

Assorted ASCII Schematics

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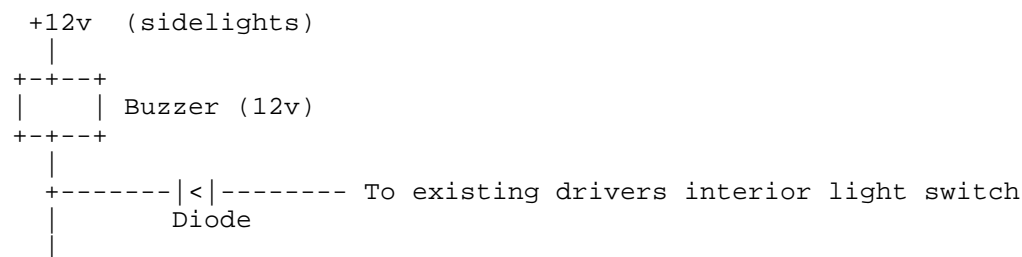
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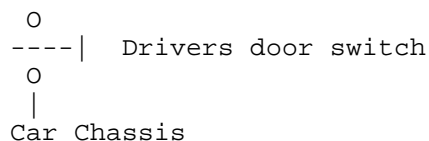
[Document Version: **1.00**] [Last Updated: **12/12/96**]

1. Headlight Reminder Circuit

From: ps10@jet.uk (Paul Simmonds)

A [...] solution is to go from the +12 Switched sidelight feed, via a buzzer to the drivers door light switch, you then need to put a diode in the door circuit to stop the other doors operating the buzzer.





Thus when you leave your lights on **AND** open the drivers door, the buzzer sounds. If you mean to leave your lights on, just shut the door and the buzzer stops!

2. Parallel Port DAC

(From Tomi Engdahl)

Connectors: D25 male

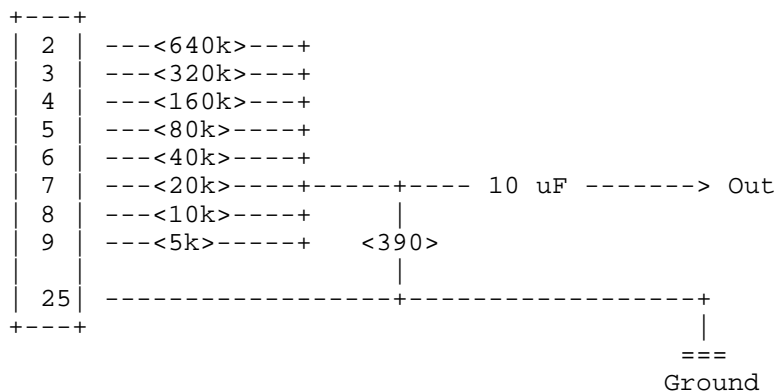
Resistors: 640k,320k,160k,80k,40k,20k,10k,5k,390 (+-1%)

(You can use different values of resistors, but the ratio of the values of the resistors must be same. 0.5, 1, 2, 4, 8, 16, 32, 64 etc.) 1, 2, 4, 8, 16, 32, 64, 128

Capacitor: Electrolytic or solid Tantalum 10 uF 10V

SCHEMATIC

[\(Parallel Port FAQ Reference\)](#)



How to build

Solder all D25 male connector pins to corresponding D25 female connector pins (pin 1 to pin 1 etc) Connect the resistors according the schematic. It is maybe not possible to obtain exact resistor values. If you can't obtain them, try nearest values. <1% deviation is acceptable.

How to use

Connect this circuit to the centronics printer port of your IBM PC or compatible. Connect the printer cable to the D25 female connector of the circuit. Your printer should work correctly with this circuit and you can keep this circuit connected all the time. Connect the sound output to your stereo system. Line in and mic lines are suitable because the output level of this circuit is

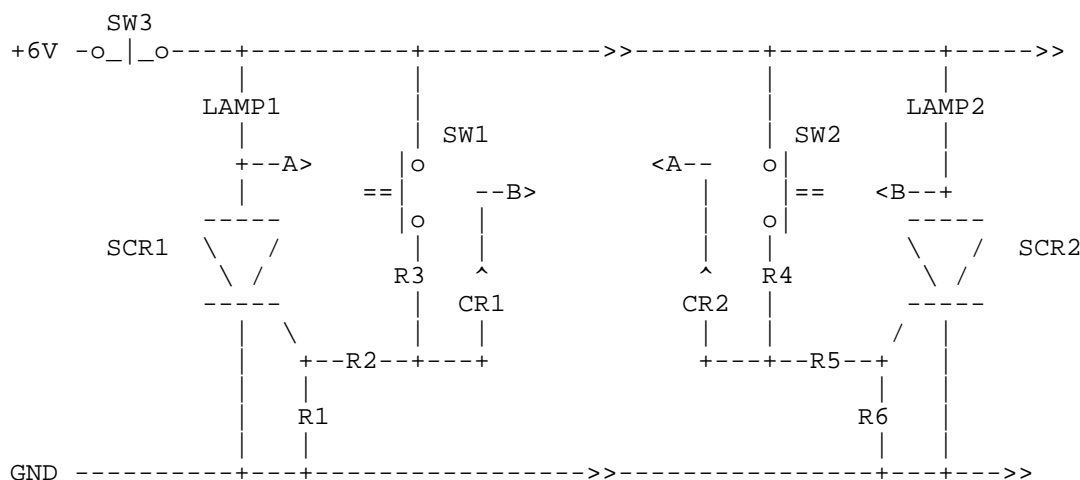
adjustable (about 0-2V PP). The sound quality is very good.

