Self-powered comparator warns when signal exceeds limits

by Roger Fell
Analog Devices Inc., Norwood, Mass.

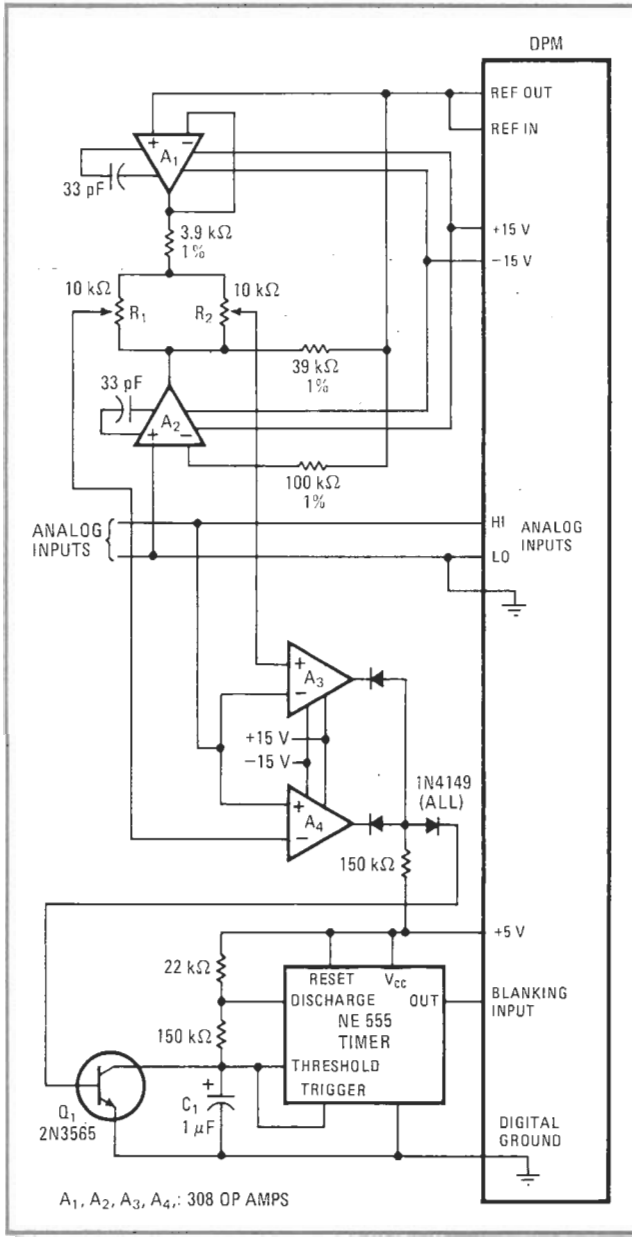
An analog comparator circuit that indicates whether the signal measured by a digital panel meter is within programable limits is powered entirely by that same DPM. The circuit is particularly useful for system applications in which the voltages of process-control equipment or pollution have to be monitored.

The DPM displays all input signals, regardless of the limits, but flashes the polarity sign or digital display for inputs outside the desired range. The comparator works with any DPM that has blanking circuitry for the polarity sign or entire display; the Analog Devices AD2006 is suggested because it has, in addition to the blanking circuitry, ±15-volt dc and +5-v dc outputs that supply sufficient power for the comparator circuitry.

The reference output of the DPM is used here as a stable reference voltage for the comparator. It is buffered and attenuated by operational amplifiers A_1 and A_2 to levels of ±2.5 v. Potentiometer R_1 is set for the lower threshold and R_2 for the upper threshold, both at any value within the DPM's input range.

An analog input between the two thresholds drives the outputs of op amps A_3 and A_4 positive. The diode network at the outputs of A_3 and A_4 is a primitive AND gate, which turns on transistor Q_1 if both op-amp outputs are high. This short-circuits the timing capacitor C_1 of the NE555 timer, which is connected as an astable multivibrator. With pin 6 of the timer held at digital ground, the output of the timer at pin 3 is forced high. This signal, at the blanking input of the DPM, unblanks the polarity sign or display.

When the analog input signal of the DPM is above or below the preset thresholds, one of the two op-amp outputs is driven negative, turning off transistor Q_1, and removing the short circuit across C_1. This enables the astable multivibrator to operate; the resulting square wave at its output flashes the polarity readout of the DPM at a rate of about 5 hertz. □



Limit checker. Potentiometers define upper and lower threshold for permissible range of analog signal. When input is above or below the threshold range, the timer, connected as an astable multivibrator, begins to flash either the entire display or its polarity sign.