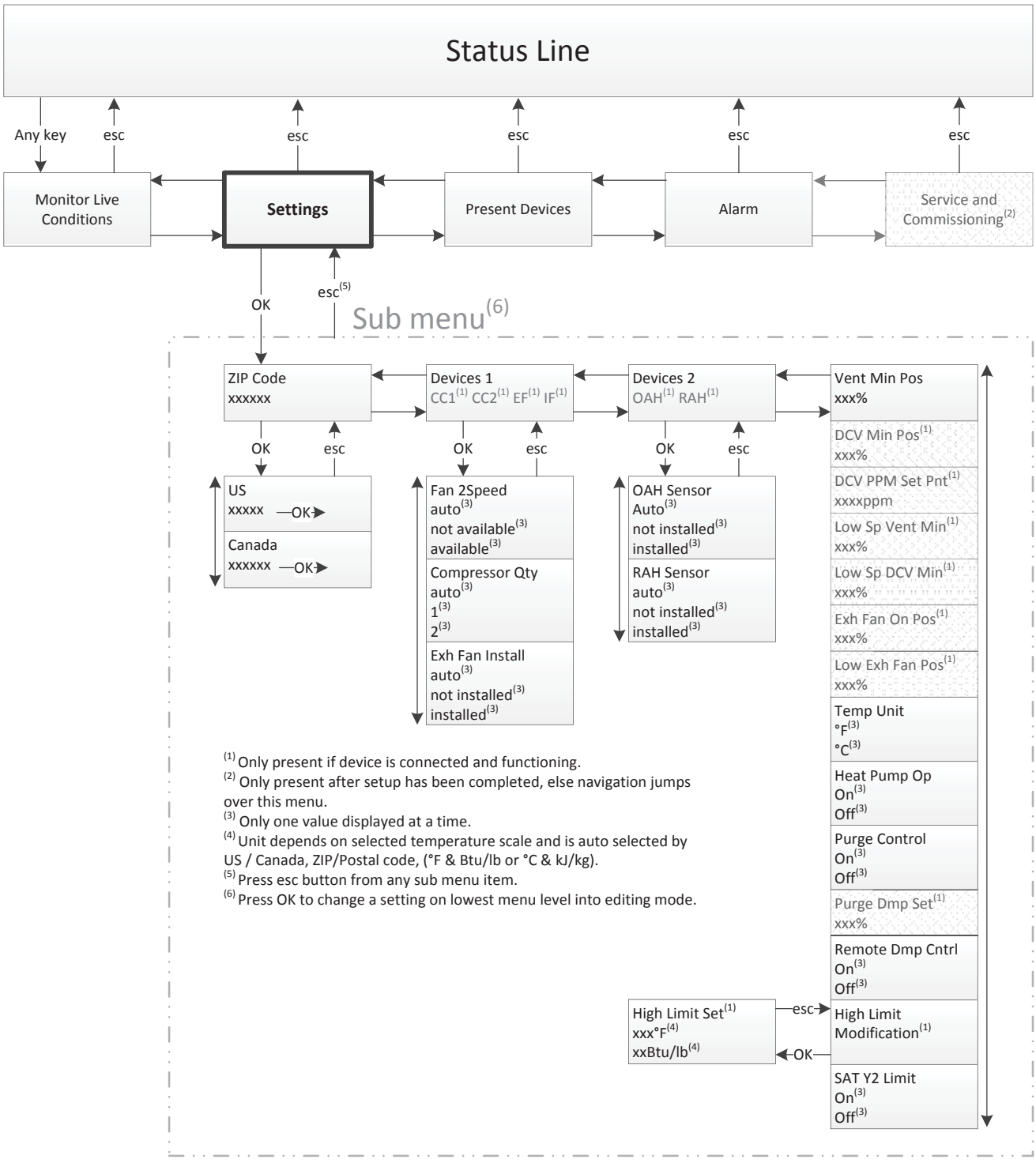

(1) Only present if device is connected and functioning.
(2) Only present after setup has been completed, else navigation jumps over this menu.
(3) Only one value displayed at a time.
(4) Unit depends on selected temperature scale and is auto selected by US / Canada, ZIP/Postal code, (°F & Btu/lb or °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.

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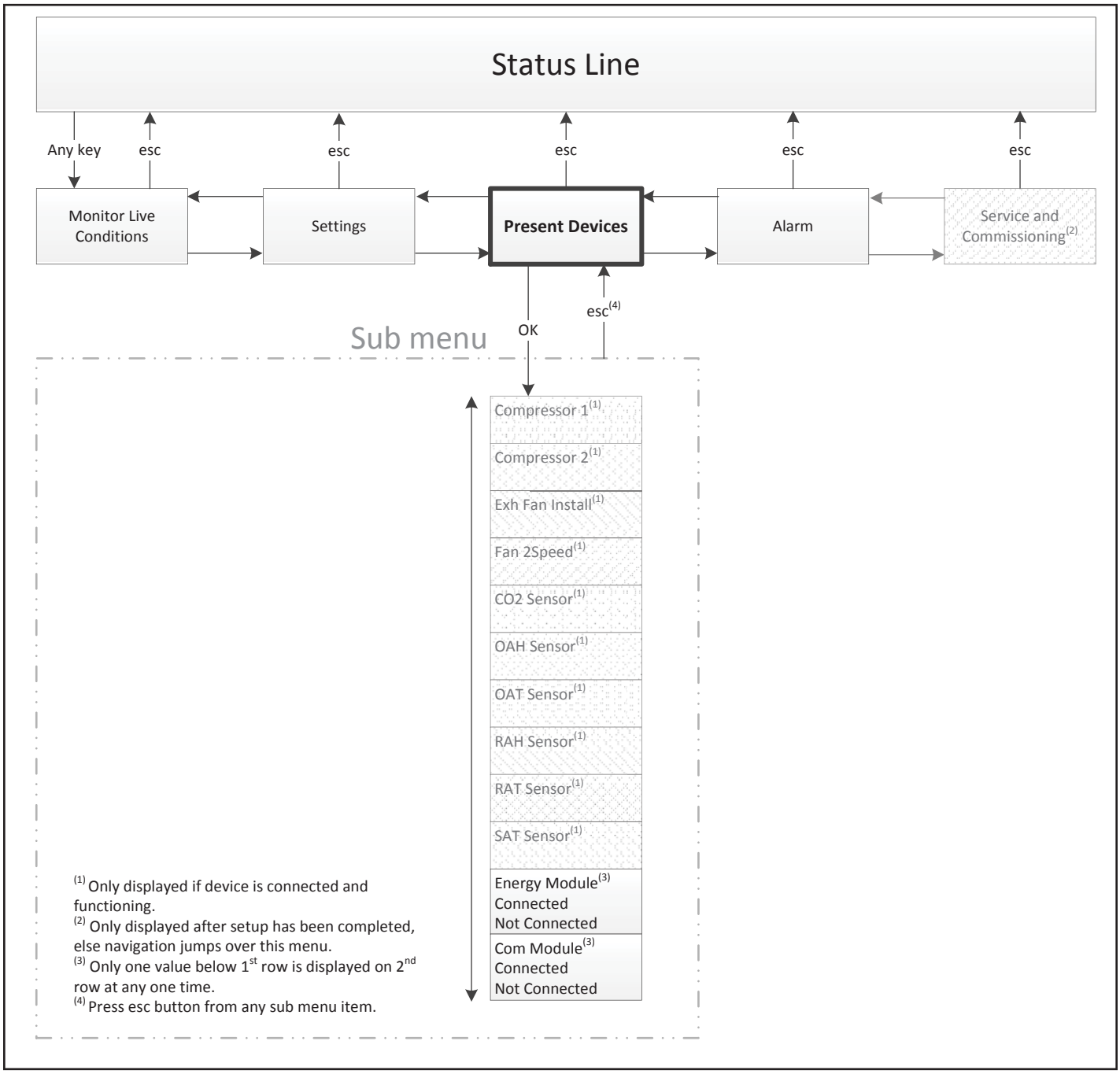

