

# HVAC Economizers 101

## Section #2

### Economizer Control Methods

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### Most Commonly Used

<b>Control Strategy</b>	<b>Condition Necessary to Economize</b>
<b>Dry-bulb changeover</b>	OA temp is less than controller set point
<b>Enthalpy changeover</b>	OA enthalpy less than controller set point
<b>Differential dry bulb</b>	OA air temp is less than return air temp
<b>Differential enthalpy</b>	OA air enthalpy is less than return air enthalpy
<b>Electronic enthalpy</b>	OA is less than a selected dry-bulb/dew-point curve
<b>Dew point and dry-bulb</b>	OA is less than a fixed dry-bulb (75°F ) or a fixed dew-point (55°F) temperature

# Economizer Control Methods

## Description of Operation

### Favorable Methods of Control

- **Dry-bulb changeover** disables economizer operation and enables compressor operation when outdoor air exceeds a fixed temperature sometimes called high limit dry bulb control.
- **Enthalpy changeover** disables economizer operation and enables compressor operation when outdoor air exceeds a fixed enthalpy (28 Btu/lb) sometimes called high limit enthalpy control.
- **Differential dry bulb** disables economizer operation and enables compressor when the temperature outside is warmer than the return air.
- **Differential enthalpy** disables economizer operation and enables compressor when outdoor-air enthalpy exceeds return-air enthalpy.

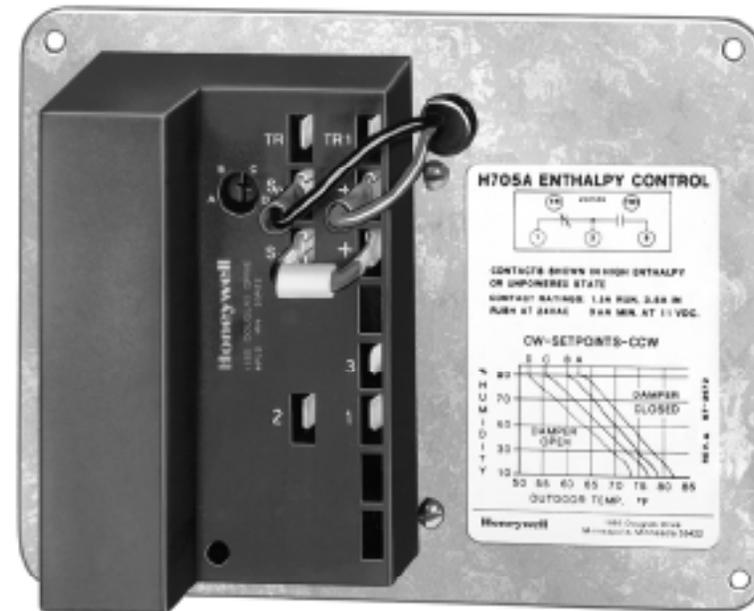
### Non-favorable Methods of Control

- **Electronic enthalpy** disables economizer operation and enables compressor when outdoor air exceeds a selected dry-bulb/dew point curve defined by electronic sensor manufacturers.
- **Dew point and dry-bulb** disables economizer operation and enables compressor when outdoor air exceeds a fixed dry-bulb (75°F ) or a fixed dew point (55°F) temperature.

