

HauntMaven.com - Wolfstone's Haunted Halloween Site



http://wolfstone.halloweenhost.com/Flicker/flktch_FlickerTechniques.html

Flickering Lights - Practice

We define "flickering lights", as turning on and off with a random or irregular timing, which does not seem to repeat. We have another page that details the theory of flicker.

There is commercial flicker stuff for those who require a reliable solution rapidly.



And then we present the practical techniques...

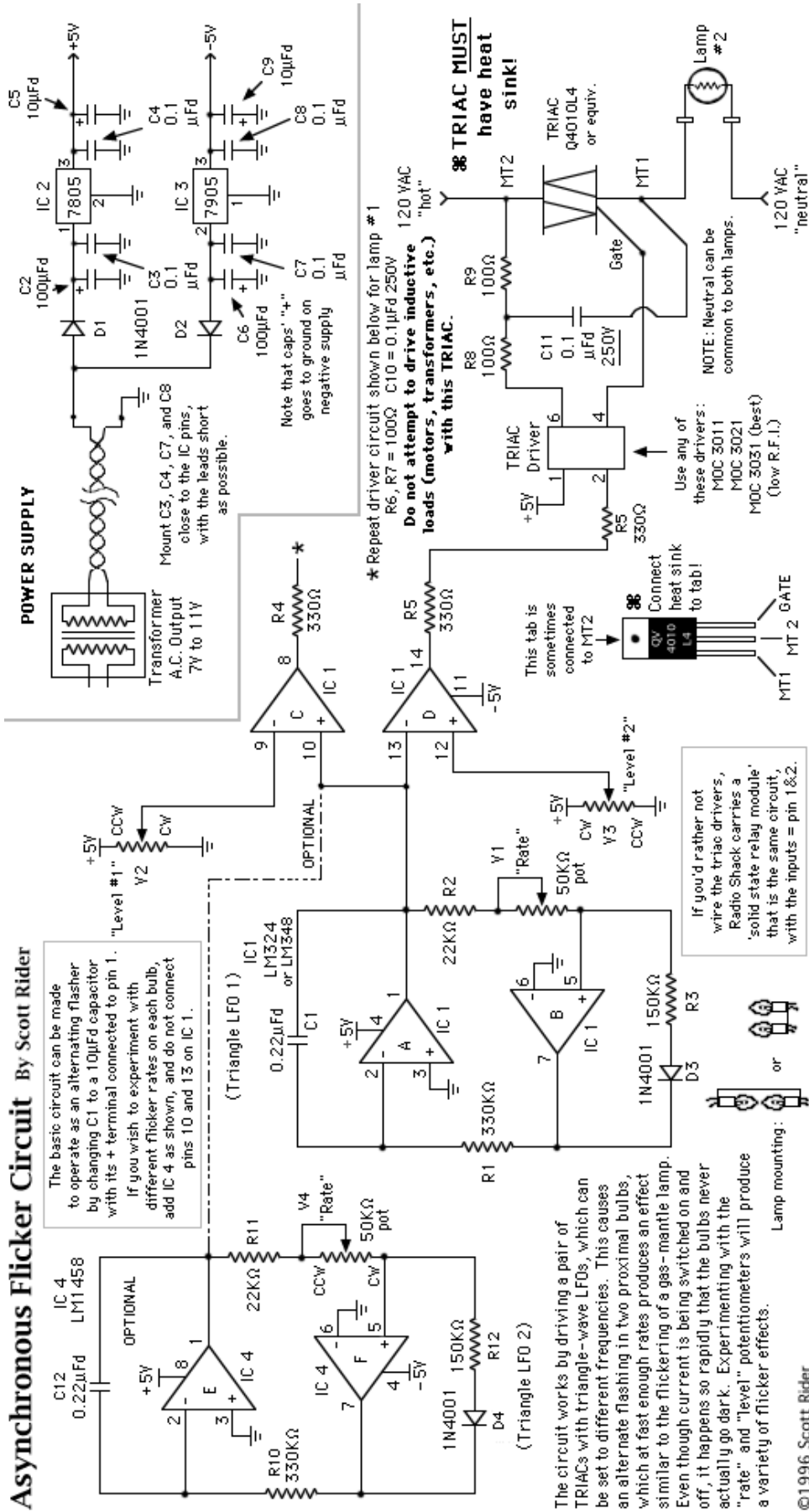
Mixed oscillators

There is a class of flicker techniques that operate by generating simple waveforms (triangles, squares, sines) at two or more frequencies and mixing them together. Since the oscillators are designed to run at different frequencies, they mix together to form a long, complex sequence that seems random.

The mixing of the oscillators can take place at various levels:

- If each oscillator drives a light bulb, and you put the bulbs close together, the oscillators are *optically* combined.
- You can *electrically* combine the signals, and send the result to a single lamp.
- If you are using a microprocessor to implement the oscillators, you can mix them in *software*.

Asynchronous Flicker Circuit By Scott Rider



No matter how the mixing occurs, these techniques have a common theme: instead of a complex pseudorandom generator, two or more simple oscillators generate simple pulses, which are then combined into a longer sequence.

Technique - ALF

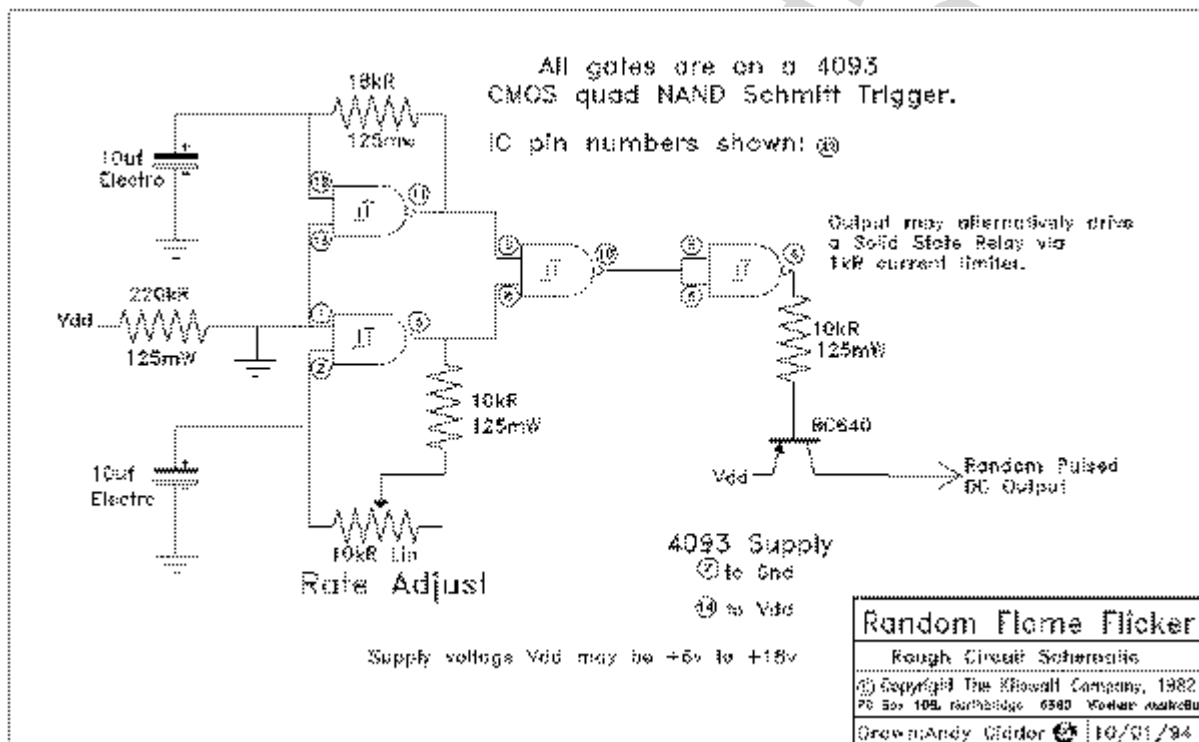
This circuit is the Asynchronous Lamp Flicker (ALF). It was designed by Scott Rider in 1996, posted at Don Bertino's site "<http://www.calweb.com/~bertino/halloween.html>", and sent to the Halloween-L mailing list.