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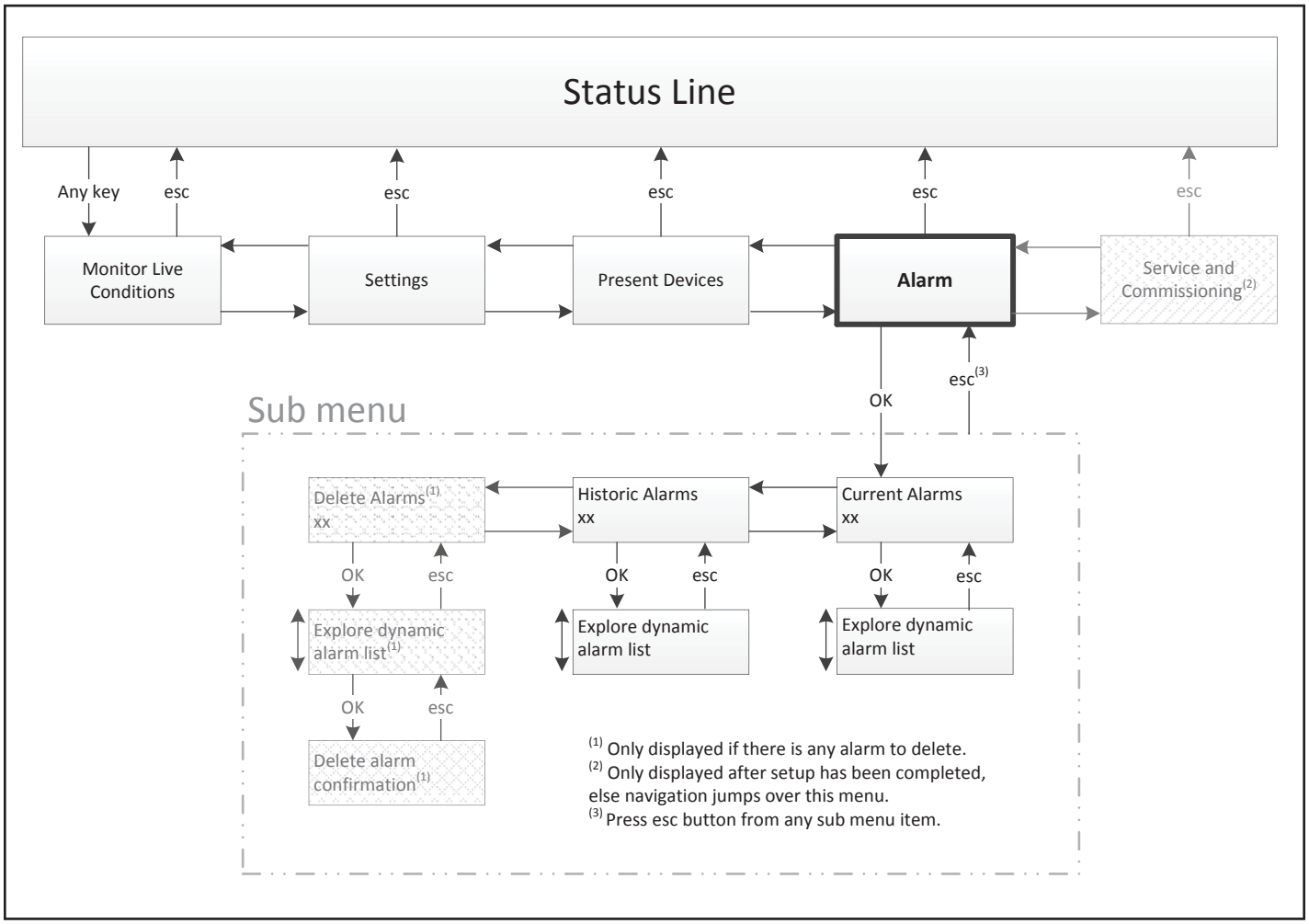

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Settings

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".
Devices 1 CC1, CC2, IF, EF, (as connected)	Fan 2Speed[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.
Vent Min Pos[1]	Vent Min Pos	_ _%	0-100%	**Setting the minimum position required for Economizer Operation.** This is where the 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.
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.
Heat Pump Op	Heat Pump Op	Off	On, Off	If the RTU that the economizer is installed in is a heat pump, then this value shall be set to "on". **Important: heat pump mode is designed to work with RTUs that use a standard thermostat and W signal to a defrost board to enable compressors. If this RTU uses a heat pump thermostat with Y + O energizing cooling, then an isolation relay may be required.** Note: Setting this to on disables specific limits (Low Ambient Compressor Lockout and Supply Air Low Temperature Protection).
SAT Y2 Limit	SAT Y2 Limit	On	On, Off	SAT Y2 Limit is an energy saving function that disables 2nd stage 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. This function saves energy by having one stage of cooling satisfy space cooling requirements.

