BUILD THE SPEEDI-WATT

Here's an easy-to-build circuit that can be used as an electronic speed control for electric drills or fans, as a power controller for electric blankets or soldering irons, or as a lamp dimmer, and for much, much more.

Look around your home and you will probably find a number of AC-powered appliances that could provide improved service to you and your family with the use a speed or power controller. We've put an electronic controller together that we call Speedi-Watt* that is ideal for that purpose. Speedi-Watt is cheap to build, compact in size, and, best of all, it is very easy to put together. As a bonus, Speedi-Watt incorporates electromagnetic-interference (EMI) suppression circuitry. That means that you will not be plagued by those herringbone TV patterns that more electrically-noisy units produce.

The Speedi-Watt is an easy-to-make circuit module to which you will need to add a knob, a three-wire power cord, a three-terminal AC plug and matching AC socket, and a suitable plastic case. The whole project should go together in about one evening.

The resulting dimmer and speed control is suitable for lamps, fans, or universal motor loads up to 500 watts (or approximately 4 amperes at 117-volts AC). By universal motors, we mean AC motors with brushes such as those used in electric drills, food mixers, and sewing machines.

Circuit Details. Speedi-Watt's schematic diagram is essentially a typical dimmer circuit that uses a phase-controlled Triac (TR1) as the power-control element. A Triac is a high-power switching device developed by General Electric about 25 years ago. It is similar in function to a silicon controlled rectifier (SCR) or thyristor.

In effect, an SCR is a bipolar switch that can operate at AC frequencies up to 400 Hz. Like a silicon controlled rectifier, it is non-conducting until it receives a trigger voltage between its gate and the anode electrode (MT1). When that happens it switches into conduction and remains that way until the voltage reverses in polarity or the current dies away to zero.

The difference between a Triac and an SCR is that while an SCR will only work with one voltage polarity, the Triac will work with both. It can conduct on both half-cycles of an AC waveform. It can be made to control the AC power fed to a load merely by being made to conduct early or late in each successive AC half-cycle.

Such a method of power control is referred to as *phase control*, because the timing of the gate trigger pulses is varied with respect to the phase of the AC waveform.

The device used to generate the trigger pulses is the Diac (D1), also developed by General Electric at the same time as the Triac. A Diac is referred to as a breakdown diode because it is non-conducting at all voltages up to its breakover point. When the breakover point is reached, it "breaks down" to the conducting state. It remains in that state until the voltage reverses in polarity or the current dies away to zero.

The Diac is used in conjunction with a capacitor to deliver a pulse of current to the gate of a Triac.

Now look at the complete circuit of Fig. 1. Note that the Speedi-Watt circuit works at 117-volt AC power-line potential. In other words, the whole thing is inherently lethal if you touch any part of the circuit while it is connected to the AC power line. Don't worry, though—when it is correctly assembled it is completely safe.

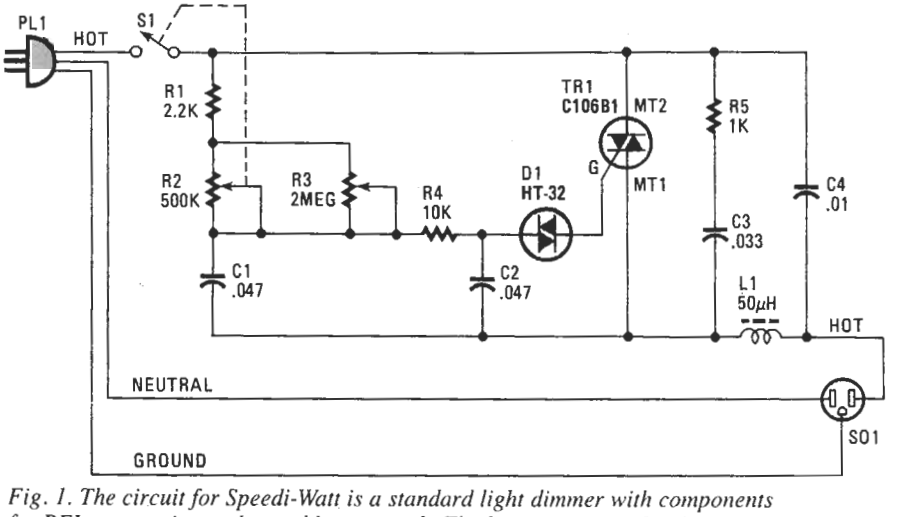

Fig. 1. The circuit for Speedi-Watt is a standard light dimmer with components for RFI suppression and a snubber network. The latter consists of resistor R5 and capacitor C3 which reduce the counter-EMF caused by the load at SO1.

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