The salient points of this design are:

- Intended to drive 110 VAC lamps.
- It drives two separate incandescent lamps, each with a different frequency of triangle wave. Although each lamp by itself undergoes a simple repetitive cycle, the light output is optically mixed to form a longer cycle.
- It's rather complex.
- All the work spent on the triangle-wave generators is lost when the signal is clipped to a square wave.

Technique - Kilowatt Company

This circuit is dated 1994. It claims to be drawn by Andy Ciddor for The Kilowatt Company.

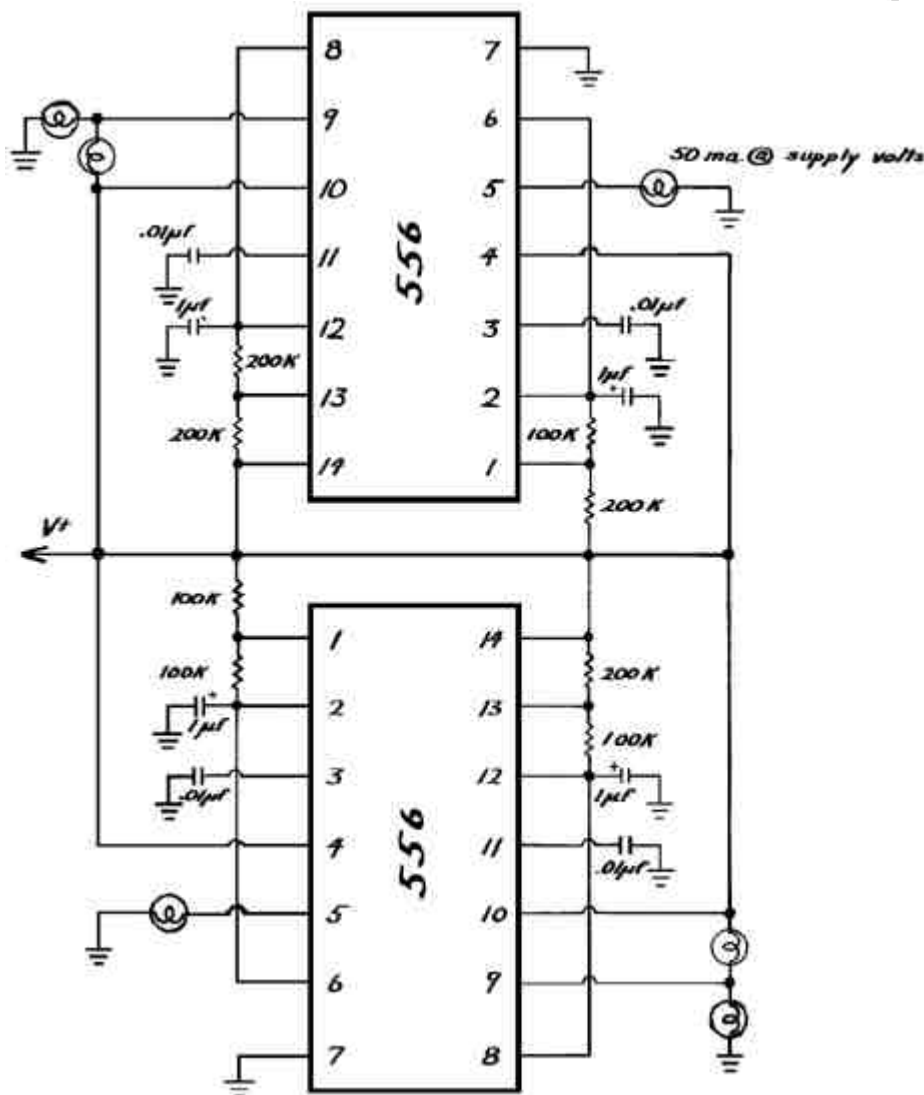


The salient points of this design are:

- This design is intended for use on battery power.
- It's short and sweet.
- Like the ALF, there are two oscillators. But the two frequencies are mixed before being used to drive a lamp, not after.
- It doesn't bother with fancy triangle waves, since the waveform would be clipped to a square wave anyway.
- It's broken, and will do nothing as shown. Pins 1 and 13 of the IC are shown going to ground with a pullup resistor. The ground connection is wrong. It just wants the pullup.

Technique - Theatre Crafts Hot How Tos

This circuit comes from Theatre Crafts Hot How Tos, and is dated 1995.

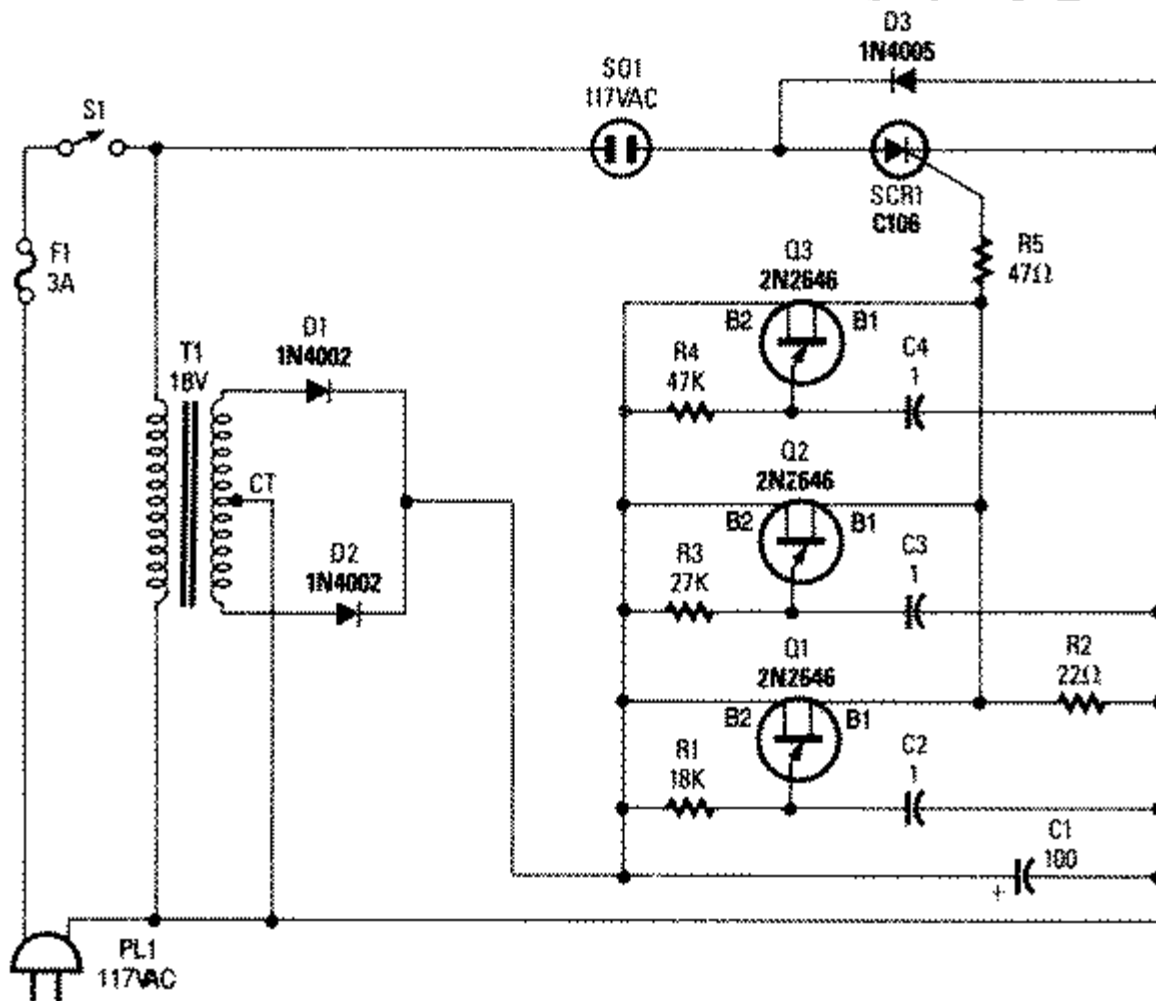


The salient points of this design are:

- This design is intended for use on battery power.
- This unit has four independent square-wave oscillators.
- The oscillators directly drive four lamps. Two additional lamps are driven with the compliment of two waveforms.
- Like the ALF, the output of the lamps are optically mixed. Looking at just one lamp would show a rather boring on-and-off pattern.