# Types of Sensors

- Dry bulb

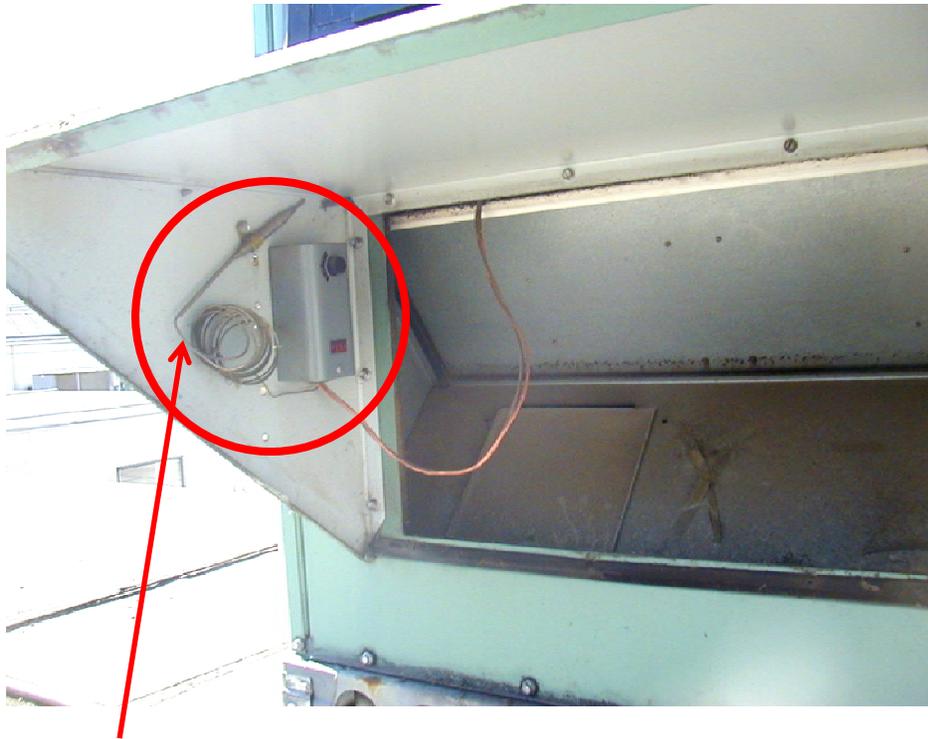
- Analog temperature sensor
  - Transmitters
  - Thermistors
- Thermostat
  - Adjustable set point
  - Fixed set point (Snap Disc)



- Enthalpy

- Integrated temperature and relative humidity (RH) transmitter – outputs enthalpy signal to controller
- Separate temperature and RH sensors – signals are converted to enthalpy inside of the controller

# Sensor Examples-Dry Bulb



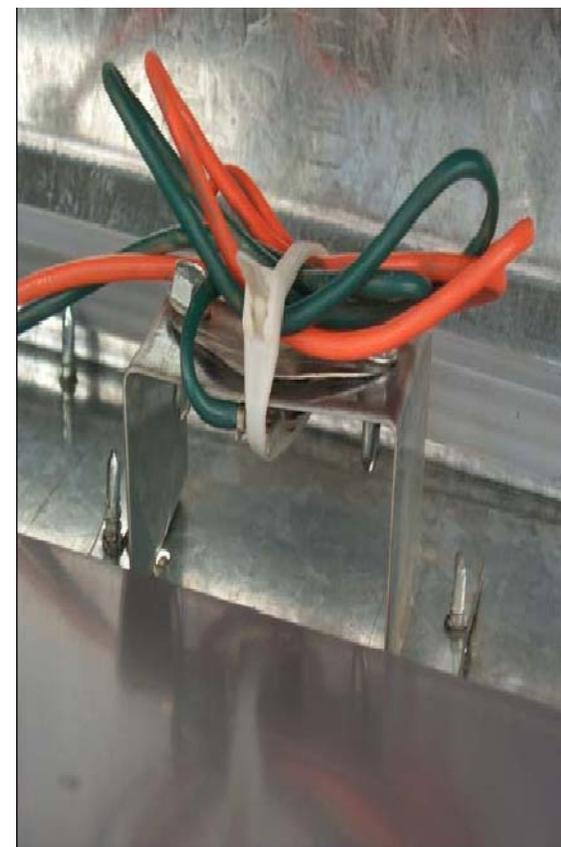
**Adjustable Dry-bulb Sensor  
With Remote Bulb**

