THINK TANK

By Byron G. Wels, K2AVB

Changing Of The Guard

Over the years, it has given me great pleasure to write this column and share with you the experiences that I've had...to review your circuits, and share your experiences. But alas, as with all things, the old must give way to the new. To paraphrase a biblical passage, "the young are called because they are strong, and the old because they know the way." And so it is with great sadness that I must inform you that I will no longer write this column—my other duties around here have become such that they take up all of my time. So, with this column I pass the helm to my successor. I hope that you'll be as faithful to him as you have been to me.

With the farewells out of the way, let's see what the mailbag has to offer this month.

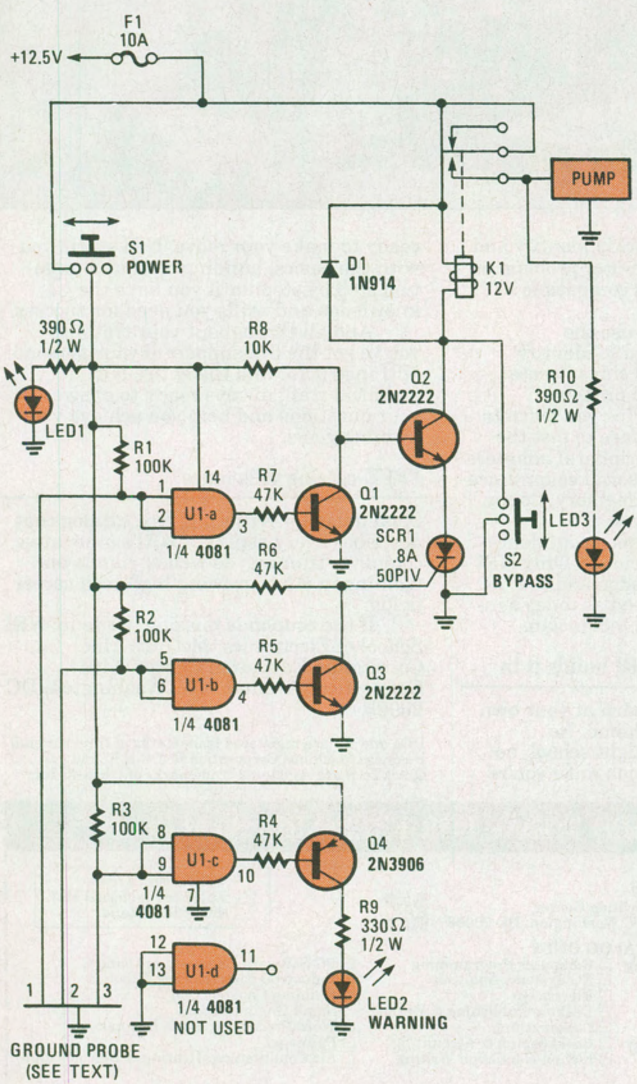

Fig. 1. The water-level control is built around a 4081 quad 2-input AND gate (only three gates of which are used), and a few other readily available components (four transistors, an SCR, a relay, etc.).

WATER-LEVEL CONTROL

I needed a circuit that would power up a water pump when the water reached a predetermined level, and then turn itself off when the water had receded to another predetermined point. So I set about to design just such a circuit. I came up with the circuit in Fig. 1. The circuit is built around a 4081 quad 2-input AND gate (only three gates of which are used), and a few other readily available components (four transistors, an SCR, a relay, etc.).

Gates U1-a through U1-c each have their two inputs tied together, and serve as probes. The probes are then placed at various levels to trigger a particular function at a predetermined time. The ground side of the circuit is placed below the minimum water level. The inputs to each gate are tied high through a 100k resistor connected to the +12.5-volt bus.

As the water level slowly rises to probe 1, the input to U1-a is pulled low by the conduction of current through the water to the ground probe. That turns Q1 off and Q2 on. With Q2 turned on, the circuit is placed in the standby mode, ready to activate the pump when conditions are right.

Probe 2 is placed at the maximum water level. If the water level reaches probe 2, the input of U1-b is brought low, turning Q3 on, which, in turn, causes current to be applied to the gate of SCR1, turning it on. The circuit through K1, Q2, and SCR1 is now complete to ground, and the water pump is now turned on causing the water level to recede. When the water level falls below probe 2, U1-b goes back to logic high. However, due to the latching nature of SCR1, the pump continues to run until the water level falls below probe 1; at that point, the ground circuit opens and de-energizes K1, turning the pump off. The pump will not turn on again until the water level again rises above probe 2.

Probe 3 was added as a warning. Should the water level reach probe 3, LED2 indicates that the pump is not working for some reason. Switch S2 was added as a manual override, while S1 powers the sensing circuit. LED3 is used to indicate that power has been applied to the pump. LED1 is used to indicate that power has been applied to the sensor.

I made the probes out of chrome-plated sewing needles to help resist corrosion. The probes are placed near the pump, while the circuitry is housed in a small remotely located enclosure.

That particular arrangement is used to control a boat's bilge pump, which draws about 7 amps under full load. However, the component values can be changed to accommodate whatever task you have for the circuit.

—Jerry Mercks, Huntsville, AL

Good Jerry, and thank you. I'm sure this circuit could easily be adapted to any sump pump and with a little imagination, to lots of other applications.