Technique - UJT

This circuit comes from the Encyclopedia of Electronic Circuits vol 4, by Graf and Sheets, pg 183. They got it from Popular Electronics magazine.



The salient points of this design are:

- This design is intended for use on 110 VAC.
- This unit has three independent oscillators.
- The output of the oscillators is electrically mixed, and used to drive a single lamp.

Technique - Multiple Strands Of Flashing Christmas Lights

Take a couple of strands of flashing Christmas tree lights and mix them all together. Shove them inside something or under logs for a fake fire.

This works because each strand flashes at a different rate, and the flashes from the multiple strings are optically mixed together.

The salient points of this design are:

- This design is intended for use on 110 VAC.
- Each string has numerous lights in it. If you don't need all that light, you will have to hide it.
- You can make the light any color you like by mixing and matching colored bulbs.

Technique - Christmas Twinkle Lights

You can buy Christmas light sets that are advertised to "twinkle".

These are strings of incandescent lamps, where every 5th lamp (more or less) uses a bimetallic element to flash itself. Since each flashing lamp is independent of all the others, they flash at different rates.

You can take a strand of these and shove it inside something or under logs for a fake fire.

This works because each lamp flashes at a different rate, and the flashes from the multiple strings are optically mixed together.

The salient points of this design are:

- This design is intended for use on 110 VAC.
- Each string has numerous lights in it. If you don't need all that light, you will have to hide it.

Here is a string of twinkling Christmas lights bought at Big Lots for \$3.50 [October 2006].



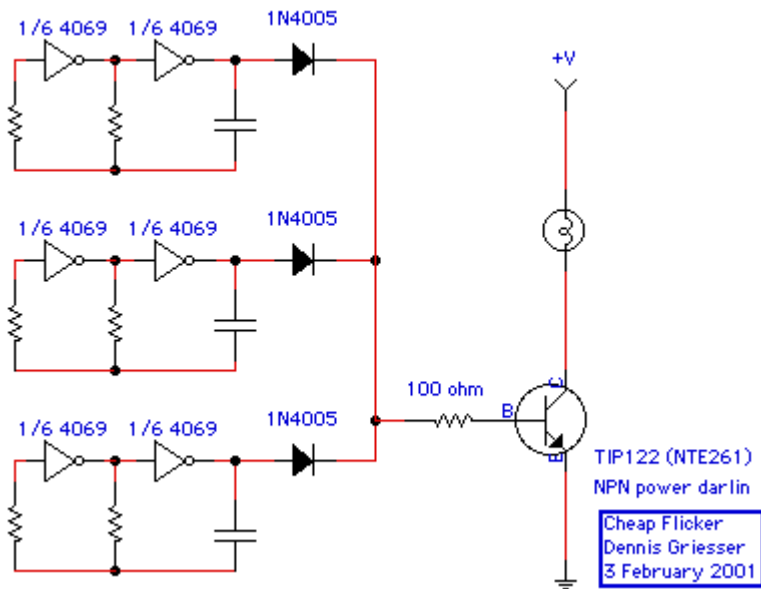
Front of the box.



Back of the box.

Technique - Wolfstone cheap flicker

This circuit is *untested*. Dennis doodled it up as a demonstration of how to pack a lot of oscillators into a single, small, inexpensive chip. Component values can be found in the 4069 page of any good CMOS data book.



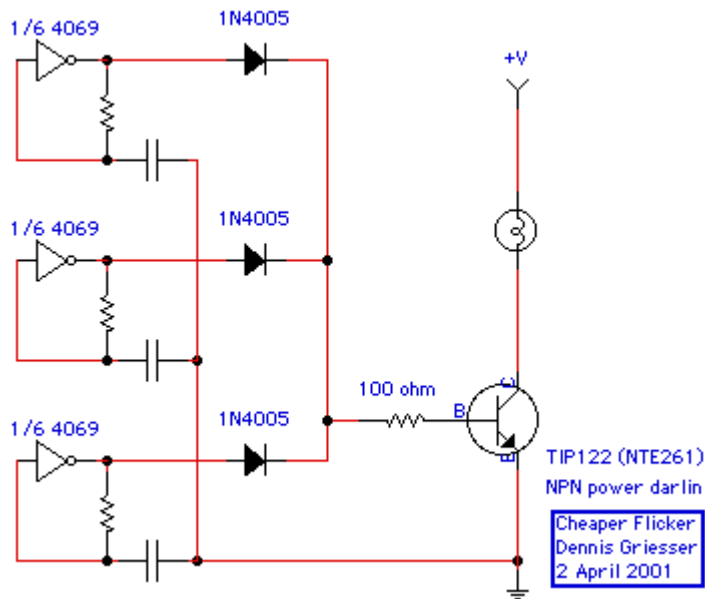
The salient points of this design are:

- This design is intended for use on low voltage DC.
- This unit has three independent oscillators.
- The output of the oscillators is electrically mixed, and used to drive a single lamp.
- A single, inexpensive 4069 chip provides all three oscillators.

Technique - Wolfstone cheaper flicker

This circuit is another *untested* Dennis exercise in packing a lot of oscillators into a single, small, inexpensive chip.

The gates should oscillate with resistor values between 47K and 220K and capacitors between .1-10uF. Getting it to oscillate at a frequency suitable for flicker is your job.



The salient points of this design are:

- This design is intended for use on low voltage DC.
- This unit has three independent oscillators.
- The output of the oscillators is electrically mixed, and used to drive a single lamp.
- A single, inexpensive 4069 chip provides all three oscillators. Half of the 4069 is left, which can be used for other purposes, such as more oscillators.

Technique - Wolfstone eyes

Years ago (roughly 1990), in making a Halloween costume for The Termintor, I decided to tape one eye shut and stuff in a bunch of flickering lights. I spent a lot of time trying to figure out a tiny multiple LED flasher circuit, and suddenly realized that the smallest flasher was the one built into the package of certain specialty LEDs.



A few year later, I did the same thing, mounting a dozen self-flashing light emitting diodes (LEDs) (some yellow, some green) behind a faceted plastic "gem" and used them as eyes for a dragon mask. The same eyes were later removed and used in the giant spider.

The salient points of this design are:

- This design is intended for use on low voltage DC.
- This unit has as many independent oscillators as there are LEDs.
- The solution scales well: you can make it as large as you want, just by adding more LEDs.
- The output of the oscillators is optically mixed. Having a diffuser or other textured lens on the output helps mix the light.

Technique - Lemax Miniature Fire

Lemax makes a line of miniature houses and figures, most of which are intended for Christmas decorations. One of their products is called "All Together Now!" and consists of several figures singing around a fire in a trash can.



The plastic flame appears to contain three LEDs. The center LED is on all the time and is probably yellow. LEDs on either side of that one alternate back and forth. These alternating LEDs have a decided greenish color for no reason that I know.

