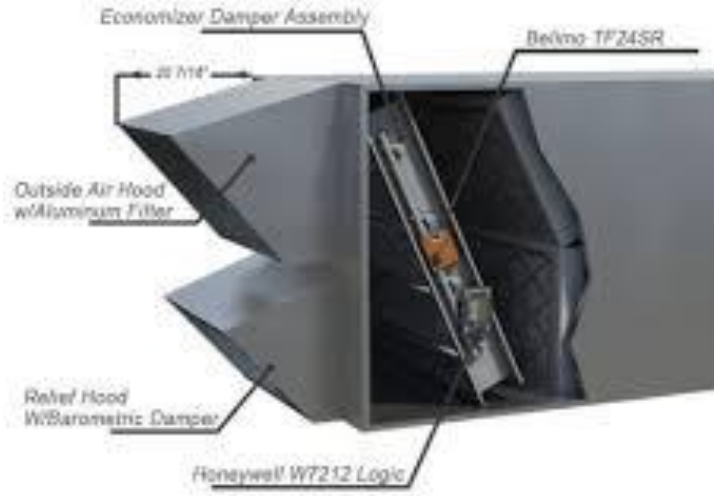
Economizers



Basic Economizer Information

Based on what York uses in the majority of RTU'S

What is an economizer?

An economizer is a part of the outdoor system, most often mounted on the roof, of an HVAC system for commercial buildings. The economizer evaluates outside air temperature and even humidity levels. When the exterior air levels are appropriate, it uses the outside air to cool your building. HVAC economizers use logic controllers and sensors to get an accurate read on outside air quality. As the economizer detects the right level of outside air to bring in, it utilizes internal dampers to control the amount of air that gets pulled in, recirculated and exhausted from your building.

economizers have a variety of benefits that may just make them the best kept secret in the commercial HVAC world. In fact, we call economizers "free cooling" in the industry. Here's why we recommend economizers for our commercial HVAC customers.

1. ***Economizers lower energy consumption, meaning lower energy costs.*** Instead of relying on your property's A/C unit to constantly cool, you can utilize the outside air to do that job for you. The less your A/C unit runs, the lower your utility bill.
2. ***Economizers reduce the amount of work your A/C unit does, prolonging the life of your system.*** In addition to helping reduce costs, that decrease in wear and tear on your HVAC system means less maintenance, fewer breakdowns and overall, a longer lifespan for your system.
3. ***Economizers improve indoor air quality through increased ventilation.*** Many buildings, especially older ones, weren't designed with modern ventilation in mind. An economizer can improve air quality by bringing in fresh air and exhausting your building's stale air.

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There are various types of economizers available based on a building's needs and varying budget requirements.

- **Dry bulb** – This is the simplest type of economizer. It uses a sensor to evaluate the difference between the interior temperature and outdoor air. Unfortunately, a dry bulb economizer is not a good choice for San Antonio given our humidity. Dry bulb economizers are only effective in arid climates.
- **Single enthalpy** (Wet Bulb) – This economizer is more advanced than the dry bulb economizer. It evaluates air temperature as well as humidity and is used by the majority of HVAC systems. A single enthalpy economizer makes up the vast majority of what we recommend and install for commercial buildings in central Texas.
- **Differential Enthalpy** – Even more advanced, this economizer uses two or more sensors to measure the return air as well as the outside air. We would expect to see this option in more complex scenarios, where, for example, a single, large system is sending air to anywhere from five to twenty zones through secondary air handlers.

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Economizer with single enthalpy sensor

When the room thermostat calls for first-stage cooling, the low voltage control circuit from R to G and Y1 is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the AUTO position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the setpoint of the enthalpy controller (previously determined), Y1 energizes the economizer. The dampers modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the setpoint, Y1 energizes compressor #1.

When the thermostat calls for second-stage cooling, the low voltage control circuit from R to Y2 is completed. The UCB energizes the first available compressor. If the enthalpy of the outdoor air is below the setpoint of the enthalpy controller (i.e. first stage has energized the economizer), Y2 energizes compressor #1. If the outdoor air is above the setpoint, Y2l energizes compressor #2.

