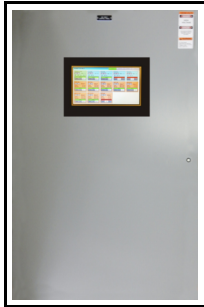




Summit Ice Melt Systems' APOGEE™ PLC Controlled Ultra High-Efficiency Control System



APOGEE General Information

Summit's APOGEE™ Ultra High-Efficiency Control System is UL Listed and is completely re-designed to utilize the most modern technology available and provide the most reliable performance ever. APOGEE brings to the ice melt systems the convenience of a 10" full color TFT LCD touchscreen control interface, Hot Spot wireless and ethernet connectivity, combined with the reliability and performance of programmable logic control. The system is designed to be operated at the enclosure or remotely over ethernet and Wireless Hot Spot with a logical, user-friendly interface.

APOGEE is specifically designed to combine the patented energy efficiency of the PRO® and LT® Roof Ice Melt Systems with multiple sensors to dramatically reduce energy consumption. At the onset of snow accumulation the building manager engages the heating system by turning on the main and branch circuit breakers.

Temperature sensors measure the outside air temperature and only permit the Summit panel controllers to power the heating cable when the ambient temperature nears freezing (e.g., 34°F). APOGEE then maintains the roofing panels above freezing (e.g., 40°F) so that snow melt will not re-freeze and form icicles and ice dams at the eaves. Summit's systems use self-regulating heating cables as the source of heat and are designed to handle most worst-case winter storm conditions.

True Energy-Efficiency

Summit's patented PRO Roof Ice Melt System already uses 1/3 less electricity than any other Class 1 heavy snow area system and Apogee further enhances heating efficiency by allowing a greater number of precise control points and parameters to be used, enabling Apogee's PLC logic to modulate power to the heaters and keep energy consumption to a minimum.

If a simple ambient temperature sensing controller were used, the heating systems' Cover Panel temperature would range from 40 during extreme winter conditions (10-15°F, snowing, windy) to 70°F during milder winter conditions (25-32°F, calm, sunny). Figures B and C show the relative energy consumption for an ambient on/off controlled system versus the APOGEE for two winter days. APOGEE reduces Summit's energy consumption by 40-60% during mild winter days and by 10-40% during colder and stormy winter days. For the average winter, energy savings should average around 35%.

APOGEE Controller Overview

Summit's APOGEE control system uses input from multiple ambient temperature sensing RTDs in series with multiple surface temperature sensing RTDs, controllers, and Programmable Logic Control (PLC) to provide the ultimate in energy-efficient roof ice melt system performance.

The ambient temperature sensing controllers allow Summit's roof ice melt panels to be powered only when the ambient temperature is between the Heater-On set point and the Low-Temperature Cutout set point, which are both adjustable.

When this condition is met APOGEE will allow the surface temperature sensing controllers to adjust the power level to Summit's roof ice melt system panels to maximize efficiency, and keep them at the desired, adjustable temperature set point. As temperatures drop and winds increase, the controller increases the heating cable output. When the temperature goes out of range we build in hysteresis/deadband to avoid chattering for quieter operation.

EXAMPLES OF STEADY STATE POWER VERSUS AMBIENT CONDITIONS:	
Weather Conditions	Percent of Steady State of Power
27-30°F, Light Winds	20-25%
27-30°F, Strong Winds	35-50%
20-25°F, Light Winds	40-60%
20-25°F, Strong Winds	50-70%
10-15°F, Light Winds	60-90%
10-15°F, Strong Winds	100%

Figure A: Energy Loads for Various Weather Conditions

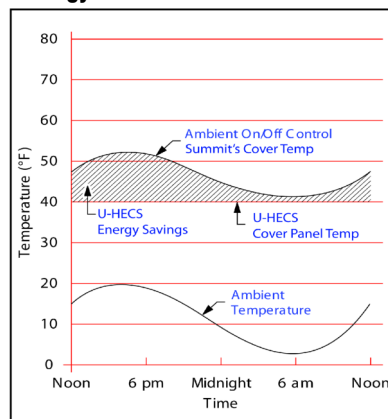


Figure B: Extreme Winter Day



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Low Ambient Temperature Operations