The alternating back and forth is not abrupt. It is more like one fades in as the other fades out.

The salient points of this design are:

- This design is intended for use on low voltage DC and is powered by two AA cells.
- This unit appears to have a single oscillator that alternately drives two LEDs.
- The output of the alternating LEDs is optically mixed. The plastic flame acts as a diffuser on the output helps mix the light.

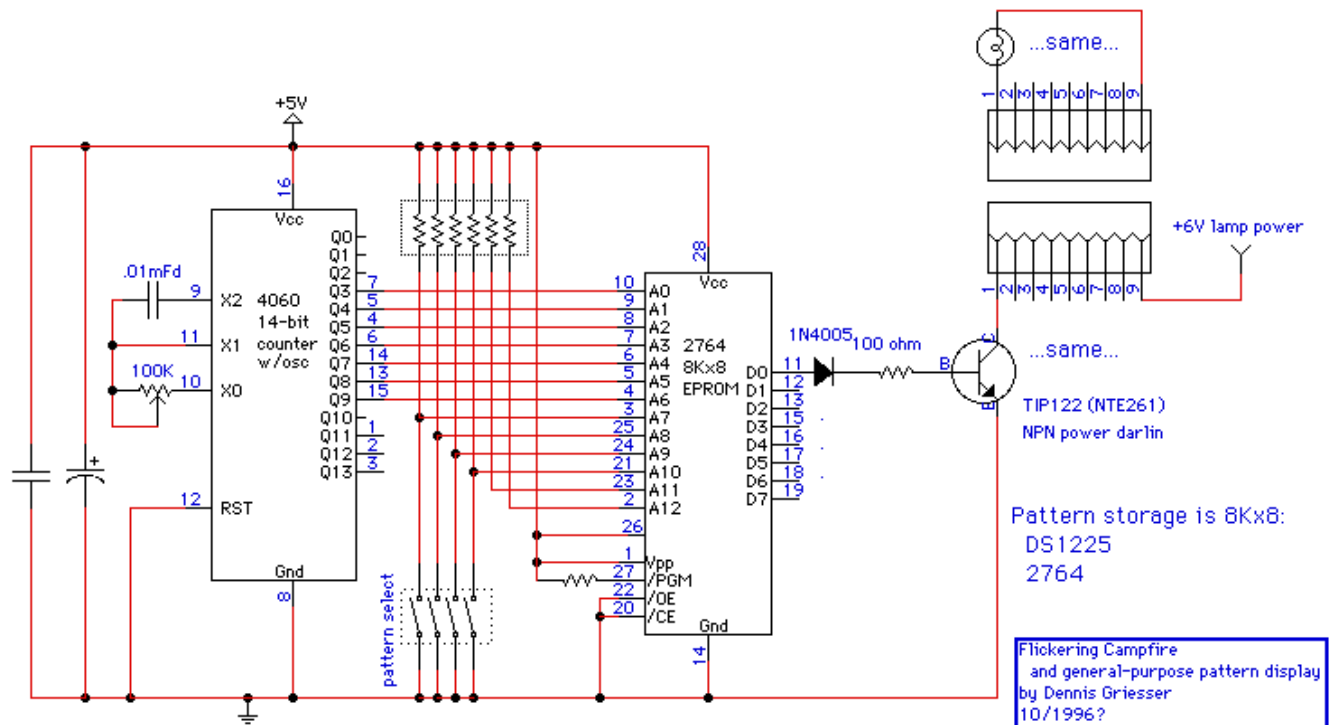
Digital sequences

This class of techniques uses digital logic to generate or replay pseudorandom sequences.

Technique - Wolfstone fake fire

This circuit was designed by Dennis for use as a fake campfire. It dates from approximately 1996.

This device uses true random numbers, pre-computed and stored in a memory chip for later replay.



The salient points of this design are:

- This design is intended for use on battery power.
- It simultaneously drives eight output lamps with different intensities.
- Each lamp is driven by a binary signal - it is either on or off. But the clock rate is high, resulting in pulse-width modulation of the filament to produce different intensities.
- The unit is actually more than a flicker generator. It is a general-purpose device for the display of moving light patterns. The memory chip contains several patterns, flicker being only one of them, which can be selected via switch.

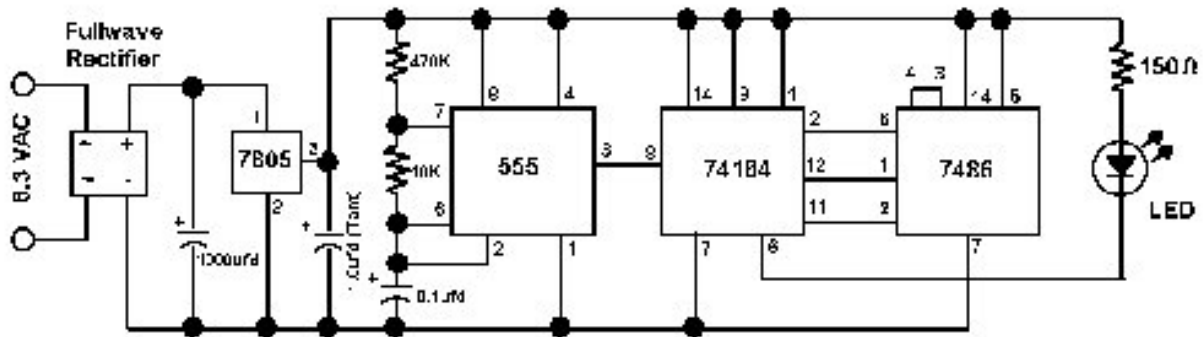
Technique - Miller's fake fire

This circuit was designed by Fred Miller, for use with model trains. His full construction project article appeared in Model Railroading Magazine, January/February 2000 (Volume 30, Number 1), with a correction in the Feb/March issue.

The device uses a shift-register with XOR'ed feedback (linear feedback shift register) to construct long pseudorandom sequences.