When the thermostat is satisfied, it de-energizes Y1 and Y2. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors are completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continuous fan operation, the economizer damper goes to the minimum position.

Economizer with dual enthalpy sensors

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

Basic Economizer Information

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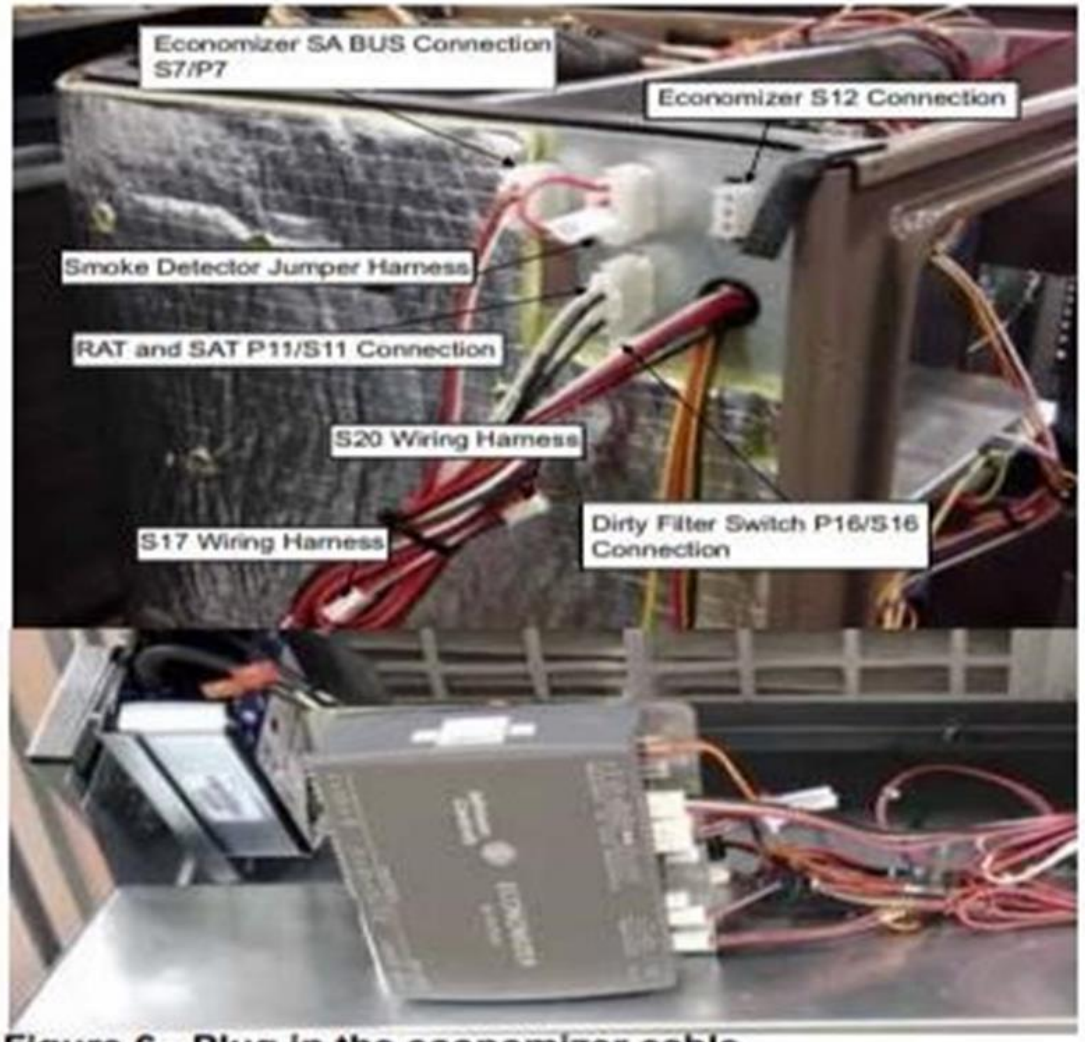

Figure 6 - Plug in the economizer cable

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- **Power Exhaust** - Our economizer options are available with power exhaust. Whenever the outdoor air intake dampers are opened for free cooling, the exhaust fan will be energized to prevent the conditioned space from being over-pressurized during economizer operation.