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Menu Item	Parameter	Default	Range	Notes
Purge Control[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 2-10VDC (2V damper closed - 10V 100% open). This function overrides all other damper position settings
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 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.
DCV PPM Set Pnt[4]	DCV PPM Set Pnt	_ _PPM	500 - 2000 PPM	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.
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 airflow rate value.
High Limit Modification[7]	High Limit Set _ _°F/°C	ZIP Code Dependent	xx-xx °F/°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. Note: a modification may result in less energy savings and non compliance with local energy code.
	High Limit Set[5]	28 Btu/lb 65.1 kJ/kg	xx-xx Btu/lb	
	High Limit Set[5]	28 Btu/lb 65.1 kJ/kg	xx-xx Btu/lb	

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 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.

7. Not visible when differential dry bulb or differential enthalpy change over strategies are used

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Monitor Live Conditions

Menu Item	Parameter Range[1]	Notes
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[2]	5.0 to 100.0 %	Displays live OAH within outside air hood at damper inlet.
Outdoor Enth[2]	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[2]	-40.0 to 158.0°F -40.0 to 70.0°C	Displays live RAT within return duct at damper inlet.
Return Air Humid[2]	5.0 to 100.0 %	Displays live RAH within return duct at damper inlet.
Return Air Enth[2,3]	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	Off	Displayed when there is no Y1 call and Mech Cooling available or when there is no Y2 call during Free Cooling.
	On	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).
	Stop xxxsec	Displayed when a Y1 call in Mech Cooling or a Y2 call in Integrated Cooling is removed, and minimum on time has not elapsed.
	Start xxxsec	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.
	Off EcoPotential	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.
Compressor 2[5]	Off	Displayed when there is no Y2 call and Mech Cooling available.
	On	Displayed when there is a Y2 call during Mech Cooling and SAT Y2 Limit is not active or minimum on / off time active.
	Stop xxxsec	Displayed when there is a Y2 call in Mech Cooling and minimum on time has not elapsed.
	Start xxxsec	Displayed when there is a Y2 call in Mech Cooling and the minimum off time has not elapsed.
	Off EcoPotential	Displayed during Free Cooling or during Integrated Cooling.
	Off Checking SAT	Displayed when there is a Y2 call in Mech Cooling and SAT Y2 Limit is on and SAT is being evaluated.
	Off SAT OK	Displayed when there is a Y2 call in Mech Cooling and SAT Y2 Limit is on and SAT has been verified below the limit.
Fan Speed[4,6]	Low/High	Displays the current commanded fan speed of the Indoor 2 Speed Fan.
Exhaust Fan[4]	On/Off	Displays the status of the of the Exhaust Fan.
G	On/Off	Displays Occupied / Fan signal from room control.
Y1	On/Off	Displays Cooling stage 1 request from room control.
T2	On/Off	Displays Cooling stage 2 request from room control.
W1	On/Off	Displays Heating request from room control.
Climate Zone	1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 4C, 5A, 5B, 6A, 6B, 7, 8	U.S. ASHRAE 90.1
	1 to 16	California Title 24
	6, 7, 8	Canada NECB

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Menu Item	Parameter Range[1]	Notes
Economizer Operation by (displays high limit change over strategy based on detected connected sensors)	OA dry bulb fixed	Displayed when only OAT sensor connected (ECON-ZIP-10K).
	OA enthalpy fixed	Displayed when an OAT and OAH sensor connected (ECON-ZIP-TH).
	error disabled	Displayed when an OAT and OAH sensor used but either value is not present.
	OAT>RAT dry bulb differential	Displayed when an OAT and OAH sensor connected and a RAT and RAH sensor connected (two ECON-ZIP-TH sensors).
	OA>RA enthalpy differential	Displayed when an OAT and RAT sensor are connected (two ECON-ZIP-10K).
Econ High Limit	xx Temp (°F - °C) xx Enthalpy (Btu/lb - kJ/kg)	This is the economizer to mechanical cooling change over limit set by ZIP Code / Postal Code and connected sensor choice.
US/Canada	Zip Code/Postal Code	Displays the ZIP Code / Postal Code entered in Settings.
Run Time Comp 1	Hours	Displays the operating time when CC1 is powered to enable compressor 1 to operate (this includes Integrated Cooling periods).
Run Time Comp 2[5]	Hours	Displays the operating time when CC2 is powered to enable compressor 2 to operate (when 2 stages are available).
Run Time Econ	Hours	Displays the operating time when in Free Cooling. (Does not include Integrated Cooling periods).
Run Time Mech	Hours	Displays the totaled time when CC1 and CC2 have been powered.
Run Time DCV	Hours	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).
Run Time Integra	Hours	Displays the operating time when in Free Cooling with Damper at 100% and CC1 is powered to enable compressor 1 to operate.
Run Time Vent	Hours	Displays the operating time when in Occupied state and Ventilation mode is active (G is On).
Run Time Heating	Hours	Displays the operating time when in Heating (W1 is On).
Run Time Unoccup	Hours	Displays the operating time when in Unoccupied state (G is Off).
Run Time FP	Hours	Displays the Operating time when in Freeze Protection.
Firmware	xx.x.xxxx	Displays software revision version.

1. When an alarm is present the value may not be displayed

2. Only visible when Humidity Sensor is present

3. Only visible when Return Air Temperature Sensor is present

4. Only visible when Energy Module is connected and the accessory component is powered, wired, terminated to the Energy Module, and has been setup in Settings menu

5. Only visible when 2 compressors are detected or enabled

6. Requires that the Energy Module is connected, 2 speed fan is installed, and the accessory Component or Device is powered, wired, terminated to the Energy Module, and has been setup in Settings menu

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Quick Setup

Setup

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" 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. Unless otherwise prompted; default entry is "Auto" or "Off". (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 established I/O 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 functions will be disabled.)**

Required "Settings" Parameters for All Configurations

1. ZIP Code US or Canada (sets the free cooling changeover high limit and temperature scale 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

      ii. When all Zip Code or Postal Code digits are parameterized press "esc" to move up a level then press the up/down arrow to access next settings parameter.
2. Vent Min Pos (Outside Air Damper Ventilation Minimum Position)
   a. When the "Vent Min Pos" submenu is displayed press "OK" to parameterize (flashing).

   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 entries have been completed, the ZIP Economizer will switch to Status display and show "Setup Complete" and will immediately begin a count down from 30 seconds, allowing the user time to be prepared in the case there is a call for cooling.

Service and Commissioning (Acceptance Test & Manual Mode)

1. The ZIP Economizer has built in commissioning processes found in Acceptance Test. Use "Economizer Test" to verify RTU Integrated Economizer operation and also if it is known that the actuator stroke is mechanically limited to less than 90 degree rotation. The test will re-scale the control signal range to maximum resolution (0-100%) over the calibrated (reduced) angle.
   a. 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% (re-scale control signal if needed), 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. **(Note: failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.)**
   b. It is necessary to return back to automatic mode for the RTU to operate. Press "OK" when "Return to Automatic" is displayed.
2. Manual Mode is used to override outputs after entering a "Timeout" duration.