Campfire Flicker

Random Noise Generator Driving LED

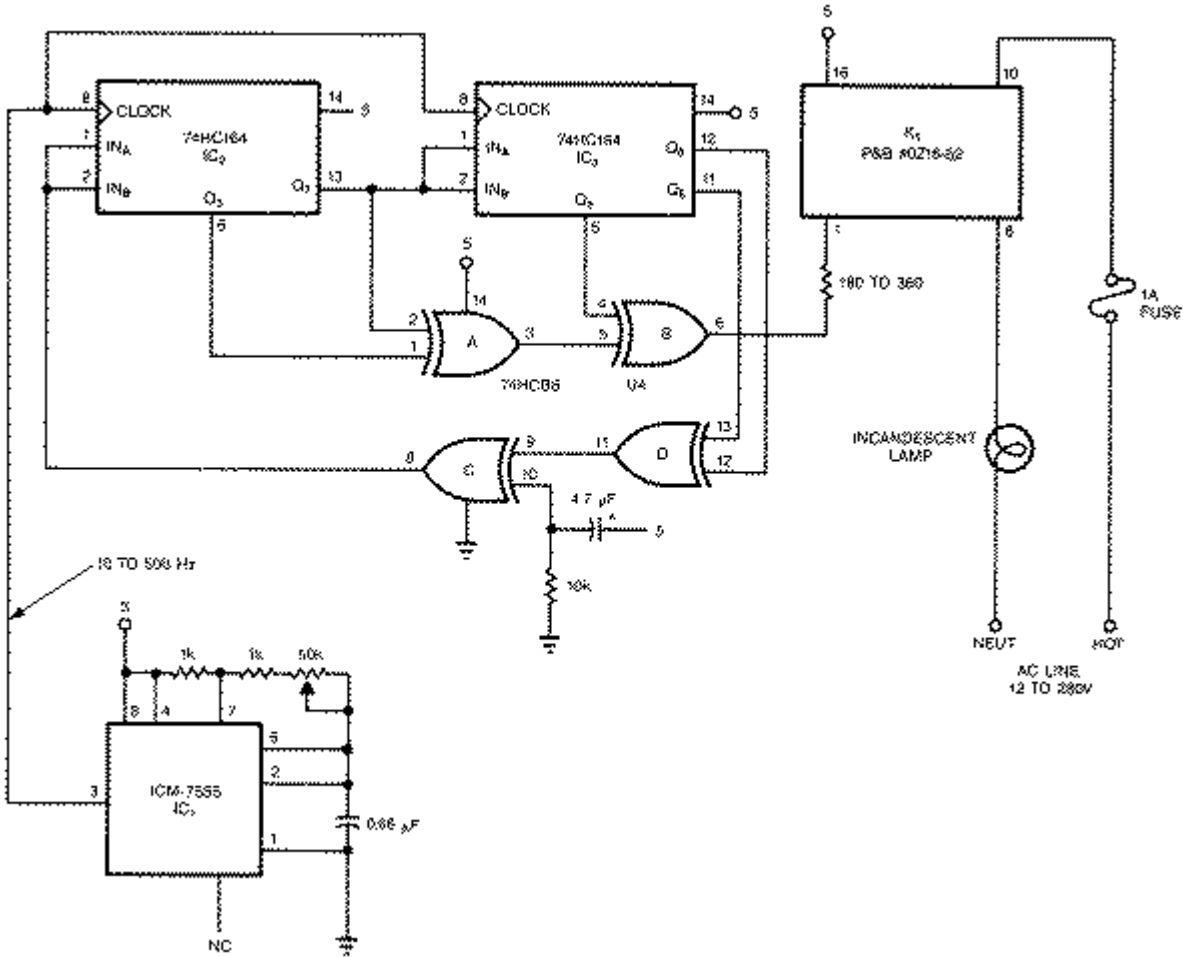


The salient points of this design are:

- This design is intended for use on low-voltage AC. It could easily run on battery power.
- It drives a single LED.
- The pseudo-random sequence is 127 bits long.
- There is no mechanism to make sure the shift register starts up with nonzero contents. This means that, every once in a long while, the unit won't work at all.
- The LED lamp is driven by a binary signal - it is either on or off.

Technique - LFSR

This circuit comes from the Encyclopedia of Electronic Circuits vol 4, by Graf and Sheets, pg 179. They got it from EDN magazine.



The salient points of this design are:

- This design is intended to drive a 110 VAC lamp. The logic requires a low DC voltage.
- Like Miller's fake fire, this circuit uses a Linear Feedback Shift Register (LFSR) to generate a pseudorandom sequence. But this LFSR has 15 stages, for a sequence 32,767 bits long.
- XOR gates A and B are intended to further randomize the output. I doubt this is necessary.
- Note the RC circuit on the input of XOR C. This makes sure the shift register starts up with nonzero contents.
- The lamp is driven by a binary signal - it is either on or off. {if that solid-state relay contains zero-crossing circuitry}

Mechanical flicker

This class of techniques uses mechanical means to create flicker, usually by moving things in front of the light source.

Technique - Silk

The mechanical moving-fabric flame has been around a long time. Disney used orange lights on a fan-blown sheet of plastic to simulate leaping flames in some of their rides.

We have additional information on silk torches. There are numerous commercial silk torches available.



This is a "Diablo" Flame Machine by [Antari](#).

It uses 3 tiny halogen lights (2-amber and 1-blue), a fan and a silk cloth. There is no cycle time so you can run the unit as long as you like. Wall mount brackets are available. Dimensions (mm) 236.6 x 189.2 x 150 Weight 4.5kg. Gross Power: AC 120v/60Hz Fuse F2A/20v

From the photo, the flame effect looks quite nice. But the choice of a rectangular metallic case looks distressingly like a flaming toaster.

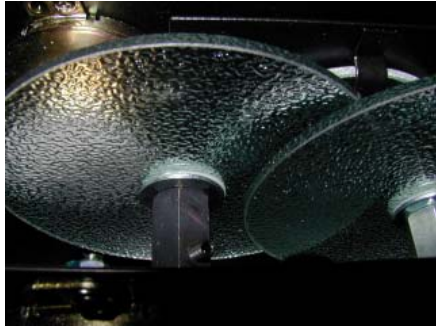
The salient points of this design are:

- This design is intended for use on 110 VAC. You could probably build one that runs on battery power, but the combination of fan and lamps make this design a power-hog.
- The lights are on all the time. The fan blows around a piece of silk, which flaps in front of the light.
- A cheap alternative to buying new silk, is to pick up a white silk scarf at a garage sale or thrift store.

Technique - Rotating hammered glass

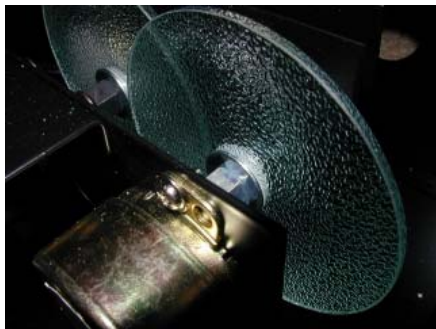
Here are two pictures of the inside of an [ADJ](#) H2O unit. It is intended to produce a rippling water effect, but can also change colors while doing so. If you set it for orange, yellow, or red, you can make a nice shimmering bed of embers.

I have one of these units are really like it. They have a DMX-controlled version, too.



The light is projected through two counter-rotating plates of hammered glass.

One plate twists the light one way, the other plate twists it the other way. The result is a smooth rippling.



The plates rotate fairly slowly, presenting a sequence that is so long that you can't really tell when it repeats.

The salient points of this design are:

- This particular implementation runs on 110 VAC. You could use the technique to build something different.
- The rippling effect is gentle, probably due to the particular pattern on the glass. It isn't well suited for big leaping flames. It should do well as a bed of glowing embers.

Technique - Gobos

A "gobo" is a piece of flat metal with a design cut into it. Some gobos are made from high-temperature glass with the pattern painted on. When focused light is projected through the gobo, it casts a patterned shadow.

You can easily get gobos with flame patterns on them.

Great American Market (GAM) #353 - Flame

Web site: "<http://www.gamonline.com>"



©1998 GAM PRODUCTS INC.

The salient points of this design are:

- Projecting through a gobo gives the *shape* of flames, but none of the flicker or motion. It's static.
- You might want some kind of color filter, too.

Technique - Rotating gobos

By itself, a [gobo](#) is static. It gives you the symbolism of flame, but is not convincing. This can be improved with a "gobo rotator".

With a rotator, you project light through two patterns. One pattern stays in position, and gives the shape of the flames. The other gobo spins around on its center axis, like the hands of a clock. By exposing and obscuring the shape gobo, this one give a feeling of motion.



This is a Rosco Gobo Rotator. It is available with many motor options: 12V DC variable speed 0-9 RPM (forward and reverse), AC 1 RPM, AC 2 RPM, AC 5 RPM, and 10 RPM.

The salient points of this design are:

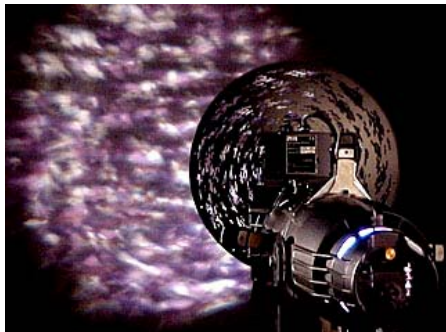
- Compared to some other designs, the gobo rotator is compact.
- You must carefully select the pattern for the rotating gobo, so that it gives the effect that you want.
- The rotating gobo is the same size as the stationary one. Unlike the effects wheel, all of the rotating gobo is used at all times.
- If you pay close attention to the projected image, you can tell that rotation is going on.
- You might want some kind of color filter, too.