  The exhaust fan, motor and controls are installed and wired at the factory. The rain hood must be assembled and installed in the field.

  The power exhaust option can only be used on bottom duct configurations.
- **Motorized Outdoor Air Intake Damper** - Includes a slide-in / plug-in damper assembly with a 2- position, spring return motor actuator which opens to a pre-set position whenever the supply air blower is operating and will drive fully closed when the blower unit shuts down.

  The rain hood is painted to match the basic unit and must be field assembled before installing.
- **Barometric Relief Damper** - This damper option can be used to relieve internal building air pressure on units with an economizer without power exhaust. This accessory includes a rain hood, a bird screen and a fully assembled damper. With bottom duct connections, the damper should be mounted over the opening in the return air panel. With horizontal ductwork, the accessory should be mounted on the return air duct.

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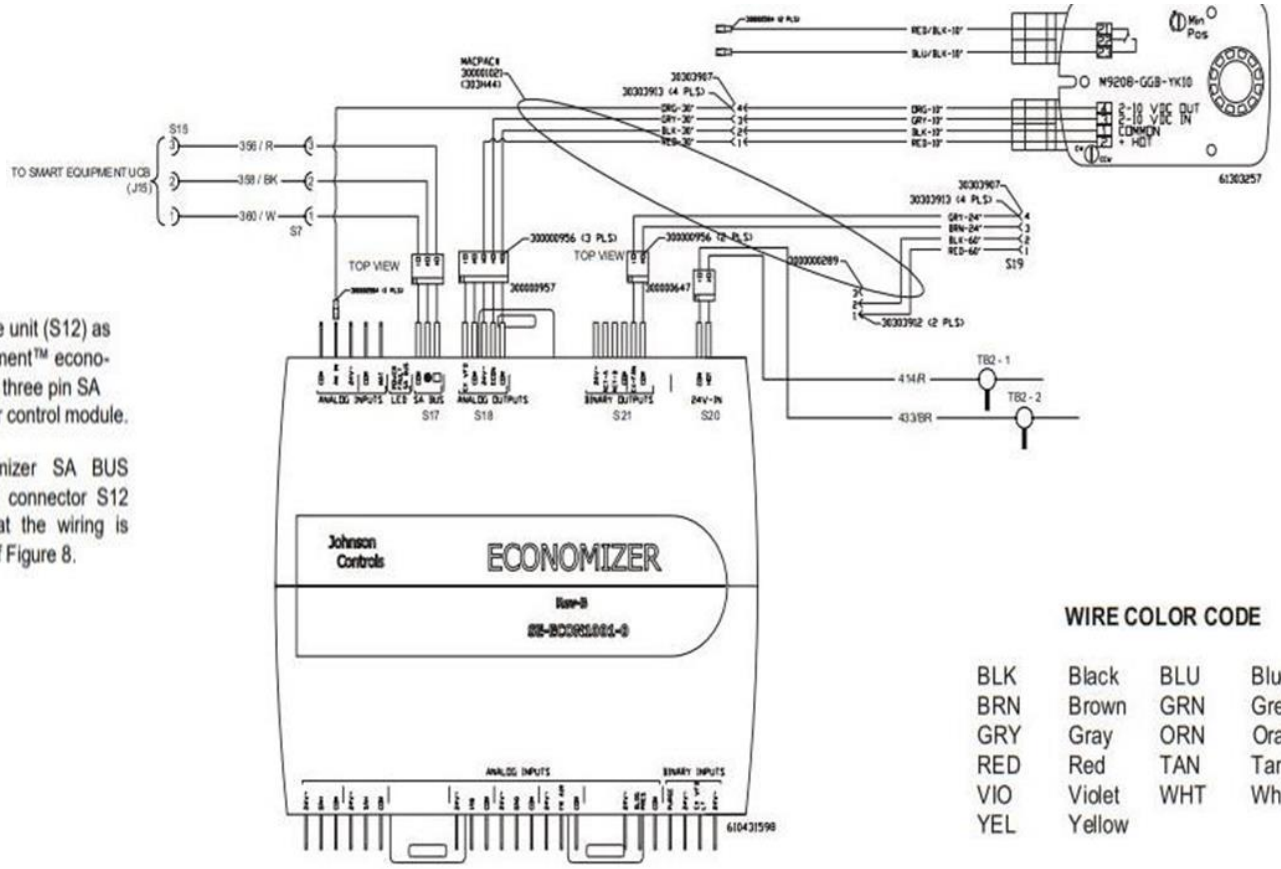
Plug the economizer cable (P12) into the unit (S12) as shown. Plug in the two pin Smart Equipment™ economizer control power wires (S20) and the three pin SA BUS connection (S17) in the economizer control module.