*Source: Johnson and  
Honeywell Controls*



**Non-Adjustable Dry-bulb  
Honeywell C7650 Sensors  
With internally mounted sensor**

# Sensor Examples-Snap Disc



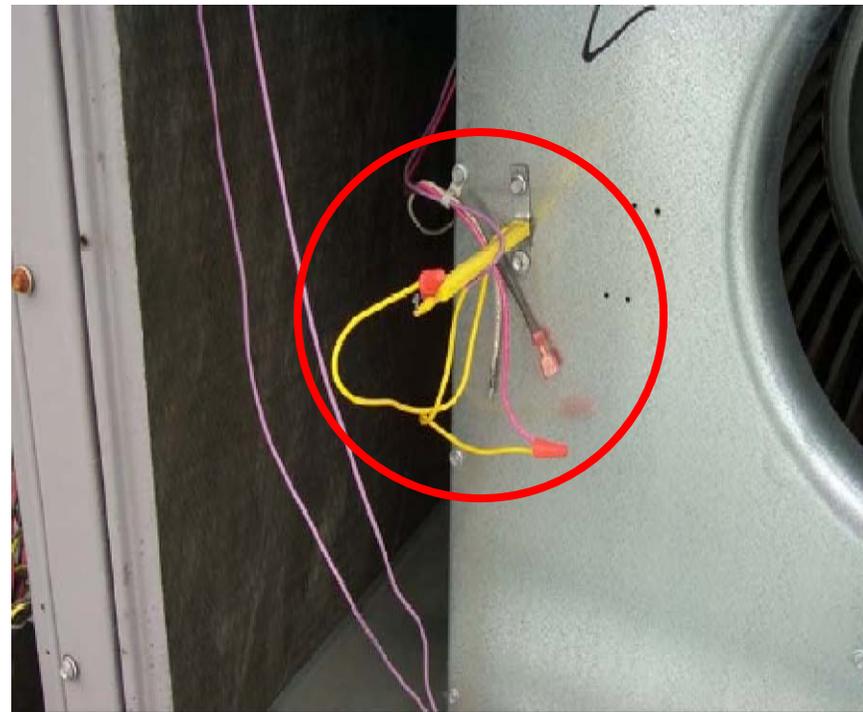
Source: Honeywell  
Controls

# More Sensor Examples

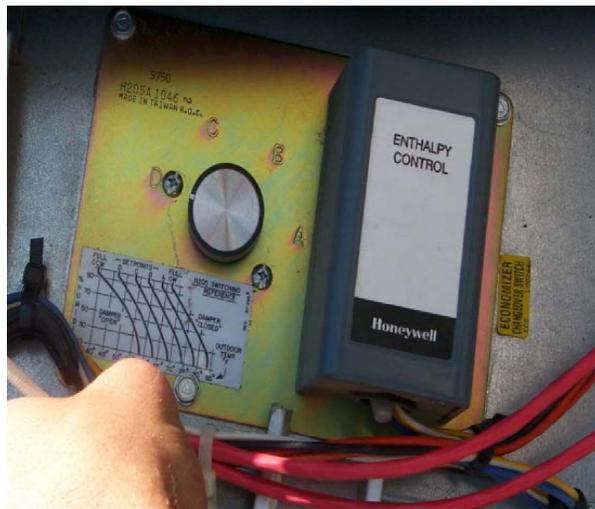
## Enthalpy and Discharge Air Temperature



**Enthalpy Sensor**



**Discharge Air Temperature Sensor**



**Enthalpy Controller with Sensor**

*Source: Honeywell Controls*

# Mixed Air and Discharge Air Low-Limit Sensor and Integrated Controls

- Many economizer controls will have a low-limit sensor that will close the outside air damper to maintain a mixed/discharge (depending on location of sensor) typically between 45°F and 50°F
  - Protects evaporator coil from freezing and keeps supply air stream above 45°F
  - Helps to maintains occupant comfort
- System considered “integrated” if the system can economize and provide mechanical cooling at the same time.
  - System considered “non-integrated” if the system can not economize and provide mechanical cooling simultaneously, i.e., if the mechanical cooling comes ON, the OA dampers go to minimum position.

# Economizer Control Methods

## Exercise #2

(Provide Answers below on notes page)

1. How does dry-bulb changeover differ from differential dry-bulb control?
2. What is the difference between an analog temperature sensor and an adjustable set point thermostat?
3. What is the typical signal that comes out of an analog temperature sensor?
4. At what temperature do Snap Discs in the outside air usually change operation?
5. Where is the integrated low-limit sensor located?