Technique - Animation effects wheel

The animation effects wheel is somewhat like a giant gobo rotator. Compared to the gobo rotator, the animation wheel is huge - and only a small portion of it is used at any given time to project the image.



This is one of many Rosco effects wheels. The discs are stainless steel discs, 16.5" (42 cm) in diameter



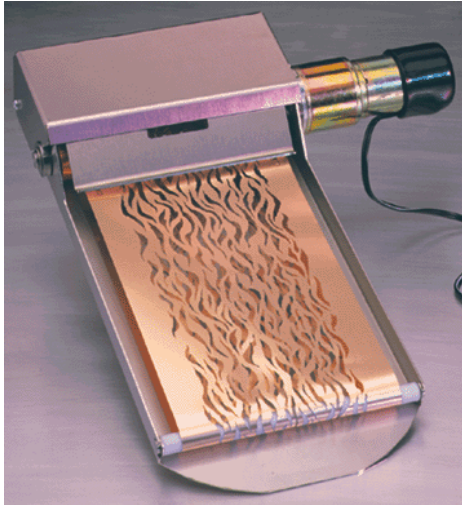
This is the Rosco Animation Effects System in action.

Depending on the choice of gobo and animation wheel, you can make effects for fire, water or whispering leaves.

The salient points of this design are:

- The animation effects wheel is huge.
- Since only a portion of the wheel is used at any given time, you get a longer sequence, with more random-seeming effect.
- The large size of the wheel gives an effect that is closer to linear motion than to rotation.
- You might want some kind of color filter, too.

Technique - Scrolling strips



The [effects wheel](#) uses a rotating pattern. An alternative uses a patterned strip that moves linearly.

This is the GAM Film/FX.

It uses a metal or polyester film loop. With a fixed speed, it costs \$595.00; a speed control knob is \$50 more. They have a DMX-controlled version, too.

Web site: "<http://www.gamonline.com/catalog/filmfx>"

The salient points of this design are:

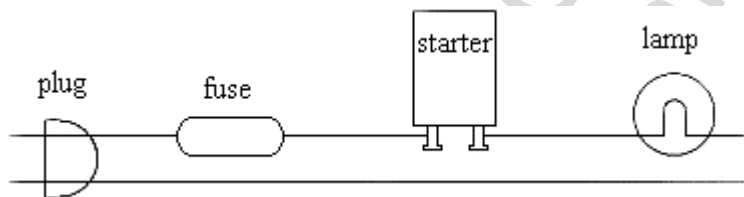
- The pure linear motion makes it well-suited for clouds, snow, rain and fire.

Thermal flicker

This class of techniques uses thermal means to create flicker, usually by turning lights on and off.

Technique - Fluorescent lamp starter

This is a classic. I have seen numerous versions. You just put a fluorescent starter in series with a 110 VAC incandescent lamp.



It's so simple, you don't really need a schematic, but if you're sweating this, here you go.

The starter can be built into a lamp fixture, put in a junction box, or spliced into an extension cord. It's a good idea to put a slow-blow fuse in series with the starter.

The key to getting this to work is picking the correct model of fluorescent starter to match your incandescent lamp load. This can be tricky - if they don't match, the flicker is poor or doesn't happen at all.

Despite the importance of matching starter to load, most of the web sites describing this effect don't tell you about that. Here is a summary of some sites with fluorescent starter flicker projects:

NAME	WEB SITE	STARTER	LOAD
Tomi Engdahl	http://www.hut.fi/Misc/Electronics/circuits/simpleflasher.html	starter for 4-60W fluorescent tubes	lamp of 5-40W
Bill C. Roberts	http://www.dctheatre.com/HowTo3.htm		40 to 60-watt incandescent lamp
	http://www.showtec.demon.co.uk/theatre/technical/fire.html		40 to 60-watt incandescent lamp
Phil Tucker	http://www.phantasmechanics.com/fpilot.html		up to 50 Watts of lights
Leigh Graham	http://fp.miranda.f9.co.uk/infoweb/spec_fx_1.html		60 to 100 watt lamp
stagecraft/faq	http://www.landfield.com/faqs/theatre/stagecraft/faq/section-19.html		lamp 40 or 60 Watts
Brian Walsh	http://www.hiddenmickeys.org/Disney/Imagineering/TunnellLamps.html	fifteen to thirty-five watt range	less than 50 watts
John J.	mrscary@kiva.net	4W up to 25W; good: 4, 6, 8W or 15-20W	45W bulb

dmx512.com	http://www.dmx512.com/web/light/diy/flikfire/flikfire.htm	6W to 8W	40W bulb
Jim Kadel	http://home.rica.net/jimk/help/flicker.gif	FS-2, max 20W	7W bulb
Baron Dremel Von Glue-Gun	http://hometown.aol.com/hauntscapecsd/ProjectsPage2.html	FS-2 (14, 15, 20 watt) or FS-5 (4, 6, 8 watt)	max 40W bulb
PropMaster		FS-5	
GrimShady			at least 40W

Some folks report good results with FS-2 & FS-5. *Avoid FS-4.* Again, the key is matching the fluorescent starter with your incandescent lamp load.

How does it work? The starter contains a tiny bimetallic thermostat element, and a capacitor in parallel. When used in a fluorescent lamp, it works like this:

- You turn on the cold lamp. The thermostat is cold, and its switch is closed.
- Current flows through the thermostat, and warms the lamp's heater filaments, which are connected in series with the starter between them.
- After a few seconds, the current draw heats up the thermostat and it opens up. This opens the heater circuit, which was shorting out the two ends of the lamp. Now the ends of the lamp are hot, and voltage is applied across the lamp, so the arc is easy to strike - the lamp lights up.
- If we let the starter cool down, the thermostat would eventually close and the heaters would short out the lamp again. But that doesn't happen because the heaters continue to draw a little current through the capacitor in parallel with the thermostat. Some of the power is lost in the capacitor and it turns into heat that keeps the thermostat open.

In a flicker circuit, it works in a similar fashion:

- If you draw enough current, the starter heats up and the thermostat opens.
- Then current is no longer being drawn, the thermostat cools down, and the switch closes again.
- open, close, open, close = flicker

Notes:

The capacitor will allow some current flow even when the thermostat is open. If your load is too heavy, the current drawn through the capacitor will cause the thermostat to stay open. If this is the case, the lamp will flash on brightly, then dim down and stay at that level all the time.

- If your load is too small, the current drawn through the starter will not be enough to heat it up and open the thermostat. If this is the case, the lamp will go on and stay on at the same level all the time.
- In order to make this work, your load has to draw enough current so that the starter will heat up, but not so much that the capacitor will keep it hot. Which is why the circuit is a little finicky.
- The starter will wear out after a while. It is a mechanical switch, opening and closing rapidly.
- Do *not* use a dimmer with this flicker unit. There have been numerous reports on the various Halloween mailing lists of folks who used a dimmer with this circuit, and it stopped flickering after a while. Turning the dimmer up a little brought back the flicker, but it would stop later. After a few hours, the dimmer was all the way up and no flicker.

The salient points of this design are:

- This design is intended for use on 110 VAC, and is not suitable for battery power.
- It drives one or more 110 VAC incandescent lamps.
- The flicker generation abuses the bimetalic element in the starter and gives it a short lifetime.
- The flicker is binary on-or-off, with a fairly long time-constant, so doesn't make a convincing fire by itself. If you put two or three of these together with a lamp that is on all the time, it could be good. Web sites dm512.com and showtec.demon.co.uk do this.

Using a fluorescent starter for flicker abuses the bimetalic element, and it will fail earlier than the manufacturer intended. I don't have any information on how long the starter will last, but the best plan is to have spares nearby and make it easy to replace the starter (put it in a socket). Beware soldering to a fluorescent starter - not only will it be hard to replace later, but you might damage the starter.



