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ideas

to 360° and continues back down to 180°. The net result is a ramp that goes down to 0V, a jump to 5V, and then another down-going ramp. The mean voltage is 2.5V. Because the loop bandwidth is approximately 15 Hz, the instantaneous effect on the VCO is small, and the net frequency change is zero. Rather than detect the

ramp-jump-ramp waveform, use Phase Detector 1 as the data output. Because this block is a simple exclusive-OR gate, each one bit appears as a spike going from 5 to 0V and back. A comparator can change it into a return-to-zero version of the input signal. Alternatively, the output can go to a retriggerable monostable with a 3.5-msec

period to generate a good approximation of a nonreturn-to-zero output. **Figure 2** shows the circuit waveforms that occur for the letter “g.” (DI #2284).

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