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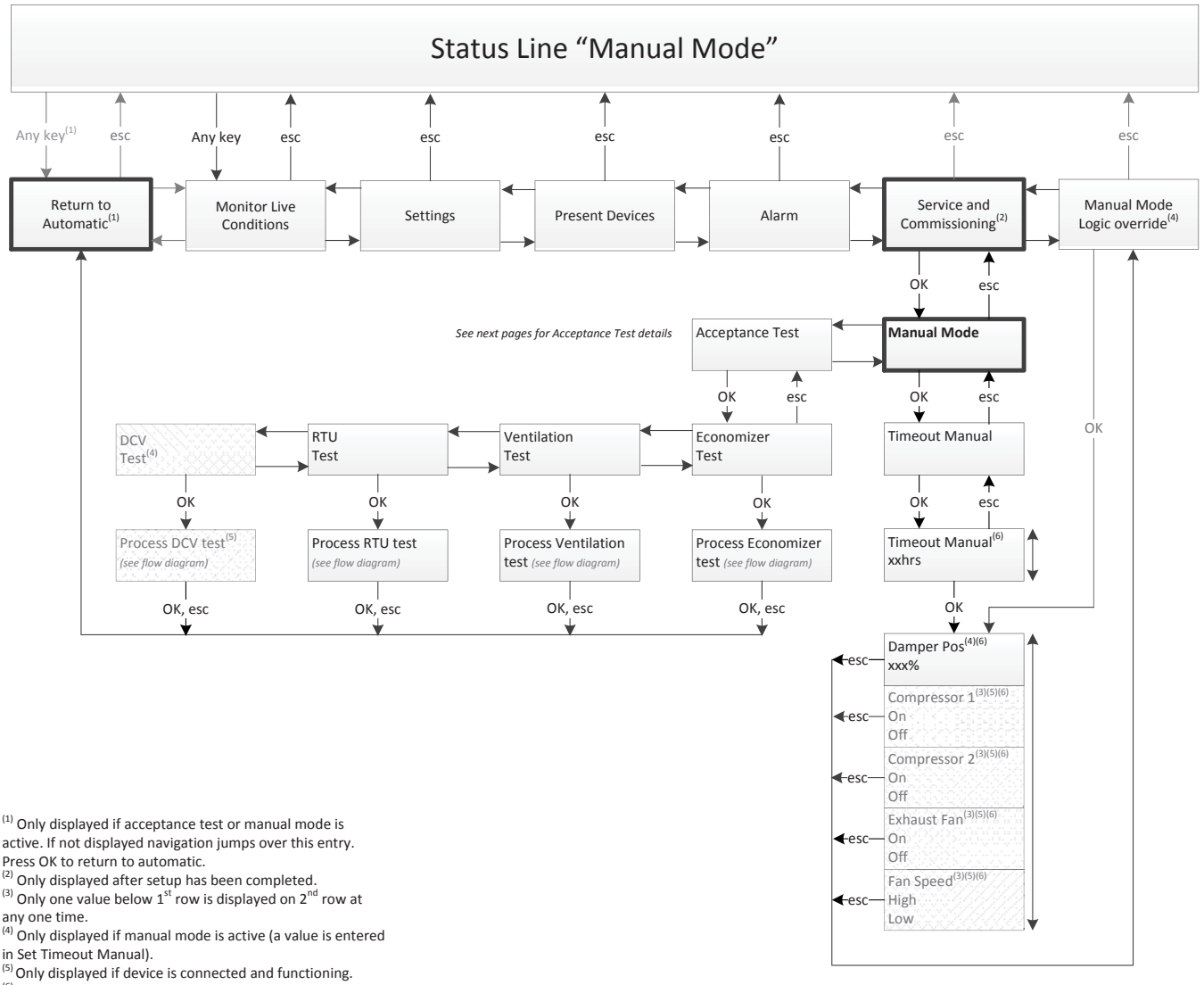

(1) Only displayed if acceptance test or manual mode is active. If not displayed navigation jumps over this entry. Press OK to return to automatic.
(2) Only displayed after setup has been completed.
(3) Only one value below 1st row is displayed on 2nd row at any one time.
(4) Only displayed if manual mode is active (a value is entered in Set Timeout Manual).
(5) Only displayed if device is connected and functioning.
(6) Press OK to change value.

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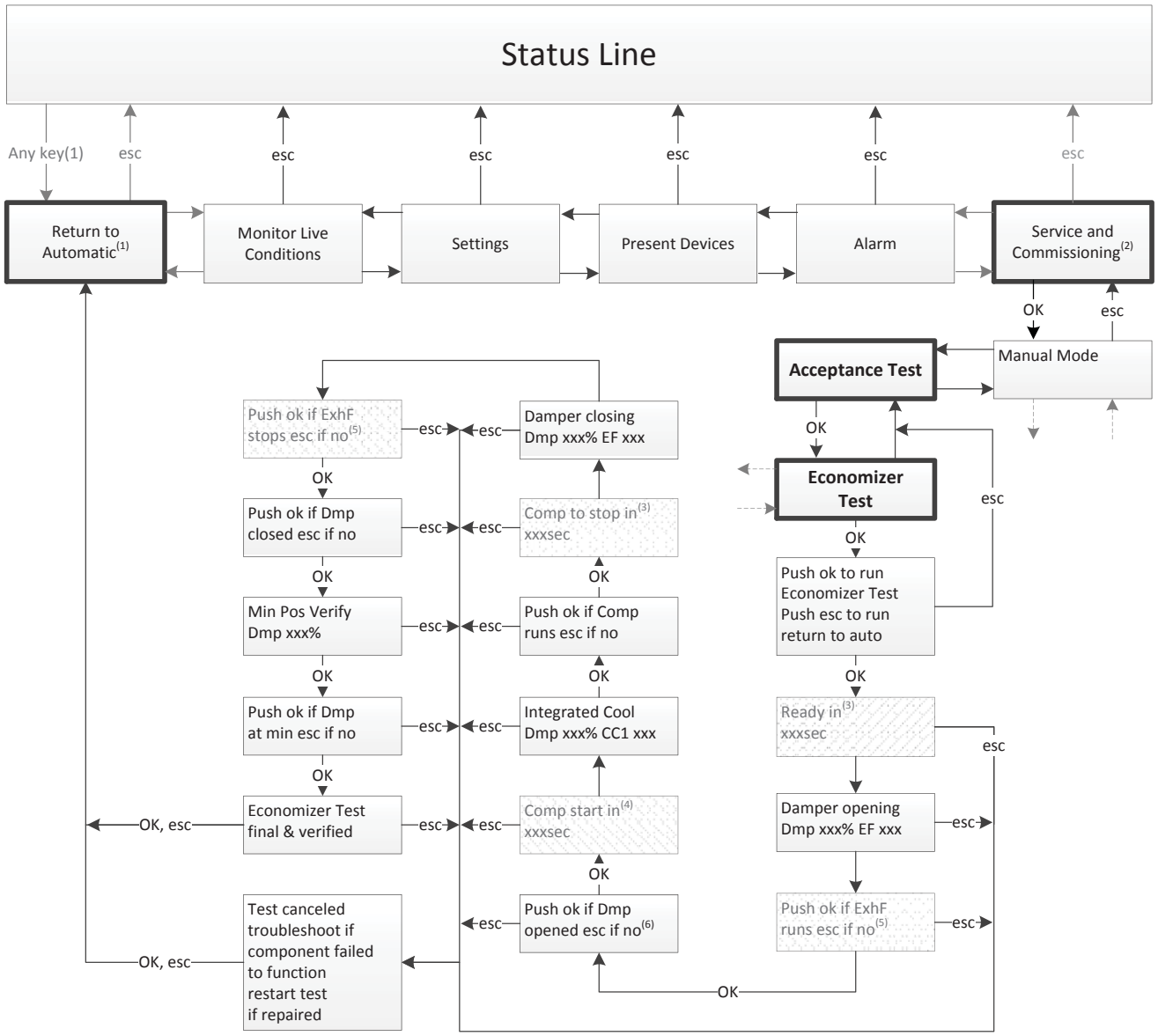