It is often difficult to find sockets for fluorescent starters. Here are some resources:

- Leviton - A gentleman gave me this sample at CalHaunts. It has a price tag from B&B Hardware for \$2.98 [March 2005].

[Orchard Supply Hardware](#)

Here are the label markings:

- maker: Leviton
- 259B
- Starter Switch
- 005-380
- UPC barcode: 0-78477-12076-7



- [http://www.damarww.com/product.asp?sub=33&dep=Starter%20Sockets\[T\]=00930A](http://www.damarww.com/product.asp?sub=33&dep=Starter%20Sockets[T]=00930A)
- Item#: 00930A
- Industry Desc.: 125T
- Finish: White
- Diameter: 1.25 in. (31.75 mm.)
- OSH - This is the starter base used by Baron Dremel Von Glue-Gun on his web site (<http://hometown.aol.com/jssherrard/HalloweenProjects.html> and <http://hometown.aol.com/hauntscapecd/ProjectsPage2.html>). He found it at Orchard Supply Hardware.



Obtained from
Omarshauntedtrail.com

Flicker bulbs

Some bulbs don't really flicker, but are shaped and/or colored to give the illusion of flame.

Technique - Non-flicker painted bulbs



This lamp has a glass envelope shaped like a flame and suitable paint.

The package says "Darice", and was found at Jo-Ann fabrics, circa 2002, in a blister pack of two.

It is intended for electric candles: 110 VAC, 7W candelabra base.

There are two kinds of light bulbs easily available that flicker by themselves. Just screw them in and they flicker.

Technique - Neon flicker bulb



This flicker bulb is actually a small gas-discharge tube, filled with neon gas. The envelope of such bulbs is usually flame-shaped. Looking closer, you can see inside, where the filament of an incandescent lamp would be, a pair of flat parallel plates, cut out in the shape of a flame.

These lamps are available with standard-sized screw bases, and smaller candelabra bases, but in all cases, the actual light-up part is small. They are usually rated at 3 Watts and and down.

When energized by 110 VAC, the lamp lights with a characteristic orange neon glow, with the light dancing on the surface of the plates.



Larger neon flicker lamps are likely to be found at home improvement stores, like [Home Depot](#).

This blister pack of two small lamps came from Jo-Ann fabrics, circa 2002.

The salient points of this design are:

- This design is intended for use on 110 VAC, and is not suitable for battery power.
- The flickering light inside the lamp has a distinct orange color, characteristic of neon. The color is very un-candle-like.

Technique - Incandescent flicker bulb

This flicker bulb is an incandescent bulb, with a flexible oversize filament looping over a small bar magnet. The envelopes tend to be spherical, large, and brightly colored.

When energized by 110 VAC, the filament moves around, jumping back and forth around the magnet.

The flickering of this lamp is rather frantic, and doesn't look much like flame to me, but you might find use for it.

These lamps are likely to be found at party stores, like Spencer Gifts.

The salient points of this design are:

- This design is intended for use on 110 VAC, and is not suitable for battery power.

Color organ

A color organ flashes a light in proportion to the loudness of sound that is fed in to it. We have a lot of color organ info.

If the color organ is fed by sound that is fairly random, such as static from a radio, it can cause whatever light you plug into it to flicker.

A large, AC-operated color organ could produce flicker in numerous incandescent lamps plugged in to it. By using a multichannel color organ, you get adjacent bulbs to flicker differently - it's a bummer when all of your "candles" flicker in synchronization. You can carry this to extremes by installing a centrally located multichannel color organ, with cables running throughout the haunt, that can be tapped whenever you need flicker.

Following are a few simple and small flicker circuits, based on color organ principles.

Technique - Audio into grain-of-wheat bulb

The folks at "<http://www.fantasonics.com/TracksDocs/Lanterns.html>" are concerned about tiny flicker circuits to illuminate model train layouts. They offer several circuits based on the concept of using grain-of-wheat incandescent lamps to replace the speakers on audio equipment.



driven straight from the output of a tape player.

They also have a circuit that drives 12-volt bulbs from a higher-powered tape player.

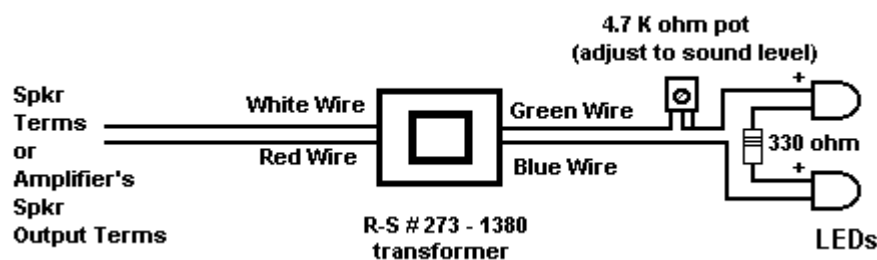
In either case, the randomness is actually a prerecorded series of sounds on the tape player.

The salient points of this design are:

- This design has no power dedicated to the lamps. They derive their power from the cassette player, which may run on batteries or 110 VAC.

Technique - Audio into LED

Jim Kadel of Haunt Master Products once suggested a minimal color-organ circuit to drive LEDs from an audio source. The context was glowing eyes for a Flying Crank Ghost. By substituting an endless loop take of random sounds, you can make the LEDs flicker with whatever predetermined pattern you so desire.



You could probably get away without the transformer, but it is a good idea to include it - it provides impedance-matching.

The salient points of this design are:

- This design has no power dedicated to the lamps. They derive their power from the audio system, which may run on batteries or 110 VAC.
- I wouldn't be inclined to do it quite this way - there is nothing to project the LEDs from being reverse-biased. I think that I would build this with the LEDs in parallel, one the reverse of the other.

Technique - Audio into neon lamp

The output of an audio amplifier is of a low voltage. But you can feed it into a transformer, boosting it up to a sufficient voltage to light a neon lamp. This is yet another system that works like a color organ.

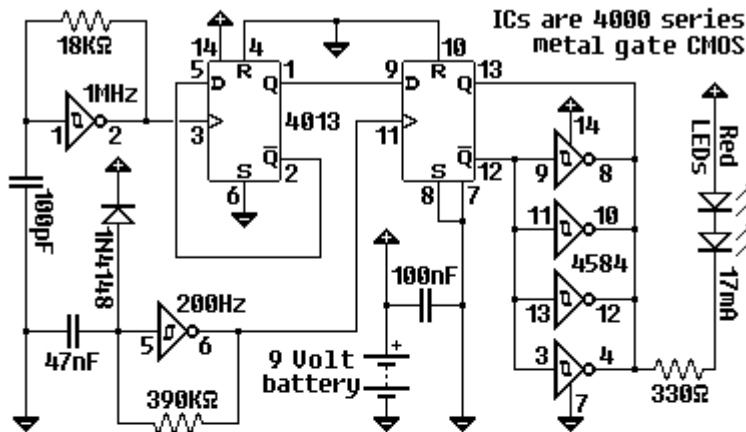
In the 1970s, I used a small audio output transformer, wired backwards, to light NE-2 lamps from a transistor radio.

The May 1992 issue of Model Railroader contains an article by Derek Verner called "How to Simulate Flickering Fires." It used the output of a small transistor radio to drive various light sources: LEDs, incandescent lamps, and an NE-2 lamp via reversed audio output transformer. Derek says this is particularly interesting because the electrodes in the lamp light up alternately as the induced voltage goes from positive to negative.

Around 25 Mar 1998, there was a brief thread on Halloween-L, wherein Jim Fosse described a somewhat larger version. Here are the juicy bits:

...powers neon flicker lamps from a dedicated audio amp. This circuit drives the standard decorative flame neon lamps with a 70.7 volt line transformer. The transformer is RS #32-1031B and costs \$5.95.

