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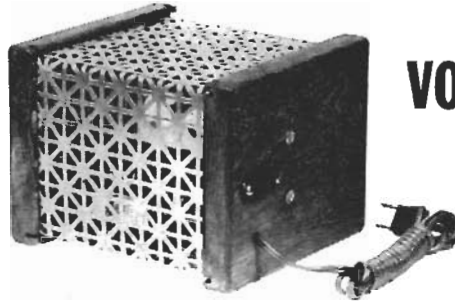
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## VOLTAGE REGULATOR For Enlarger Lamp

By ROBERT A. WOLFF

EVERY time an amateur photographer turns on his high-intensity enlarger lamps, he runs the risk of having exposures ruined by variations in lamp brilliance. However, if he uses a solid-state constant-voltage power supply as an energy source, he assures himself of constant light output irrespective of voltage variations.

One of the niceties of a solid-state power supply is that it's easy to build. Parts are inexpensive and available at most electronics supply stores, and only a modicum of specialized electronics know-how is needed. The unit discussed in this article is one which any amateur electronics man can construct.

The transformerless solid-state package, shown in photo, weighs less than two pounds. It can deliver a constant 120-volt d.c. output to a 75-watt enlarging lamp or photoflood, irrespective of line-voltage variations which range from 100 to 140 volts. The unit can also be used with 150-watt enlarger lamps if the enlarging process does not exceed the normal exposure periods.

The constant-voltage supply shown in Fig. 1 is basically a conventional series voltage regulator driven by a full-wave line-voltage rectifier. Advantage is taken of the rectifier's capability of producing an output voltage equal to the peak value of the a.c. line, or about 170 volts. (Under low-line conditions, for example, 100 V a.c., the rectified output is about 140 volts which is more than adequate for a 120-volt load.) By employing full-wave rectification, the period between peaks is halved, thereby allowing a small, more economical filter

capacitor to be used. The 3-ohm resistor in series with the controlled avalanche-type diode bridge limits the surge current to a safe value during turn-on.

The TI3031 series-regulator transistor is a low-cost germanium *p-n-p* audio power device. When it is properly heat sunk, this transistor is untroubled by high ambient temperature conditions and line-voltage variations.

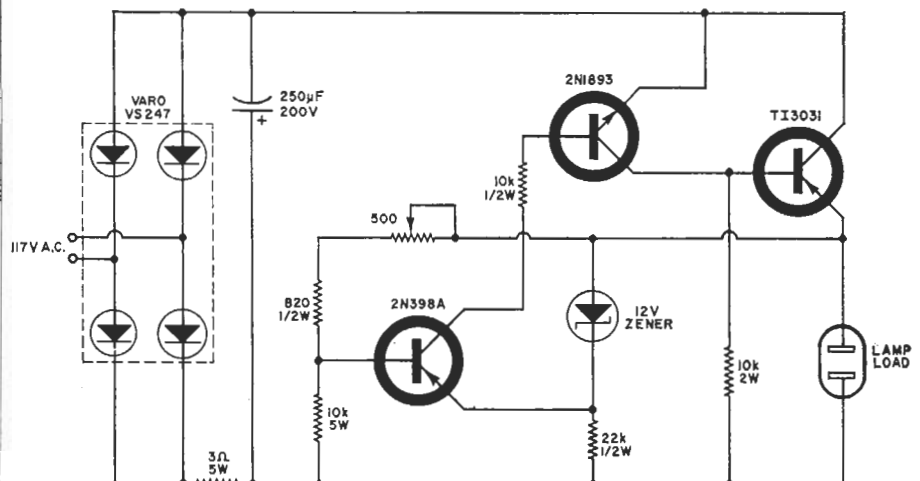
The regulator transistor is driven by a two-stage error amplifier referenced by a 12-volt zener diode. Zener and resistor tolerances are accommodated by the base-bias control potentiometer in the first error stage. Since the final output voltage is sensitive to changes in bias resistance, the 10,000-ohm, 5-watt resistor is purposely overrated to limit temperature rise and minimize shifts in resistance over extended periods of operation.

### Setting Light Output

One of the easiest ways to set the voltage control is by the comparison method. Plug a 75-watt lamp into a standard household outlet, and carefully take a light-meter reading at a fixed distance away. Plug the same lamp into the power supply and carefully adjust the voltage control until the lamp brilliance gives the same light-meter reading as in the previous measurement. The constant-voltage supply will now maintain this brilliance, regardless of line-voltage variations.

Several prototype voltage regulator systems were built by the author. Each performed well under conditions of wide line-voltage fluctuations. ▲

Fig. 1. Lamp brilliance is set by adjusting the 500-ohm potentiometer.



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