(1) Only displayed if acceptance test or manual mode is active. If not present navigation jumps over this entry. Must press OK to return to automatic.
(2) Only displayed after setup has been completed.
(3) Only displayed if a compressor is running. During this test the compressor (CC1) will run for 60 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.

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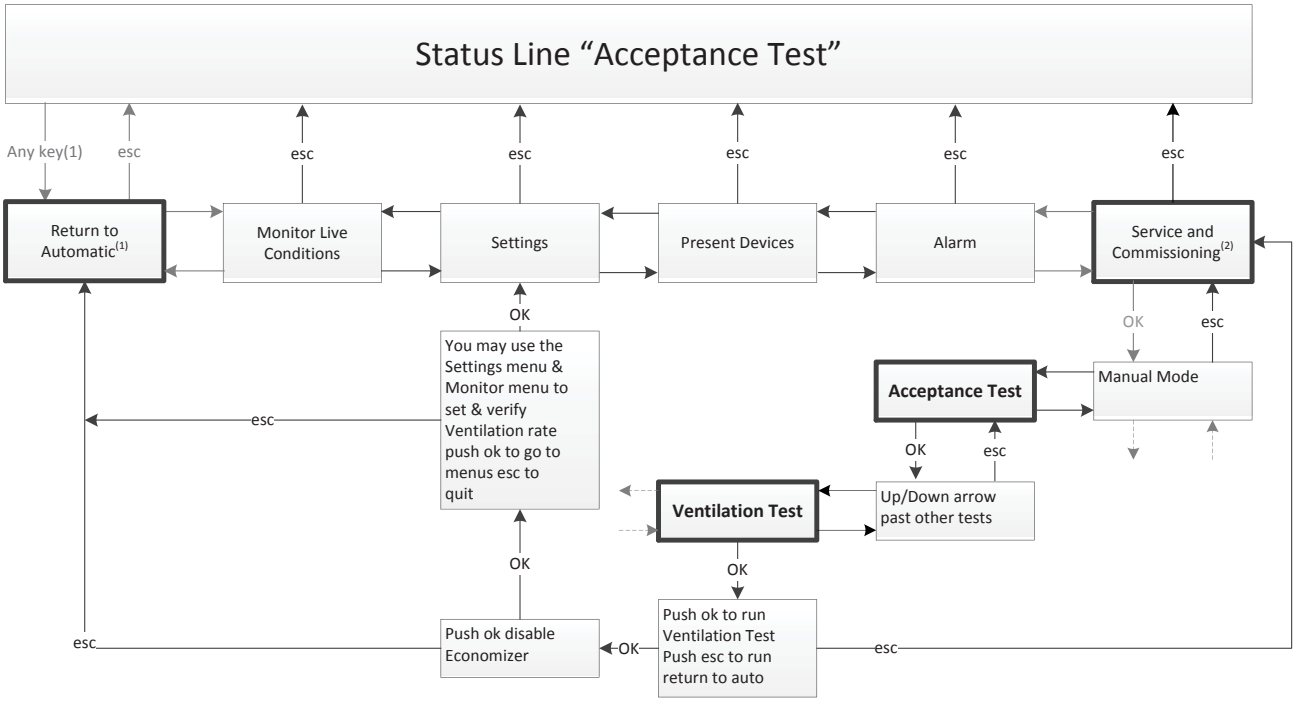
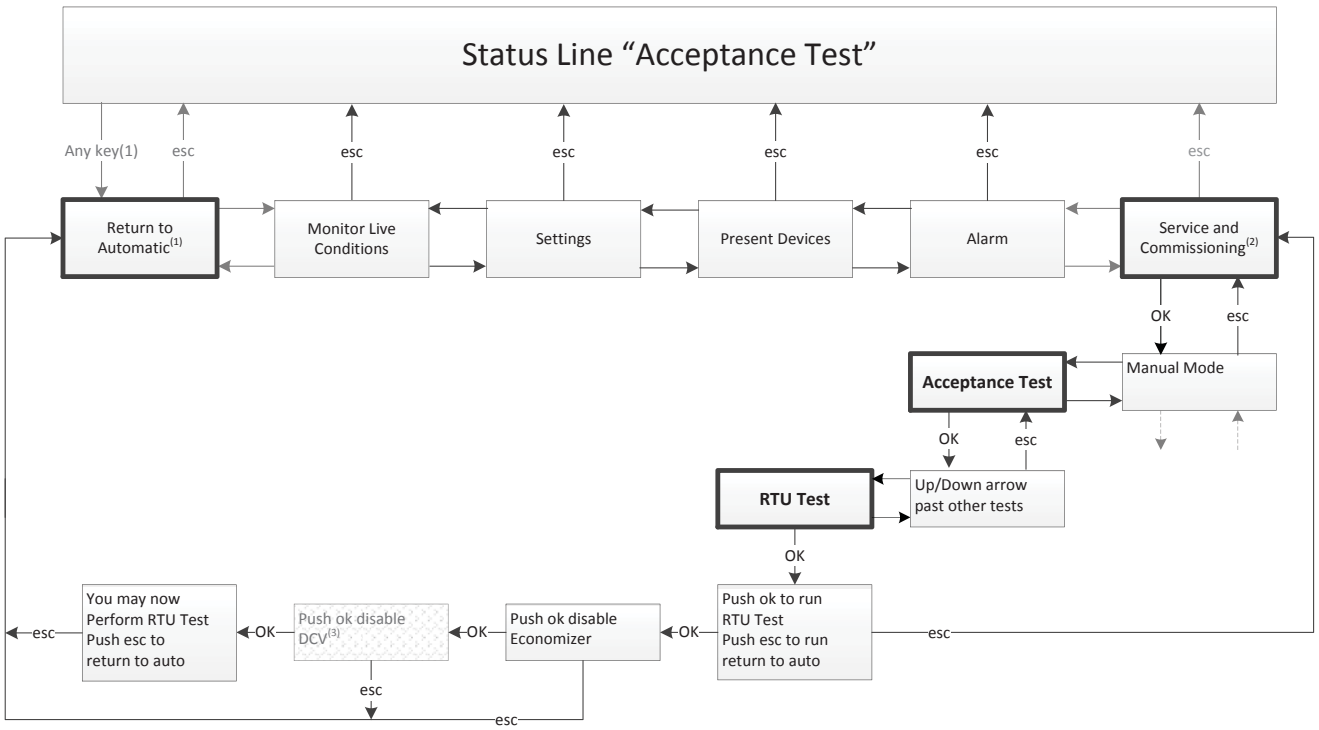


