Freezing Rain Sensor Model 6495

General

The AWI Model 6495 Freezing Rain Sensor uses an ultrasonically vibrating probe to detect the presence of icing conditions. The vibrating frequency of the probe (nominally 40,000 hertz) decreases with the accumulation of ice, frost, or wet snow. After ice has accumulated on the probe to a predetermined thickness, the AWOS DCP instructs the sensor to turn on its internal heaters to deice the probe.

During deicing, maximum heater power is 400 watts. The deicing system is capable of completely melting approximately 3.8 mm of ice on the probe and strut within 30 seconds at -20 degrees Celsius (°C). The heat sink dissipates the heat from the probe assembly following a deice cycle.

The heat sink provides a recovery time (i.e., the time required for the sensor to revert to ambient temperature) of 10 minutes following a deice cycle. The heat sink also thermally isolates the probe assembly from the electronics, which allows accurate measurement at temperatures at or close to 0 °C (32 °F).

Frequency values and status are reported to the AWOS once each minute. The system combines information from the freezing rain sensor with data from other AWOS sensors to generate the required reports of freezing rain.

- Sensing technology eliminates false signals
- Advanced probe design
- Self- deicing / Water-shedding capability
- Repeatable measurement
- FAA-certified for AWOS use

Functional Description

The Freezing Rain Sensor uses an ultrasonic axially vibrating probe to detect the presence of icing conditions. This sensing probe is a nickel alloy tube mounted in the strut at its midpoint with 1 inch (25.4mm) exposed to the atmosphere. This tube exhibits magnetostrictive properties and expands and relaxes under the influence of a variable magnetic field. A magnetic bias field is provided by a magnet mounted inside the strut and modulated by a drive coil surrounding the lower half of the tube. A magnetostrictive oscillator (MSO) circuit is created by the addition of a pickup coil and operational amplifier. The ultrasonic axial movement of the tube resulting from the activation of the drive coil causes a current to be induced in the pickup coil. The current from the pickup coil drives the operational amplifier, which provides the signal for the drive coil. The oscillation frequency of the circuit is determined by the natural resonant frequency of the sensor tube, which is tuned to approximately 40,000 hertz. As the ice detector encounters an icing environment, ice collects on the sensing probe. The added mass of accreted ice causes the frequency of the sensing probe to decrease in accordance with the laws of classical mechanics. A 0.02-inch (0.5mm) thickness of ice on the probe causes the operating frequency of the probe to decrease by approximately 133 hertz. The ice detector control circuitry utilizes a microprocessor to monitor probe frequency when instructed by the CDP. The ice detector deices itself through internal heating elements in both the strut and probe. After the ice detector is deiced, the sensing probe cools quickly and is ready to sense ice formation again.

SENSORS

Specifications

Output Range: ..... Mass equivalent between 0.020 and 0.10 inches (0.5 mm and 2.5 mm)
Output Format: ..... RS-232 (9600, 2400, 300 baud)
Input Power: ..... 115 vac, 55-65 Hz
Power Consumption: ..... 5 Watts in ice sensing mode; 350 Wattsin deicing mode
Size: ..... 19" H x 19" W x 4" D
Weight: ..... 16 lbs. (7.25 kg)

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