

TITLE: SIMPLE FLASHER

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No, we aren't talking about a guy with a room temperature IQ and a raincoat. A guy from Florida I met on the internet threw me an interesting challenge. Ronn Walker (Tropical Helicopter, Leesburg Airport FL) asked me if there was a way of flashing a warning light by using only two wires. That's right, break the wire between the light and the warning switch to ground and insert a circuit to flash that light.

Hmmm...four wires is simple. One to + supply, one to ground, one to the light, and one to the grounding switch that turns on the warning light. An opamp flasher-oscillator in between and the design is trivial.

Three wires is a little more difficult, in that we have to depend on the ground of the warning switch to turn the opamp oscillator on, but still not all that difficult.

Two wires took a little thought. How do we derive the + supply for the opamp oscillator and still turn off that power supply when we supply a ground to the lamp to flash it? Hmmm...well, if we've got a square wave driving that lamp, then for half the time we've got the full battery voltage available through the resistance of the filament of the light bulb. If we could somehow "save up" the voltage available during the off-time of the bulb and then regurgitate it into the opamp oscillator during the on-time, then we might just be able to make a stable circuit out of it.

"Store up" in electronicspeak simply begs for a capacitor. A *large* capacitor if we want the saved voltage to keep that oscillator going for a second or so during the lamp-on portion of the cycle. And, to keep that saved voltage from discharging back into the grounding device, we need to put a blocking diode in series with the supply.

Here's the deal. Suppose you have a light on your instrument panel that is supposed to warn you when the oil pressure gets too low. Somewhere on the engine there is a switch plumbed into the oil gallery that is set so that when the oil pressure gets below a certain value the switch contacts are turned on. Now if we run one side of that light to the battery and the other side of the light to one end of the oil pressure switch, and then if we ground the other side of the oil pressure switch, when the oil pressure drops to that preset level, the light will come on and tell you that you are about to become a passenger in your airplane.

But the human organism doesn't respond to steady lights all that well...witness the bubblegum machine on the top of most of our police and fire vehicles. A flashing light will get your attention far more than a steady burning bulb. The problem is that you've installed the light and don't want to go through a whole lot of hassle to blink it.

Not a problem. Consider the schematic diagram accompanying this article. Originally, I1 (the panel lamp) was connected through fuse F1 to the battery bus (12 to 28 volts, it matters not). The bulb was then attached to S1 so that when the oil pressure (or fuel pressure, or whatever) allowed the switch to close, the lamp would illuminate.

We break the circuit between I1 and S1 to insert oscillator U101 and switching transistor Q101 to flash the bulb. The circuit works like this: During the period when the bulb is dark (off), C101 charges through the filament resistance of I1 and diode D101 to nearly the battery bus voltage; this voltage allows U101 to operate as a normal oscillator. When the bulb lights, D101 is reverse-biased and does not conduct. During this period,

C102 supplies voltage to U101 to continue oscillating. As U101 oscillates, it turns on and off Q101 and this alternately provides a ground and an open to lamp I1 and thus I1 flashes at the rate of oscillation of U101.

The frequency at which U101 oscillates is determined by R105 and C102. With C102 at 10 microfarads, a 47k ohm resistor at R105 will cause U101 to oscillate at a one cycle per second rate. If you want a slower rate, increase the value of R105. If you want a faster rate, decrease the value of R105. Values between 10k ohms and 1M ohm will allow the flash rate to go from several dozen flashes per second to a flash every 30 seconds or so. In the photo you will see a 100k ohm potentiometer so that we could set the rate from faster than the eye could see to a flash every two seconds, just for testing purposes.

As I said, this system will work well from 12 to 28 volts (tested, actually, and worked well from 9 to 32 volts). What it will also work on are LEDs as well as incandescent bulbs. Just be sure the flasher circuit is the last thing before the grounding switch, with all the diode-resistor rigamarole on the power supply side of the flasher circuit.

That's about it for this month. I promised you an engine heater article, and the weather gods in Northern California have conspired against me for three months in getting you the data for this article. If things proceed on their merry way this spring this way, it will be next winter before I can get good data for you to make your own heater system. However, we can certainly make the temperature sensor that turns the heater on when the temperature drops to a preset level. And, we can do a whole bunch of new audio and instrumentation stuff that will take us gracefully into next winter. Stay tuned.

Jim

Author's Note: Jim Weir is the chief avioniker at RST Engineering. He will be glad to answer avionics questions for this article or on any avionics subject in the Internet newsgroup rec.aviation.homebuilt. If you are having trouble with newsgroups, go to [www.rst-engr.com](http://www.rst-engr.com) and click on the "How To Use The Net" link.

#### PHOTO LOG:

Photo1 and Photo2: The entire circuit fits very easily into the smallest Radio Shack box that is available. Be sure that the capacitors are rated for the voltage that you are using (35+ volt capacitors for a 28 volt airplane, 16+ volt capacitors for a 12 volt airplane, etc.).