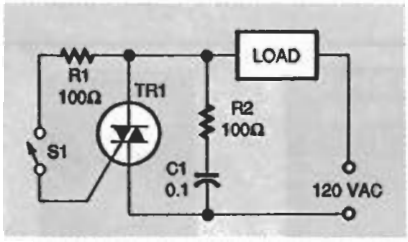

FIG. 1—SIMPLE AC POWER SWITCHING circuit with a triac that can be triggered from the AC line.

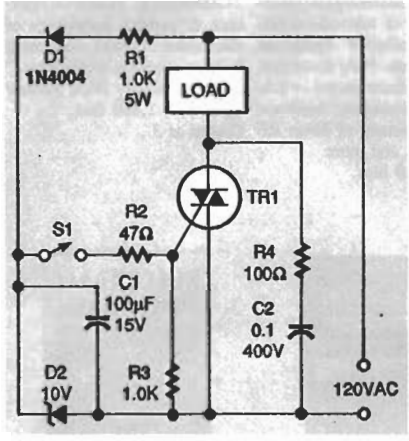

FIG. 2—AC POWER SWITCH whose triac can be triggered with line-derived DC.

kinds of appliances and machines. However, the triac for this circuit must be selected with the necessary rating to switch AC power safely for your intended application. *Caution:* The components for all of the schematics in this article have been selected for switching *only* 120-volt, 50/60 Hz AC.

In Fig. 1, the triac is off and acts like an open switch when S1 is open. However, it acts like a closed switch that is gated on from the AC line through the load and R1 shortly after the start of each AC half-cycle, when S1 is closed. The triac's main terminal voltage drops to only a few hundred millivolts when the triac turns on, so R1 and S1 consume very little current.

Keep in mind that the triac's threshold is *not* synchronized to the AC line when S1 is initially closed, but it becomes synchronized on all subsequent half-cycles. Resistor R1 and capacitor C1 form a *snubber* network that (as was described last month) suppresses voltage spikes that occur when inductive loads are switched and current and voltage are out-of-phase. Snubber networks are included in all of the triac circuits presented in this article.

Figure 2 shows how the triac functions as a power switch that can be triggered by the AC line-derived DC supply. Capacitor C1 is charged to +10 volts on each positive line half-cycle through resistor R1 and Zener diode D1. The charge on C1 triggers the triac when S1 is closed. Notice that resistor R1 is subjected to close to the full AC line voltage at all times. Consequently, it must have a high power rating (5 watts here).

Caution: All parts of this circuit are "live" so the circuit poses a life-threatening electrical-shock hazard. Moreover, this circuit is difficult to interface with external control circuitry because it does not include an isolator or matching device.

Isolated input control

Figure 3 shows how the circuit in Fig. 2 can be modified so that it can easily be interfaced to external control circuitry. Here, switch S1 is replaced by bipolar junction transistor Q1, which is driven by the output stage of an optocoupler (or optoisolator) IC1. It consists of an infrared light-emitting diode (IRED) optically coupled to a phototransistor. Any of a number of industry-standard transistor-output optoisolators will work here.

These include the TIL111, TIL 112, 4N27, and 4N28. The optocoupler can be driven from a 5-volt or greater DC supply through resistor R1. The triac turns on only when the input circuit supply is connected to the 5-volt or greater power source by switch S1.

As was pointed out in last month's article, optocouplers

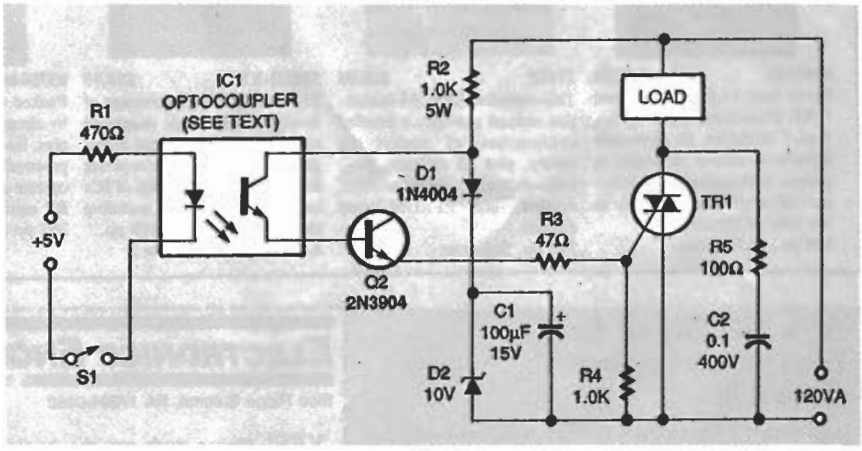

FIG. 3—OPTICALLY COUPLED AC power switch with a triac that can be triggered by DC input.

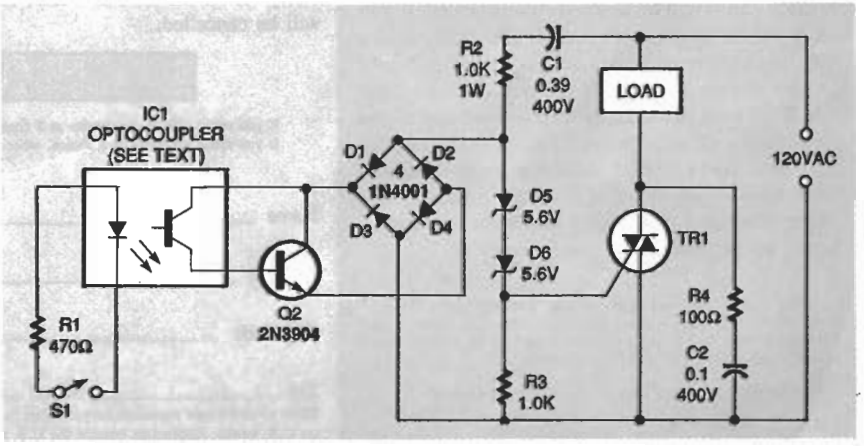

FIG. 4—OPTICALLY COUPLED AC power switch with a triac that can be triggered by AC input.