

# **Terminal Box Airflow Reset: An Effective Operation and Control Strategy for Comfort Improvement and Energy Conservation**

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During unoccupied hours, the nighttime reset increases the cooling temperature set point to a higher value (30°C/85°F) and decreases the heating temperature set point to a lower value (18°C/65°F). When the zone sensible load ratio is higher than the minimum airflow ratio, the terminal box may provide less airflow to the zone. Consequently, terminal boxes may consume less heating, cooling, and fan power. If the zone sensible load ratio is lower than the minimum airflow ratio, the terminal box provides the minimum airflow to the zone and no energy savings can be achieved. Since the zone sensible load ratio is less than the minimum airflow ratio most of the time for typical commercial buildings, the nighttime reset often achieves no or little energy savings.

The implementation of the nighttime reset is difficult when a building is lightly occupied during non-office hours since the occupancy and number of rooms that may be used during the weekend or nights, are unpredictable.

If the nighttime reset is implemented, a pre-cool or a pre-warm period is required to condition room air temperatures to comfortable levels before the office hours. The length of the pre-cool or the pre-warm depends on building thermal energy build-ups and HVAC system capacities. Many HVAC systems have to run 24 hours per day during the summer due to lacking the capacity for pre-cool and significant thermal energy built-up in the building mass. Since the HVAC systems have to eventually remove the thermal energy built-ups, the energy savings of using nighttime reset is very small for large commercial buildings.

The nighttime reset often creates unexpected high electrical power during the pre-cool or the pre-warm period. This can be a problem for some facilities where the pre-cool or pre-warm occurs during the peak demand period.

All these problems can be solved using the airflow reset, which decreases the minimum airflow to a lower value for variable air volume terminal boxes, and reduces the total airflow to a lower value for constant air volume terminal boxes during unoccupied hours. The airflow reset has been implemented in dual duct variable air volume terminal boxes, in dual duct constant air volume terminal boxes, and in single duct terminal boxes.