(1) Only displayed if acceptance test or manual mode is active. If not present navigation jumps over this entry. Must press OK to return to automatic.
(2) Only displayed after setup has been completed.
(3) Only displayed if device is connected and functioning.



(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.

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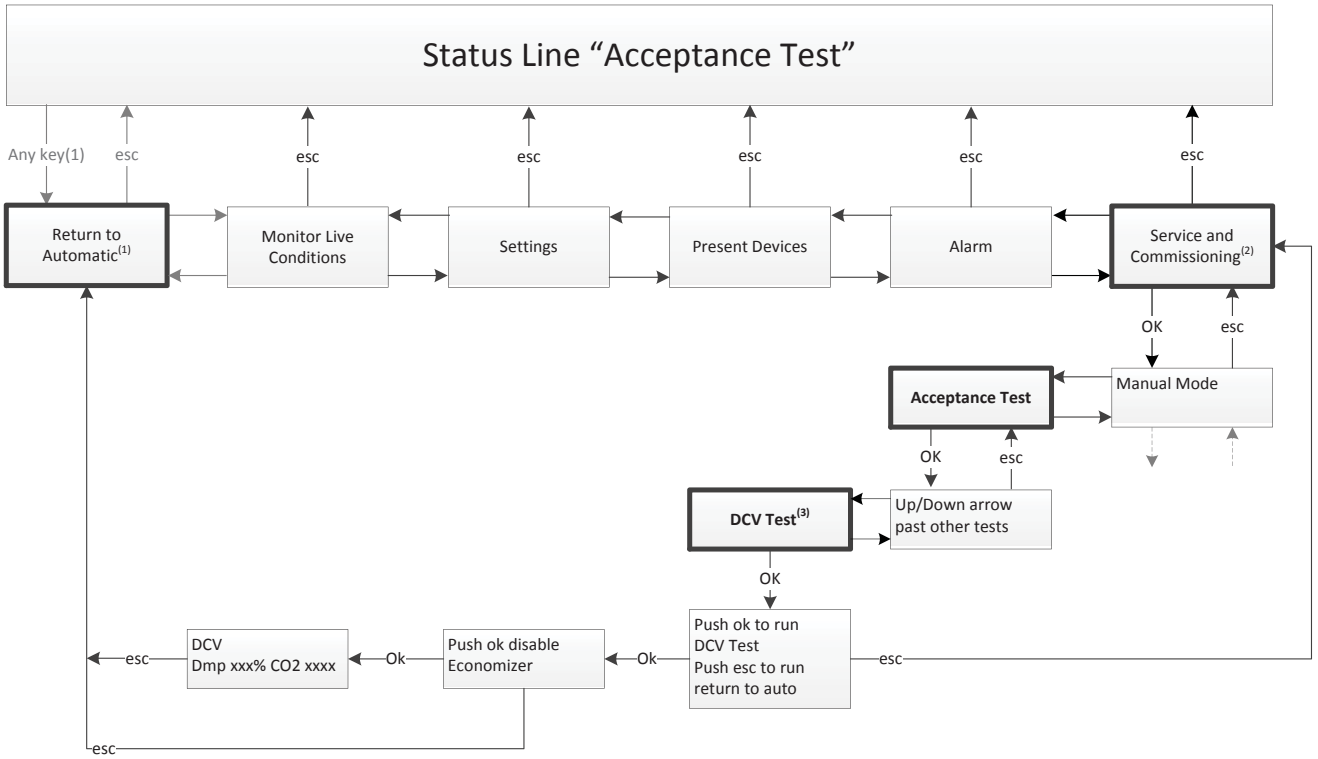

(1) Only displayed if acceptance test or manual mode is active. If not present navigation jumps over this entry. Must press OK to return to automatic.
(2) Only displayed after setup has been completed.
(3) Only displayed if device is connected and functioning.

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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. 2nd stage compressor disabled.
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 at least 4 minutes

  AND Supply Air Temp is less than or equal to its required setpoint + 1.5° (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 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 ≤ 18 VAC (75%)

  AND it stays below there for 30 seconds

  THEN Brownout will be enabled.

- IF input voltage rises to ≥ 20.4 VAC (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, 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.

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High Limit Changeover

(4 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 3°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 4°F below the RAT

    AND OAT is 3°F below the reference differential temp high limit DTHL

    THEN economizing will be enabled.
  - IF OAT is greater than or equal to 2°F below the RAT

    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 3°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 3°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 off[2].
- Compressor 2 is off[2].
- Fan Speed[1] could be energized (low speed) or de-energized (high speed) for indoor fan.
- Exhaust Fan[1] 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 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 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[2].
- Compressor 2 is off[2].
- Fan Speed1 is de-energized (indoor fan is operating on high speed).
- Exhaust Fan[1] is on.
- Damper Pos output is fixed at 100% (fully open to outdoor air).

