

Lamp dimmer fades in equiluminous steps

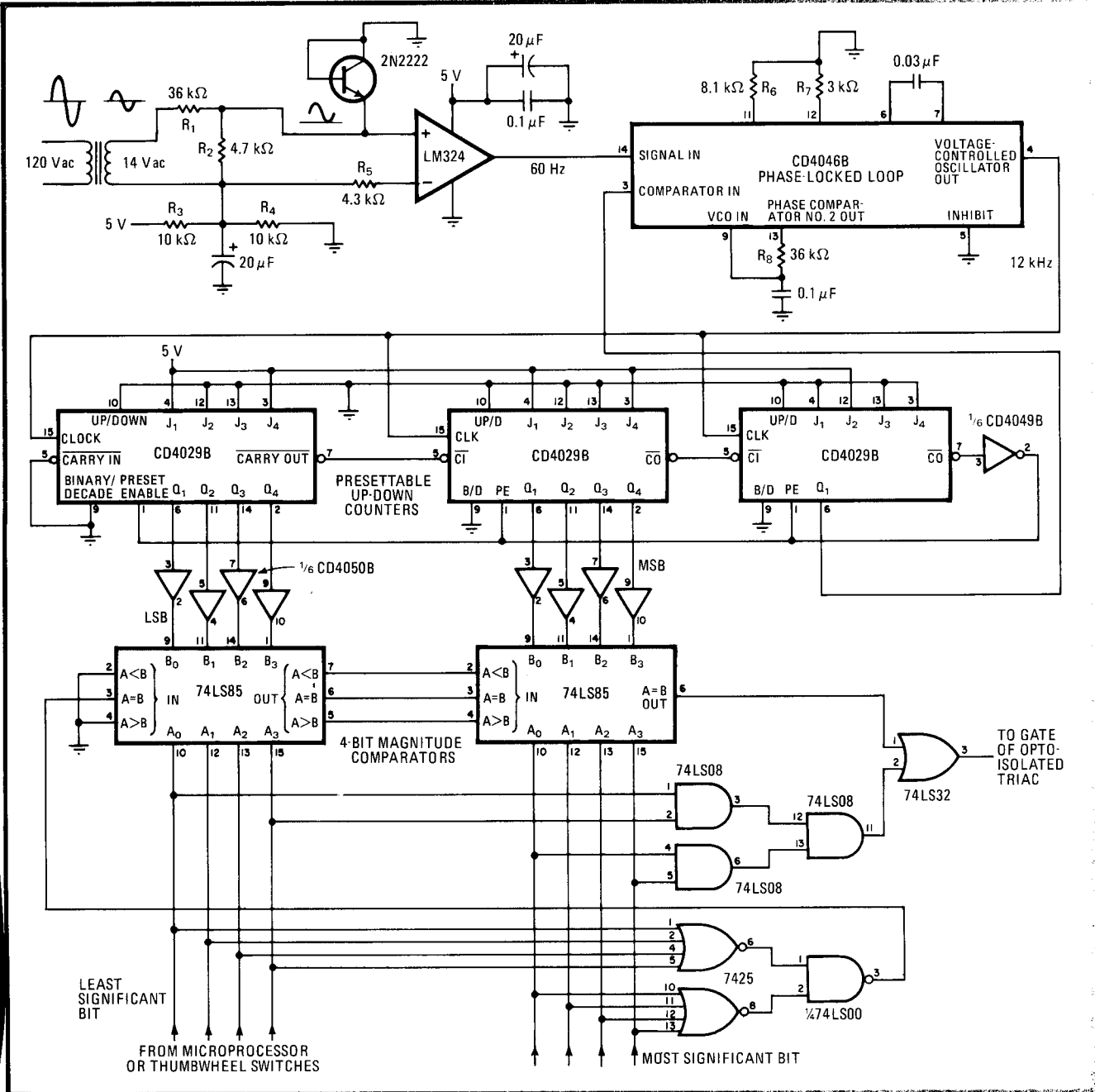
by Mark E. Patton
Sanders Associates, Nashua, N. H.

This programmable light dimmer will serve particularly well as an intensity-control source for vision response testing and in theatrical lighting systems, where it can provide, as perceived by the human eye, a virtually linearly stepped increase or decrease in luminous output

(the Munsell curve).¹ Using readily available chips, it can be built for less than \$20.

In operation, a triac-driven lamp is triggered by the 60-hertz line input once during each half cycle, at a point determined by an eight-input binary-coded decimal control word derived from a microprocessor or a thumb-wheel switch. Thus the lamp brightness may be easily selected and accurately maintained, or alternatively, it can be gradually diminished or increased as desired.

As shown, the LM324, biased to operate from a 5-volt dc supply, works as a comparator to provide 60-Hz square-wave pulses to the CD4046B phase-locked loop and as a buffer to suppress line transients. The PLL and the 4029 up-down counters working together act to



Linear lighting. Programmable lamp dimmer can provide intensity increments and decrements in near-linear steps (as perceived by human eye), virtually meeting Munsell curve specifications. BCD control word, derived from microprocessor, sets switching point on 60-Hz line input.

multiply the line input by 200, so that the counters decrement from 99 toward 0 at a 12-kilohertz rate. This rate permits the selection of $12,000 / (60 \times 2) = 100$ brightness levels.

Meanwhile the two-digit BCD control word is introduced to the 74LS85 4-bit magnitude comparators, where it is compared with the output of the counters. When the line-synchronized output of the counter becomes equal to the control word, the opto-isolated

triac, which is connected to the ac line, is fired.

The triac should be heavily filtered to prevent switching noise on the line from reaching the logic circuitry. Also, to increase circuit stability near the zero and maximum-voltage switching points of the 60-Hz input signal, the outputs of the 74LS85s are gated for a loaded BCD code of 99 and are disabled for a code of 0. □

References

1. GTE Sylvania, GTE Sylvania Lighting Handbook, 5th ed., 1974.