Snow melt at the roof/snow interface depends on roof snow depth, ambient temperature, roof design, interior heat, building insulation, and solar gain. However, there are low ambient temperature conditions when no snowmelting simply cannot occur. In many cases temperatures below 10°F range will create “no snowmelting” conditions. APOGEE includes a control panel mounted solid state controller and an eave soffit mounted RTD temperature sensor that will detect these low ambient temperatures and de-energize the heating system to save energy. The Low-Temp Cutout (LT Cutout) set point is easily field-adjustable.

The temperature at which APOGEE turns on the heaters can be set and adjusted at the control panel or remotely (we recommend 36-40°F). In addition, the LT Cutout feature can be set at the control panel or remotely (we recommend 10°F to start) and can then be adjusted up or down based on the local winter conditions for the building. For example, if 10°F is the proper LT Cutout set point and the winter had 150 hours below 10°F, up to 10% energy savings can be realized when compared to a control system without the LT Cutout feature. Figure D demonstrates how the LT Cutout would typically operate without the LT Cutout feature operating.

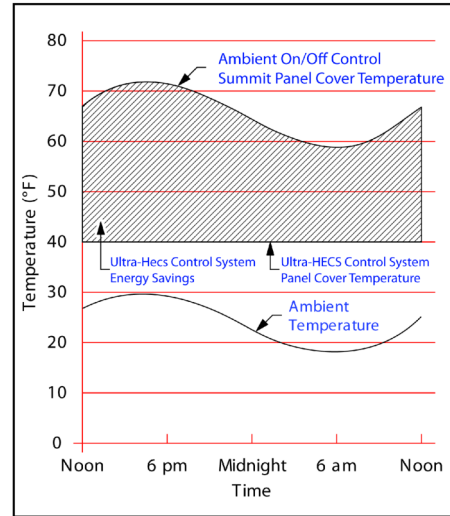



Figure C: Mild Winter Day

Summary

When compared with standard ambient-only temperature control, APOGEE can provide up to 50% energy savings for a typical winter, particularly in heavy snow load Class 1 areas. In addition, up to 10% more energy savings can be realized when using the LT Cutout feature.

Specifications

- *  UL Listed by Certified UL-508A Shop designed, constructed, Tested, and approved
- * 10" TFT LCD Color touchscreen control at the enclosure, or remotely over ethernet or wireless Hot Spot
- * Remote access and control app for iPad, iPhone (3G or better), or iPad Touch
- * PLC computer controlled for the utmost reliability and convenience, and designed to separately control multiple heater zones for greater efficiency
- * Includes power distribution blocks and modular, mounted branch circuit breakers and 30mA ground fault (EPD) breakers
- * Integrated timers to delay operation for interval activation between circuits to minimize peak inrush current load
- * Utilizes solid-state relays for quiet and efficient operation
- * Accommodates 1-phase or 3-phase incoming power
- * Operates on 208V, 240V, or 277V
- * Ambient controller sensor displays ambient temperature and Heater-On set point
- * Multiple separate control zones available
- * Up to 18 branch circuits with ground fault protection
- * NEMA 4 enclosure
- * PROUDLY built in the USA

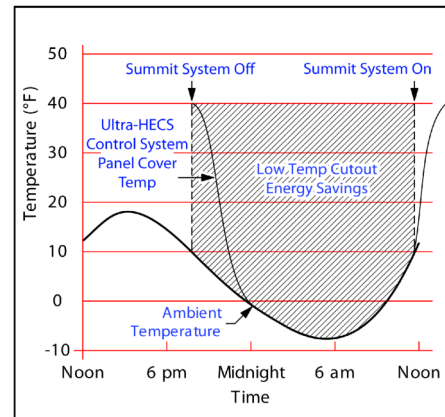


Figure D: Low Temperature Cutout Operation



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