Product Lines - Commercial Refrigeration

- Pressure Controls
- Temperature Controls
- AKO Controls
- Defrost Timers
SUBJECTS WE WILL COVER IN THIS SESSION

- Refrigeration Overview
  - Refrigeration System Basics
  - Differentials
  - Cut-in and Cut-outs
  - Capillary Tubes
- ETC Product Features
- Troubleshooting
- Cold Controls
WHAT ARE THE DIFFERENCES BETWEEN AIR CONDITIONING AND COMMERCIAL REFRIGERATION?

- Scientific principals are similar, however refrigeration systems are:
  - Operation time 24 / 7
  - Defrost cycles
  - Load changes

- Energy conservation important on A/C systems
  - However, more critical on commercial refrigeration applications
REFRIGERATION SYSTEM

- Pressure Control
- Defrost Control
- Temperature Control

Cold Controls
Differentials

- Narrow Differential (10°F or less)
  - When a narrow differential is desired
  - Closely maintain within 5°F to 6°F
  - Typically used for air sensing applications

- Wide Differential (10°F or more)
  - Required due to swing in evaporator temperatures between compressor ON and OFF
  - Household refrigerators and room air conditioners
  - Typically used to sense evaporator coil temperature
**CUT-IN AND CUT-OUT COOLING OPERATION**

- **Cut-out mode:** Differential is above setpoint
  - Output relay energizes when temperature rises to setpoint *plus* the differential value
  - When temperature drops to setpoint, the relay de-energizes

- **Cut-in mode:** Differential is below setpoint
  - The output relay energizes when the temperature rises to setpoint
  - When the temperature drops to setpoint *minus* the differential value, the relay de-energizes
TERMS AND DEFINITIONS

- **Constant cut-in controls (A30 series)**
  - Designed for frost free refrigerators
  - Used in coolers and display cases

- **Differential cut-in controls (A12 series)**
  - This type of control offers an adjustable differential
  - Rotating the dial indicator to the colder position changes the cut-out temperature only and widens the differential

- **Capillary tube**
  - The gas within the capillary tube reacts to temperature changes
  - Actuates the power element diaphragm to trip the toggle mechanism
CUT-IN AND CUT-CUT COOLING EXAMPLE

Desired Temp
(Cut-Out Mode)

Desired Temp
(Cut-In Mode)

Temperature
(+)

Setpoint

(-)

Cut-in (On)

Differential

Cut-out (Off)

Cooling/Cut-out

Relay energizes

Relay energizes

Relay energizes
TERMS AND CONCEPTS

- Two types of Cold Controls
  - Constant Differential
  - Constant Cut-in

- Applications
  - Water coolers
  - Beverage dispensers
  - Display cases

- Constant Differential also called “straight range controls”
- Designed for household refrigerators and freezers
CONSTANT CUT-IN WITH DIAL
CAPILLARY SENSING BULBS

- The capillary-only bellows sense from the coldest exposure point
- The capillary with bulb senses from the bulb only
- The bulb portion of the A22 and A30 capillaries must be mounted with tip end pointing upward within 65° of vertical
- Sensing elements of A22 and A30 contain saturated vapor liquid refrigerant and are sensitive to barometric pressure changes
- Sensing elements C12 and C17 contain liquid filled bulbs for accurate temperature control
- C12 and C17 bulbs may be oriented in any position
CAPILLARY-ONLY TEMPERATURE CONTROL

- Limited vapor-fill sensing element
- Sense directly by the capillary
- May be used where the desired sensing is at the coldest point along the capillary (including the control body itself)
- Entire control located where it will sense fixture temperature
APPLICATIONS FOR TEMPERATURE CONTROLS

- Ice Machines
- Display Cases
- Reach-In Refrigerator/Freezers
- Walk-In Refrigerator/Freezers
- Beverage Coolers
- Condensing Units
TEMPERATURE CONTROL MANUFACTURERS

- Ranco®
- Johnson Controls – Penn
- White-Rodgers
- Saganomia (Danfoss)
- G.E. - Art series
- Asian Manufacturers
- Sunne Peco
**ELECTRONIC TEMPERATURE CONTROLLER (ETC)**

- **Feature Sets**
  - Electronic Accuracy
  - Backlit Display
  - Wide Range (-30°F to 220°F)
  - Wide Differential Selection (1°F to 30°F)
  - Easy Installation
  - Easy Programming
  - Clear Temperature Display
  - No Jumpers
  - Contractor Preferred
  - Sensor up to 400 Feet
  - Averages Multiple Sensors

- **Applications**
  - Ice Machines
  - Reach-In Refrigerator/Freezers
  - Walk-In Refrigerator/Freezers
  - Beverage Coolers
  - Condensing Units
  - Display Cases

It Just Makes Sense™
ETC APPLICATIONS

- Retail store display freezers and reach-in coolers
- Supermarket display cases for produce/meats
- Retail store walk-in coolers and freezers
- Boiler operating control (used as a thermostat)
- Condenser fan cycling or staging
- Cooling tower pump and fan control
- Space and return air temperature control
- Bulk milk coolers
- Poultry houses and livestock barns
MANUFACTURER COMPARISON

- **Ranco® Electronic Temperature Control is easier to use!**
  - No jumpers required
  - Simple programming
  - Backlit display
  - Short cycle protection
  - 0-10 volt relay output
  - Removable temperature sensor

- **Johnson A421**
  - Hard to remember programming
INSTALLATION FOR ETC CONTROL

- Mount unit to wall or flat surface
- Review typical line voltage wiring diagram
- Determine location of sensor
- Program four simple steps

Figure 4: Typical 120 VAC Wiring Diagram.
TROUBLESHOOTING ERROR MESSAGES

- E1 appears when up or down keys are pressed
  - If E1 appears when no keys are being pressed, replace the control.

- E2 appears if control settings are not properly stored in memory
  - Check all settings and correct if necessary.

- EP appears when the probe is open, shorted or sensing a temperature that is out of range
  - Check if the sensed temp is out of range.
  - If not, check for probe damage by comparing it to a known ambient temperature between -30°F and 220°F. Replace the probe if necessary.

- EE appears if the EEPROM data has been corrupted
  - This condition cannot be field repaired. Replace control.

- CL appears if calibration mode has been entered.
  - Remove power to the control for at least five seconds. Reapply power.
  - If CL message still appears, replace control.
APPLICATIONS FOR COLD CONTROLS

- Ice Bin Level Control
- Ice Harvest
- Commercial Refrigeration
- Household
- Water Coolers

- A and CC Series
- K and RC Series
- 9500 Series Cold Controls
- 3030 Series Uni-Kits