Note: Take care to note that economizer SA BUS connection S7/P7 and economizer connector S12 are the same visually. Ensure that the wiring is installed exactly like the top image of Figure 8.



WIRE COLOR CODE

BLK	Black	BLU	Blue
BRN	Brown	GRN	Green
GRY	Gray	ORN	Orange
RED	Red	TAN	Tan
VIO	Violet	WHT	White
YEL	Yellow		

Notes:

1. Unit wiring shown as reference only. Check unit wiring for actual unit wiring.

Basic Economizer Information

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When wiring between the economizer board to the Smart Equipment™ unit control board (UCB) is complete, the Smart Equipment™ UCB automatically recognizes the presence of the economizer board.

All economizer boards come with the following default settings:

- **Economizer Free Cooling Enabled:** Default: Yes. Writable point to allow free cooling or not.
- **Economizer Firmware version:** 3.4.1.447 or 4.0.0.1051
- **Economizer Damper Position:** As shipped, this value will show 0% (closed)
- **Economizer Minimum Position:** 10% open
- **Economizer OAT Setpoint:** 55 deg.F
- **Economizer Free Cooling Available:** YES or NO depending on if the conditions are suitable. This is not a manually writable value.
- **Economizer Mechanical Setup:** Option B. This should NOT be changed unless the operator intends to alter the algorithm configuration between Free Cooling and Compressors. Please refer to LIT-12011950 before making changes.
- **All Compressor OFF –Economizer:** NO. This means that the compressors can come on when in Free Cooling.
- **Econ OA Enthalpy Setpoint:** 27 BTU/lb
- **Free Cooling Selection:** Auto. If Auto is left on, the UCB will detect all the sensors that are connected and determine if the system is Dry Bulb, Differential Dry Bulb, Single Enthalpy or Dual Enthalpy

Note: Nothing needs to be done in the UCB unless you want to check status or adjust parameters.

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To confirm the economizer damper position:

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞▼Service☞	
ECONDAMPPOS	38	(AI-IN 0-10VDC INPUT)

To change the setting for economizer damper minimum position:

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞Setup☞	
LOWAMB-MINPOS	0%v	(OCCLOAMBMINPOS)

To change the OAT Setpoint:

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞Setup☞	
ECONOAT-SPEN	55 F	(DRYBLBCHGOVRSETPT)

NOTE: This value can be changed in single digit increments between 40°F and 80°F

To change the Economizer Mechanical Setup:

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞▼Setup☞	
ECONMECHSTP	OPTION B	(ECON MECH SETUP)

NOTE: This should NOT be changed unless the operator intends to alter the algorithm configuration between Free Cooling and Compressors. Please refer to LIT-12011950 before making changes.

To modify whether the compressors can come on when Free Cooling is available:

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞Setup☞	
ALLCOMPOFF-ECON	NO	(ALL COMPRESSORS OFF IN FREE COOLING)

To change the Economizer Outdoor Air Enthalpy Setpoint:

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞Setup☞	
ECONOAENTH-SP	27 B/#	(ENTHCNGOVRSETPT)

To change the Free Cooling Selection (Dry Bulb, Single Enthalpy, Dual Enthalpy):

MENU	▼Details	
SUB MENU	☞▼Econ	
SUB MENU	☞Setup☞	
FREECLG-SEL	AUTO	(FRECLGCHNGOVRMETHOD)

- If the economizer will not operate make sure that the red factory installed jumper wire is installed between R and Occ on the SSE board.
- This jumper must be installed unless you have another way to verify occupancy remotely, otherwise the SSE thinks that the unit is in Unocc.