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

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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[2].
- Compressor 2 may or may not be on based on thermostat call for stage 2 cooling[2].
- Fan Speed[1] 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[1].
- Exhaust Fan[1] 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[1]

- Outdoor air may or may not be suitable "for free cooling"; however it is still in 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 heating.
- G input is energized indicating occupied state.
- Compressor 1 may or may not be on depending on thermostat call for stage 1 cooling[2].
- Compressor 2 may or may not be on depending on thermostat call for stage 2 cooling[2].
- Fan Speed[1] 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[1].
- Exhaust Fan[1] is off.
- Damper Pos – Minimum 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 Modes of Operation[3]: Mechanical Cooling, 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[2].
- Compressor 2 is off[2].
- Fan Speed[1] will be energized (indoor fan is operating on low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].
- Exhaust Fan[1] is off.
- Damper Pos output is at Low SP Vent Min[1].

Possible Modes of Operation[3]: 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)[2].
- Compressor 2 is de-energized (unless Heat Pump Op in Settings menu is turned on)[2].
- Fan Speed[1] will be de-energized (indoor fan is operating on high speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].
- Exhaust Fan[1] is off.
- Damper Pos output is at Vent Min Pos or damper in DCV[1] position. See DCV[1] 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[2].
- Compressor 2 may or may not be on depending on thermostat call for stage 2 cooling[2].
- Fan Speed[1] 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[1].
- Exhaust Fan[1] is off.
- Damper Pos output is closed to Outdoor Air.

Possible Modes of Operation[3]: Free Cooling, Integrated Cooling, Mechanical Cooling, Heating, or Purge.

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Purge[1]

(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[2].
- Compressor 2 may or may not be energized depending on thermostat call for stage 2 cooling[2].
- Fan Speed[1] 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[1].
- Exhaust Fan[1] is off.
- Damper Pos output goes to value set in Purge Dmp Set.

Possible Modes of Operation[3]: Mechanical Cooling, Heating.

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[2].
- Compressor 2 is de-energized[2].
- Fan Speed[1] 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[1].
- Exhaust Fan[1] is off.
- Damper Pos output is modulated from minimum to closed to maintain discharge air setpoint.

Possible Modes of Operation[3]: Heating , Free Cooling and Ventilation.

Energy Module Option Functions[1]

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.

Indoor 2 Speed Fan

Thermostat Signal	Economizing Available	OAT	Energy Module Fan Relay	Fan Speed	ZIP Econ / RTU Mode
G, Y1, not Y2	No	N/A	Closed	Low	1 Stage DX
G, Y1, not Y2	Yes	>55ºF	Open	High	Economizing
G, Y1, not Y2	Yes	<55ºF	Closed	Low	Economizing
G, Y1, Y2	No	N/A	Open	High	2 Stage DX
G, Y1, Y2	Yes	N/A	Open	High	Integrated Economizer
G, W1	No	N/A	Open	High	Heating
G, W1	Yes	N/A	Open	High	Heating
G, not Y1, not W1	No	N/A	Closed	Low	Ventilation
G, not Y1, not W1	Yes	N/A	Closed	Low	Ventilation
not G, not Y1, not W1	No	N/A	Open	Off	Unoccupied[3]
not G, not Y1, not W1	Yes	N/A	Open	Off	Unoccupied[3]

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.

Exhaust Fan

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(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

    OR Damper Pos is 100% open

    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 Comissioning

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: Compressors, exhaust fan[1] and indoor 2 speed fan[1] 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 fan[1] will not be turned on automatically based on damper position in this mode, but it can be manually commanded.

Acceptance Test (4 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 EF[1] (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 fan[1] does turn on based on damper position in this test.

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[1] 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

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

[2] Subject to Compressor Protection Strategies as noted earlier.

[3] The following modes underlined take display priority on the ZIP MMI when co-existing with this mode.

[4] 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.

[5] Minimum on/off times must be observed before compressor will be commanded.

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Alarm from Sequences - MMI Display

ID	Alarm Text
1	OAT Sensor out of range economizing is disabled
2	OAT Sensor not detected economizing is disabled
3	OAH Sensor out of range economizing is disabled
4	OAH Sensor not detected economizing is disabled
5	OAH Sensor out of range operation by diff temp
6	OAH Sensor not detected operation by diff temp
7	RAT Sensor out of range operation by OAT dry bulb
8	RAT Sensor not detected operation by OAT dry bulb
9	RAT Sensor out of range operation by OAH enthalpy
10	RAT Sensor not detected operation by OAH enthalpy
11	RAH Sensor out of range operation by OAH enthalpy
12	RAH Sensor not detected operation by OAH enthalpy
13	RAH Sensor detected but OAH Sensor not detected
14	RAH Sensor detected but RAT Sensor not detected
15	SAT Sensor out of range economizing is disabled
16	SAT Sensor not detected economizing is disabled
17	Y2 present without Y1 single stage
18	SAT drop for CC1 insufficent cooling system problem
19	SAT drop for CC2 insufficent cooling system problem
20	Damper Pos value missing
21	SAT should be lower
22	Damper is stuck
23	Energy Module is missing module functions disabled
24	Exhaust fan not detected
25	Compressor 1 not detected
26	Compressor 2 not detected
27	2 Speed fan not detected
28	CO2 Sensor not detected DCV functions disabled
29	CO2 Sensor out of range DCV functions disabled
30	Heat and Cool both present

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Troubleshooting

Problem	Possible Cause	Action
The ZIP Economizer / Mechanical Cooling Not Operating	No input power	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.
	Setup not complete	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 in IOM manual.
	Brownout	If voltage is below 19 volts, then the ZIP Economizer may be in Brownout Protection mode. This mode diables 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).
	In acceptance test or manual mode	If the Yellow LED is lighted, then the ZIP Economizer is in a mode other than Automatic. End Mode by finding menu Item "Return to Automatic". Refer to menu flow diagram.
There are No Characters Displayed on the ZIP Economizer	No input power	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.
	Ambient temperature below display range	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.
The Display Shows “Brownout”	Input voltage is below 18VAC / connected load is too much for transformer	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.
The Display Shows “Setup Incomplete”	The initial setup of the ZIP Economizer has not completed	The ZIP Economizer requires parametizing 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 parametizing is required.
	Additional devices have been added after initial setup	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 paramatized, the ZIP Economizer will function as intended.
There is No Free Cooling	Display shows “OAT sensor out of range economizing is disabled”	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 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.
	Display shows “OAT Sensor not detected economizing is disabled”	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.
	Display shows “OAH Sensor out of range economizing is disabled”	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.
	Display shows “OAH Sensor not detected economizing is disabled”	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 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 Device 2. Verify that display for OAH is Auto or Installed. If Auto, change it 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.

