Interfacing to the NRG #40 Anemometer or IceFree3™ Heated Anemometer

Introduction

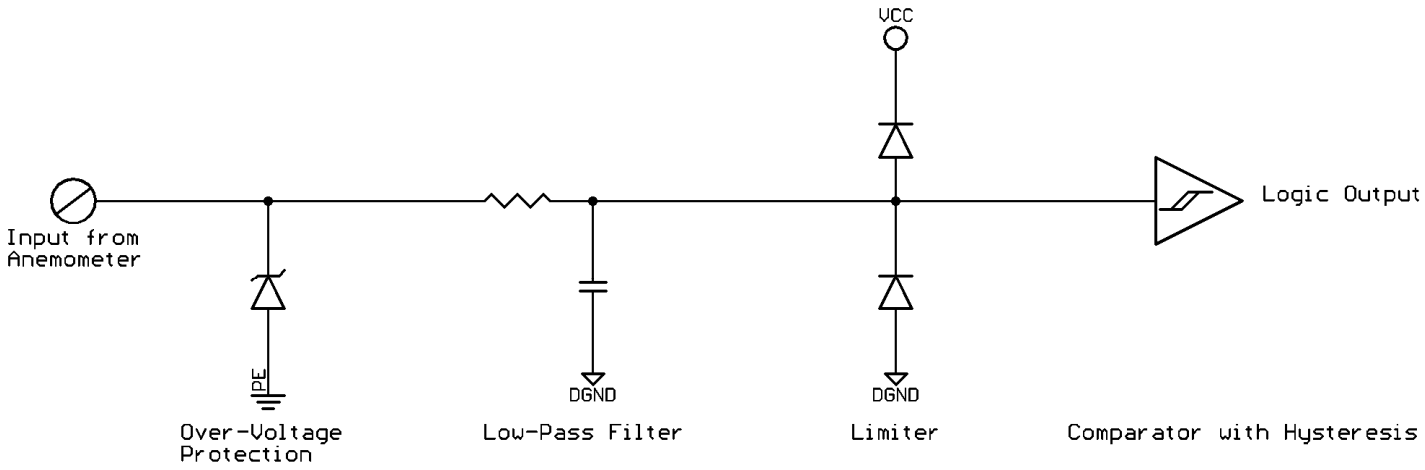
The output signals of the Renewable NRG Systems #40 Anemometer and the Renewable NRG Systems IceFree3™ Anemometer are variable amplitude sine wave AC, with frequency proportional to wind speed. This application note gives you some guidelines for developing an interface for these sensors.

Output Signal

The frequency of the anemometers' output signal is proportional to wind speed. The frequency range that must be reliably sensed varies from approximately 2 Hz at threshold to more than 100 Hz at high wind speeds. Consult the sensor's specifications for the exact wind-speed frequency calibration data.

The amplitude of the output signal is specified at a minimum of 80 mV peak-to-peak at 2 mph to a maximum of 12 V peak-to-peak (typical 9 V p-p) at high wind speeds.

Here is a block diagram of a typical input circuit for these anemometers:



Block Diagram of Anemometer Input Circuit

Overvoltage protection

For the anemometer to provide accurate data, it must be mounted high and in the clear. This inevitably makes the sensor susceptible to electrostatic discharge or even lightning damage.

Adequate precautions are required to provide life and fire safety in the event of a lightning strike on the sensor, but are far beyond the scope of this Note.

To provide reliable data collection, your measurement system must be protected against the more likely electrostatic discharge overvoltage. At a minimum, we recommend placing an 18V rated metal-oxide varistor (MOV), or a Transient Voltage Suppressor (TVS) diode, across the signal input. As with any sensor, careful attention to earth grounding, over-voltage protection components, and cable shield connections are also important.

Input Filtering

To remove high frequency noise at the input which may falsely trigger your input circuit, we recommend low-pass filtering the input. NRG input circuits use a single-pole RC filter of 100 k··and 0.1 ·F, giving a time constant of 0.01 seconds. This corresponds to a corner frequency of approximately 16 Hz, which attenuates the signal significantly only at high wind speeds where the anemometers' outputs are of higher amplitude.

Limiter

The anemometer output signal amplitude is AC (positive and negative) and can exceed the power supply voltages. A limiter is usually needed to protect the comparator inputs from reverse polarity and over voltage, unless the comparator is specified to withstand the wide input voltage range. Since the input filter resistor is in series, a simple diode limiter, such as the circuit shown, is sufficient.

Comparator

To convert the sine-wave signal to a logic-compatible digital signal, a comparator is used. The threshold of the comparator must be set low enough to detect the signal at minimum amplitude, at the low threshold wind speed. Also, the comparator must have hysteresis to prevent bursts of false counts around the sine wave zero crossing.