Fire Light - LEDs SHIMMER RANDOMLY AS THOUGH ON FIRE



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- 1) The 200Hz oscillator samples the phase noise of the 1MHz oscillator yielding a truly random coin-toss output.
- 2) The ÷2 flip-flop ensures the sampled waveform has a true 50% duty cycle.
- 3) Change the 200Hz oscillator frequency for different effects: 30Hz has more of a flickering effect while 500Hz shows a shimmering effect instead.
- 4) Oscillator freq starts to drop when operating voltage falls below 7VDC.
- 5) To use the circuit below 5 VDC you must use 74HC series CMOS chips to achieve the 1MHz frequency and good strong LED current drive capability.
- 6) Drives LEDs with up to 20mA. Add an output transistor for heavier loads.

They still flicker like they do when powered by the power line but, in addition, they pulse to the beat of the music.

I've run 2 flicker lamps (all I have) off of my 1 watt output radio.

I don't suggest that you use this line for powering speakers unless you really like the '70s fuzz sound. The neons distort the audio quality very badly.

I went up to the attic and bought down 2 strings of C7 neons flicker lamps. I wired up the circuit to my 30W sub woofer amp. I could light all but 4 of the 14 lamps.

You will need an amp with overcurrent limiting to protect the amp from the weird load that the neons present.

My neighbors must have thought I was crazy listening to Toccata in D loud enough to shake the house;) But, you should have seen the lamps!

Phase jitter

Technique - Novotill's Battery Circuit

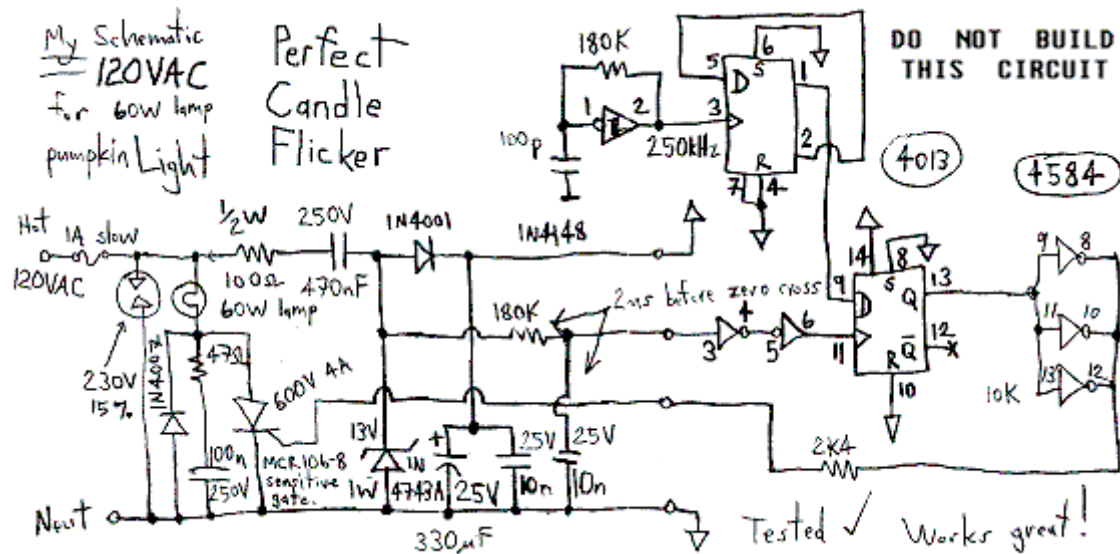
Stepan Novotill (<http://members.shaw.ca/novotill>) has posted a circuit that relies on phase jitter between two independent oscillators. This version is suitable for battery power.

The salient points of this design are:

- Operates on battery power.
- You only get a single channel of flicker.

Technique - Novotill's A.C. Circuit

Stepan Novotill (<http://members.shaw.ca/novotill>) has posted a circuit that relies on phase jitter between two independent oscillators. This version is designed for 110 VAC power, and uses the 60 Hz line as one of the oscillators.



The salient points of this design are:

- This design is intended for use on 110 VAC, and is not suitable for battery power.
- WARNING: This is a hot-chassis design!
- You only get a single channel of flicker.

Other forms of flicker

This is the place where we dump all the stuff that doesn't fit into any other section.

Technique - FlickerPup

In 1998, Doug Ferguson noted that neon flicker bulbs had a nice effect, but were not bright enough. He suggested that a flicker bulb be used to optically drive a photocell attached to a lamp dimmer. Doug called the design FlickerPup, for "flicker puppet".

There is a nice FlickerPup write-up on Doug's Phantasmechanics web site.

Technique - Software

Microprocessors are inexpensive, and one-chip ones such as the PIC series and Atmel can easily be programmed with pseudorandom generators.

The details of this project are beyond the scope of this collection. But I'll scribble some notes that I intend to try:

- You can easily find articles on software to generate pseudorandom numbers.
- If you need a pseudorandom generator that is easily implemented and must fit in tight memory constraints, you might consider a software implementation of a linear feedback shift register.
- Try to set things up so that the user does not get a direct look at the flame. Either use a lamp globe or have the candle wick burned down into the wax. This allows you to use a single incandescent lamp per flame.
- Control the brightness by pulse-width modulation at a clock rate above visual persistence.
- Many single-chip units have built-in PWM generation hardware. Those that lack it can implement it in software. Your development environment probably has a library that does this.
- Use a "drunkard's walk" algorithm to set the amplitude for the PWM.
- Put limits on the walk, so that the lamp averages 75% of the normal power. This should give the lamp a bit of a yellow tinge, and allow headroom so that it can flare up occasionally.

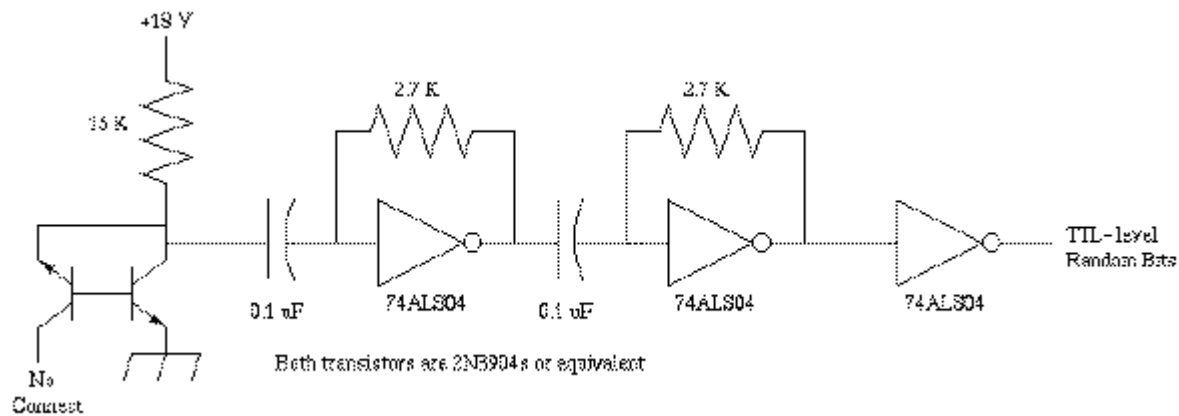
We have a page dedicated to producing flicker with software.

Technique - Analog

There are various sources for analog noise. One fairly common analog noise source is an avalanche diode.

The following circuit comes from "<http://world.std.com/~wware/hw-rng.html>" where it is presented in the context of cryptography.

The circuit is described as follows: "This circuit uses avalanche noise in a reverse-biased PN junction, the emitter-base junction of the first transistor. The second transistor amplifies it. The first two ALS04 inverters are biased into a linear region where they act like op amps, and they amplify it further. The third inverter amplifies it some more, and clips it to TTL levels."



The salient points of this design are:

- This technique only generates a single random bit. It's your job to figure out how to drive lights off of it!