# FIRE FLICKER CIRCUIT by Fred Miller, MMR

Note: A full construction project article appeared in the Jan/Feb 2000 issue of Model Railroading Magazine. *A correction was also published in the Feb/March 2000 issue. The circuit shown below has been revised for stable operation.*

This simple electronic circuit will blink a LED in a seemingly random fashion, closely simulating the flicker of a fire. If a small LED of a red or orange color is used, the LED can be used to simulate the actual flames in a small campfire. If a larger LED is driven by the circuit, the resulting light could be used to simulate the reflections of a large fire in a furnace, boiler or building. Blue and/or white LEDs could represent the flickering of a welding torch.

Campfire Flicker
## Random Noise Generator Driving LED

F. Miller
Revised 2003
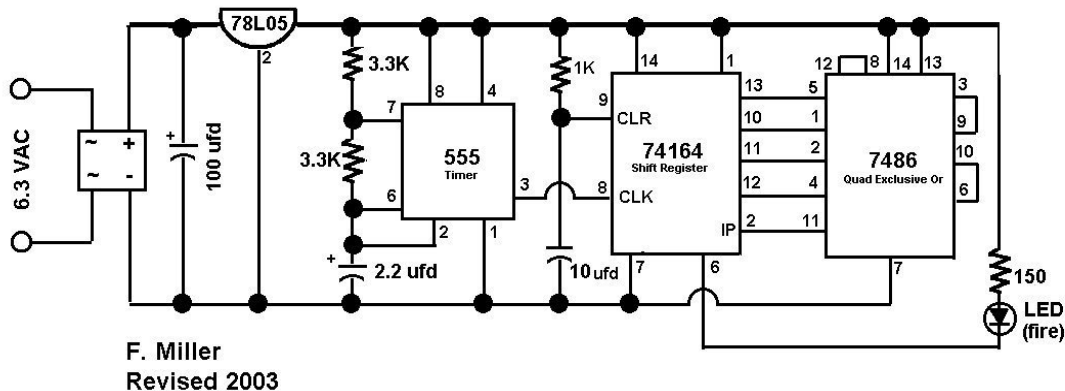
The circuit makes use of inexpensive TTL (Transistor-Transistor-Logic) chips to produce a pseudo random sequence of on-off states for the LED. The circuit is actually called a 127-state pseudo-random sequence generator, typically used to generate "white noise" or random numbers. A 555 Timer Chip is used as a self-oscillating clock circuit which "cycles" a 74164 8-bit shift register chip. The 6th and 7th register outputs are combined using a 7486 Exclusive-OR logic chip and the results fed back into the 1st register. This results in a continuing cycling of the shift register output so that 127 different states are repeated. In other words, the shift register output states are not repeated until 127 "clicks" of the clock. Sampling the output of any register will yield an apparently random length of on-off cycles. This is used to drive a LED, lighting the LED when the output is a 0 and turning the LED off when the output is 1. Since the

555 timer circuit is set to run at about 90 hertz (cycles/sec), the output sequence would repeat at about every 1.5 seconds (frequency of 1/127 of 90). This makes the LED on/off cycling appear random.

Construction:

My model layout has a buss of 6.3 VAC running under the layout for powering house lights and street lamps. Since the TTL logic chips in the Flicker Circuit require a 5 VDC power source, I added a simple power supply circuit to the circuit board to convert to the required 5 VDC.

The circuit is constructed on a small perf-board available from Radio Shack. All of the other components are also available from Radio Shack and are listed in the parts list. The circuit is soldered together using any available small gauge wire.

Fire Flicker Circuit Board - Bottom (Wiring)

Fire Flicker Circuit Board - Top (Components)
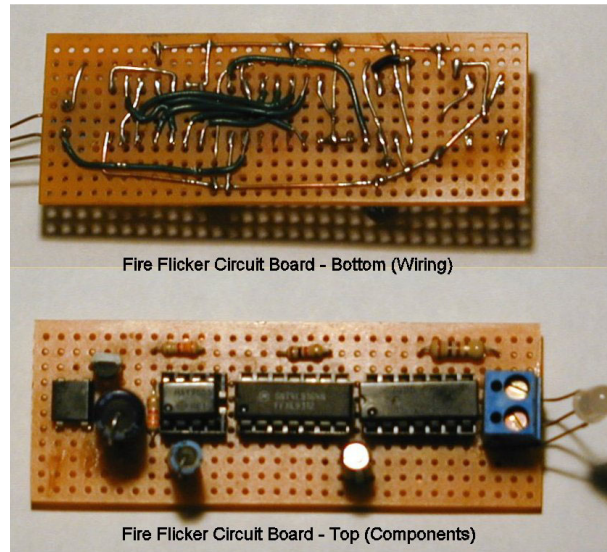
Note: The parts list below includes Radio Shack Product Code. Radio Shack does not now stock all items in-store and some might have to be mail ordered. Jameco, Digikey and Mouser are other mail order sources stocking all of the items at better prices.

Perf Board (276-150
Pkg (of 2) 8 pin IC Socket (276-1995)
Pkg (of 2) 14 pin IC Socket (276-1999)
Pkg (of 5) 3.3Kohm 1/4w resistors (271-1328)
Pkg (of 5) 150 ohm 1/4w resistors (271-1312)
LM555 Timer (276-1723)
74164 TTL 8-bit Shift Register (276-2841)
7486 TTL Quad Exclusive-OR (276-2819)
7805 5v Reg (276-1770)
100ufd 35V Cap (272-1028)
10ufd 35V Cap (272-1025)
2.2ufd 50v cap (RSU 11930450)
1a 200v Rect. Bridge (276-1161)
Pkg of LEDs (276-1622)
Misc: Wire and solder