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Problem	Possible Cause	Action
There is No Free Cooling	Display shows “SAT sensor out of range economizing disabled”	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 to the value of a temperature instrument. If values are significantly different, replace sensor.
	Display shows “SAT sensor not detected economizing disabled”	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.
	The ZIP Economizer is in another operating mode	Check Status screen for current operating mode or state. Please see sequence description for more information.
A Sensor is Not Detected or Out of Range	OAT sensor	Please see troubleshooting action under Problem "There is no Free Cooling".
	SAT sensor	Please see troubleshooting action under Problem "There is no Free Cooling".
	OAH sensor	When operating in single enthalpy limit configuration, Please see troubleshooting action under Problem "There is no Free Cooling", otherwise see below.
	OAH Sensor. Display shows “OAH sensor not detected operation by diff temp”	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 with 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 OAH is Auto or Installed. If Auto, change it 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.
	OAH Sensor. Display shows “RAH sensor detected but OAH sensor not detected”	This configuration is not allowed. You need an OA sensor for economizing. If the desire is for single enthalpy high limit, then a combination of OAH and OAT sensor is required. Otherwise for differential enthalpy high limit all 4 sensors (OAH, OAT, RAH, RAT) are required.
	RAT Sensor. Display shows “RAT sensor not detected operation by OAT dry bulb"	Sensor previously detected is not present. Previously configured for differential dry bulb, 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.
	RAT Sensor. Display shows “RAT sensor not detected operation by OAH enthalpy”	Sensor previously detected is not present. Previously configured for differential enthalpy, now economizing will be based on single enthalpy. 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.
	RAT Sensor. Display shows “RAH sensor detected but RAT sensor not detected”	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.
	RAH Sensor. Display shows “RAH sensor out of range operation OAH enthalpy”	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 0.6VDC (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. If sensor was intentionally disconnected then go to: Alarm, Delete Alarms, select the alarm. When prompted to, press enter to permanently delete, press OK.

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Problem	Possible Cause	Action
A Sensor is Not Detected or Out of Range	RAH Sensor. Display shows "RAH sensor not detected operation by OAH enthalpy"	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 0.6VDC (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 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.
Alarm "Y2 Present Without Y1"	Potential wiring or thermostat problem	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.
Alarm "Heat and Cool Both Present"	Potential wiring or thermostat problem	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.
Alarm "SAT Drop for CC1 Insufficient Cooling System Problem"	Potential compressor, refrigerant, or supply fan problem	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. • Contactor 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.
Alarm "SAT Drop for CC2 Insufficient Cooling System Problem"	Potential compressor, refrigerant, or supply fan problem	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.
Alarm "SAT Should Be Lower"	Potential damper, linkage, or actuator problem	When in Free Cooling 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 subjected to solar radiation. • Check that SAT sensor is in a location that airflow is mixed.
Alarm "Damper Pos Value Missing"	Actuator or wiring problem	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.
Alarm "Damper is Stuck"	Damper or linkage problem	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 to see if anything is in the way of damper. • Check that actuator limit stop not adjusted to smaller angle.
	Damper rotation below what is allowed	If the damper rotation is less than 85% (77°) and the Economizer Test has not been run to scale the output to the damper travel, this alarm may occur.
Alarm "Compressor 1 Not Detected" Alarm "Compressor 2 Not Detected"	CC1 output circuit is open	When the ZIP Economizer is first powered, it detects the presence of the compressor control circuit. If the circuit is detected as open, this alarm will be generated. Check all wiring, connectors, and devices in series between CC1 and contactor coil.

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Problem	Possible Cause	Action
Alarm "Compressor 1 Not Detected" Alarm "Compressor 2 Not Detected"	Compressor safety open	• Check Low Pressure control. • Check High Pressure control. • Check Compressor Current protector.
	Compressor contactor coil bad	Check that there is resistance through the coil and compare to min requirements in technical document.
	Inability to auto detect	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	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% (77°) 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 is Missing. Module Functions Disabled"	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"	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"	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"	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"	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 "C02 Sensor not detected".

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10K-2 Thermistor Output Table

°F	°C	Ohms
-39	-39.44	323839
-37	-38.33	300974
-35	-37.22	279880
-33	-36.11	260410
-31	-35.00	242427
-29	-33.89	225809
-27	-32.78	210443
-25	-31.67	196227
-23	-30.56	183068
-21	-29.44	170775
-19	-28.33	159488
-17	-27.22	149024
-15	-26.11	139316
-13	-25.00	130306
-11	-23.89	121939
-9	-22.78	114165
-7	-21.67	106939
-5	-20.56	100218
-3	-19.44	93909
-1	-18.33	88090
1	-17.22	82670
3	-16.11	77620
5	-15.00	72911
7	-13.89	68518
9	-12.78	64419
11	-11.67	60592
13	-10.56	57017
15	-9.44	53647
17	-8.33	50526
19	-7.22	47606
21	-6.11	44874
23	-5.00	42317
25	-3.89	39921
27	-2.78	37676
29	-1.67	35573
31	-0.56	33599
33	0.56	31732
35	1.67	29996
37	2.78	28365
39	3.89	26834
41	5.00	25395
43	6.11	24042
45	7.22	22770
47	8.33	21573
49	9.44	20446
51	10.56	19376
53	11.67	18378
55	12.78	17437
57	13.89	16550
59	15.00	15714
61	16.11	14925
63	17.22	14180
65	18.33	13478
67	19.44	12814
69	20.56	12182
71	21.67	11590
73	22.78	11030
75	23.89	10501
77	25.00	10000
79	26.11	9526
81	27.22	9078
83	28.33	8653
85	29.44	8251
87	30.56	7866
89	31.67	7505
91	32.78	7163
93	33.89	6838
95	35.00	6530
97	36.11	6238
99	37.22	5960
101	38.33	5697
103	39.44	5447
105	40.56	5207
107	41.67	4981
109	42.78	4766
111	43.89	4561
113	45.00	4367
115	46.11	4182
117	47.22	4006
119	48.33	3838
121	49.44	3679
123	50.56	3525
125	51.67	3380
127	52.78	3242
129	53.89	3111
131	55.00	2985
133	56.11	2865
135	57.22	2751
137	58.33	2642
139	59.44	2538
141	60.56	2438
143	61.67	2343
145	62.78	2252
147	63.89	2165
149	65.00	2082
151	66.11	2003
153	67.22	1927
155	68.33	1855
157	69.44	1785
159	70.56	1718
161	71.67	1655
163	72.78	1594
165	73.89	1536
167	75.00	1480
169	76.11	1427
171	77.22	1375
173	78.33	1326
175	79.44	1279
177	80.56	1234
179	81.67	1190
181	82.78	1149
183	83.89	1109
185	85.00	1070
187	86.11	1034

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