

# Digi-CRAC Control Logic for Data Center DX Units

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## Applications

**Systems:** Direct expansion units, such as Liebert and PAC units

**Tonnages:** 3 to 30 tons.

**Power:** three phase for compressors.

## Technologies

1. Variable airflow and compressor speed.
2. Optimal compressor sequence and on/off control.

## Benefits

- Decrease energy consumption by 30% to 40%
- Decrease peak demand by 20% to 50%
- Eliminate needs for humidification and dehumidification
- Reduce data server heating stress
- Reduce compressor on and off cycling by 80%.
- Typical energy savings 2,000 kWh/ton/yr.

## Control Logic

**Fan Speed Control:** When CRAC unit is in ventilation mode, Digi-CRAC slow down the fan speed to 20 Hz to 30 Hz based on the fan motor type and conditions, and air distribution format (top or underfloor air supply).

**Cooling Control:** Cooling call is initiated by the CRAC unit controller. Digi-CRAC will turn on all compressors and modulate both the indoor fan and compressors speed to maintain the room temperature set point. The speed varies from as low as 30 Hz to 60 Hz (adjustable). Oil return technology is implemented to ensure safe and reliable compressor operation under the low speed.

**Dehumidification Control:** Dehumidification call is initiated by the CRAC unit controller. Digi-CRAC modulates both the fan and compressor speed at low limit to maximize the dehumidification capacity.

**Re-heat Control:** Re-heat call is initiated by the CRAC unit controller. Heater(s) is controlled under the existing CRAC unit controller.

**Humidification Control:** Humidification is initiated and controlled under the CRAC unit controller.

**Fault Detection:** Digi-CRAC receives the following information: fan power, compressor power, fan current, compressor current, fan speed, compressor speed, compressor status, fan airflow, heater status, return air temperature, discharge air temperature, heating and cooling call, and room temperature set points. With the information, Digi-CRAC detects and reports the following faults:

1. Air-temperature sensor failure;
2. Ductwork blockage and low airflow;
3. Under/over refrigerant charge;
4. Phase drop out and or contactor failure, and
5. Compressor failure, condenser fan failure, and indoor fan failure.