ALTERNATE DIMMING

I'm looking for a special-effect lighting-control circuit. It has to alternately increase the brightness of one bulb while decreasing the brightness of another. I'm presently using two regular dimmers with small motors that physically rotate the shafts. Is there some easier way to do that electronically?—L. Hurst, New Orleans, Louisiana

From what you described in your letter, just about anything else would be easier, although nothing could be anywhere as straightforward. You can do the whole thing electronically, but the problem has to be broken down into a few parts.

In order to alternately dim and brighten a light bulb, a circuit has produce a low-frequency sine wave or other similar output waveform. If you use the sine-wave to control a light, as the voltage increases and decreases, the light bulb will get brighter and dimmer, and you'll want to be able to adjust the cycle time from about 1 to 10 seconds.

The circuit in Fig. 2 uses a 555 oscillator, and the potentiometer can vary the frequency from ten to one hundred Hz. We've multiplied the required frequencies by ten because we're using the 555 clock to control the 4018, which is a programmable counter set to divide by ten.

By summing the outputs of the 4018, and connecting the Q5 output to the Data input, the chip will produce a rising and falling staircase waveform at a frequency of one-tenth the 555's clock rate. It's a kind of make-believe sine wave. There's not enough room here to go into a complete description of the 4018, but a good data book will help you understand what the chip is doing.

The stepped output from the 4018 looks something like a cross

between a triangle wave with a flat top, and sine wave with steep sides. If you want a better approximation, you have to cascade 4018's to get more steps, and add filtering to smooth the output.

Since we're only controlling an incandescent bulb, however, the waveforms we're getting from the circuit are good enough. You can add more stages and filtering if you want, but first try the circuit as shown to see if you really need the extra stages.

The actual control of the bulb is being done by a standard light dimmer. You can either build the one shown or modify a store-bought one. Whichever you choose, remember that you're playing around with the AC line voltage, so be careful where you stick your fingers.

The varying voltage from the 4018 is directly driving the LED half of an MOC3010 optocoupler. The other half of the optocoupler is controlling the light dimmer's triac. As the 4018's output voltage increases, the incandescent bulb will get brighter, and as the 4018's output voltage decreases, the bulb will dim.

The circuit in Fig. 2 controls only one dimmer, but there are ways around that. You can invert the output of the 4018 and use it to drive a second optocoupler and dimmer or, if you want to be slick and sneaky about things, you can use a single light dimmer to do the whole job.

Remember that when the dimmer's triac turns off the bulb, you've got 120 volts across the dimmer. That means you can hang one bulb on the dimmer outputs, and a second one across the dimmer itself. That way, the brightness of the two bulbs will always be exactly out of phase with each other.

If you decide to use one dimmer to control both bulbs, make sure that both bulbs have the same wattage. The bulb sitting across the dimmer will be drawing its operating current through the filament of the first bulb, and nothing can cause more trouble than using the filament of a 60-watt bulb to supply current to a 500-watt flood light. **R-E**

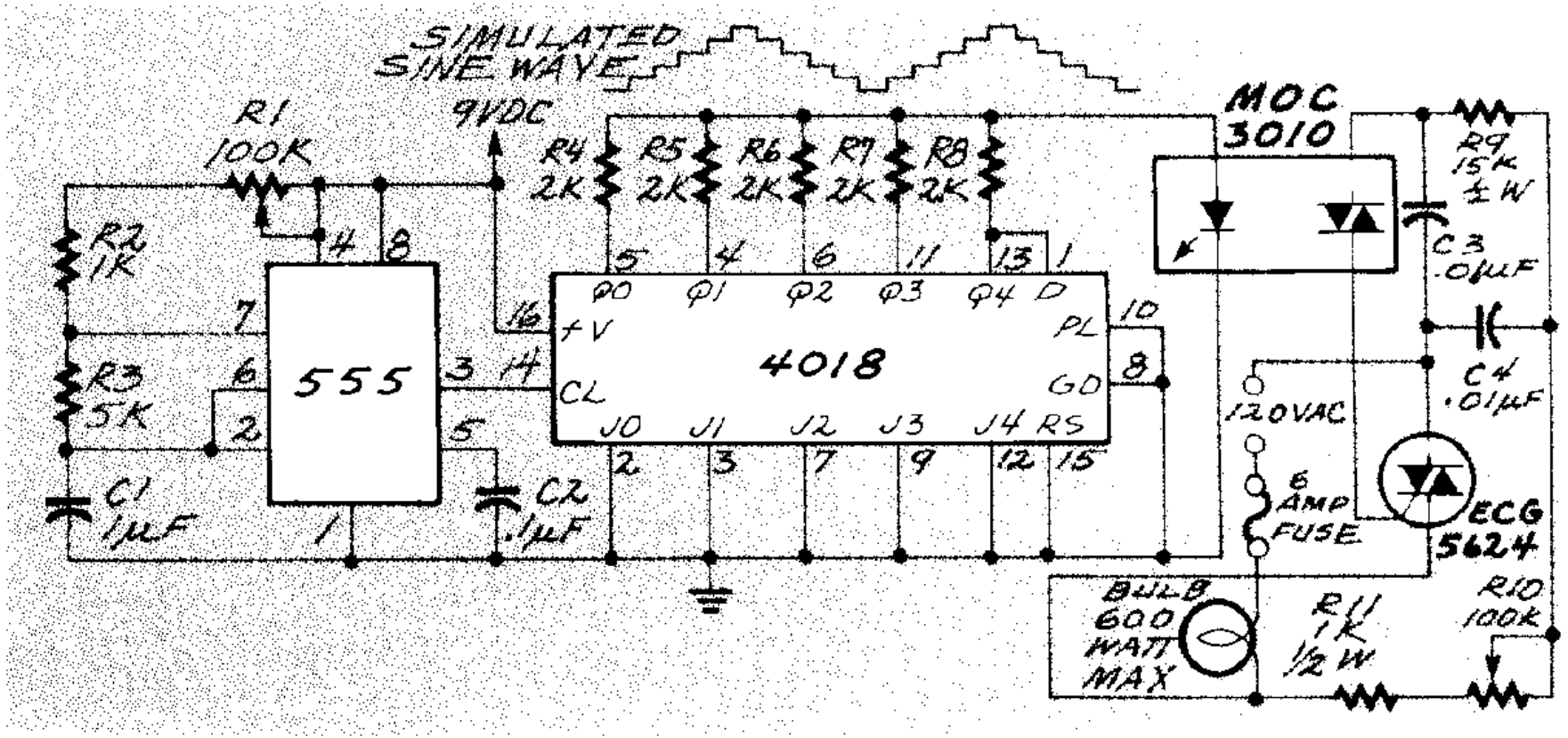
SIMULATED
SINE WAVE
9VDC
R1
100K
R2
1K
R3
5K
C1
1µF
555
C2
.1µF
R4
2K
R5
2K
R6
2K
R7
2K
R8
2K
4018
+V
CL
PL
GO
RS
J0
J1
J2
J3
J4
Q0
Q1
Q2
Q3
Q4
D
MOC
3010
R9
15K
½W
C3
.01µF
C4
.01µF
120VAC
6
AMP
FUSE
ECG
5624
BULB
600
WATT
MAX
R11
1K
½W
R10
100K

FIG. 2