3. Quiz-Show Indicator

From: dthomas@bbx.basis.com (Dave Thomas)

```
"Name something you eat with eggs."  
  -<bzzzzt!>-"Fiberglass."
```

Here's a simple, cheap circuit that will let you conduct your very own quiz shows. It has a lamp and a button for each player. When a button is pressed, it lights that player's lamp and locks out the other button until the circuit is reset.



- SW1,SW2 normally open momentary pushbuttons
- SW3 normally closed momentary pushbutton
- LAMP1, LAMP2 6V incandescent lamps
- R1, R6 470 ohm
- R2,R3,R4,R5 1 K
- SCR1, SCR2 Small SCRs, not power type
- CR1, CR2 1N914 diodes
- + connection
- ^ cathode of a diode
- A> <A-- are connected (jump)
- B> <B-- same deal

Circuit Description

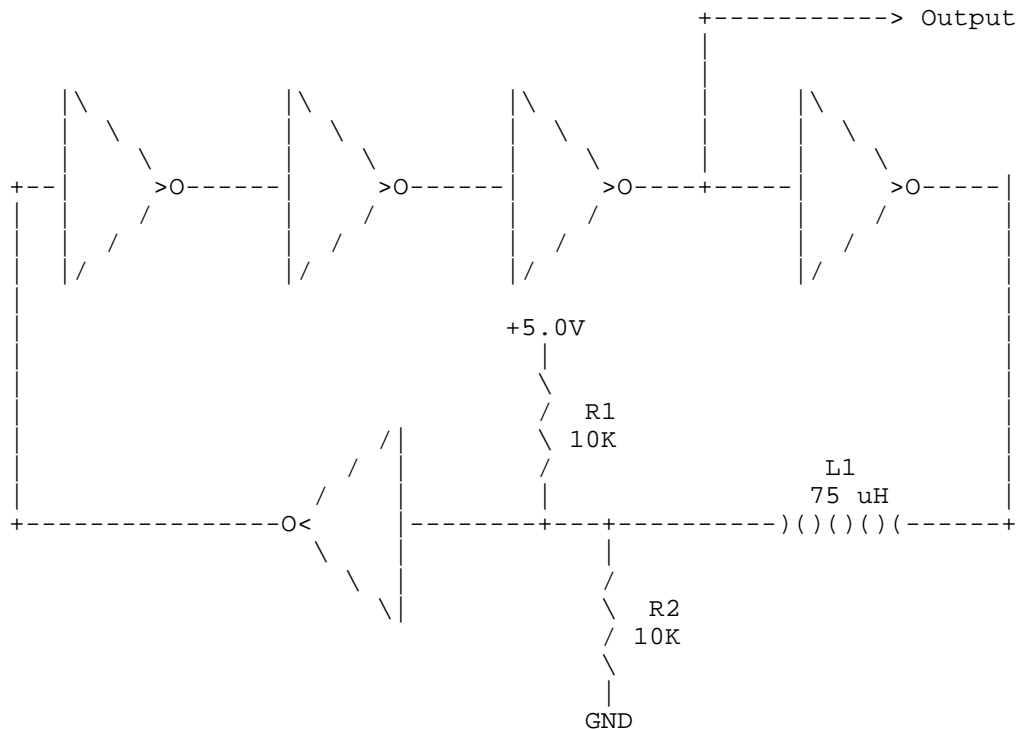
When the circuit is first powered up (or after a reset -- same thing), both SCR gates are held at ground potential by R1 and R6. Therefore, neither SCR will latch up, and both lamps will be off.

When one of SW1 or SW2 is pressed, the corresponding SCR's gate is pulled high, so the SCR latches on. Even if the switch is released, the SCR remains latched, keeping the lamp illuminated.

- > What I am looking for is a low power oscillator (>.5 mA @ 5V)
- > running at a frequency of roughly 1 MHz. However, the frequency-
- > determining component should be an inductor with a value of
- > approx. 75 uH

The circuit below uses a single CMOS lowspeed 74C14 inverting Schmitt trigger chip, your 75uH inductor, and two 10K resistors. It draws about 400uA and oscillates at about 4MHz.

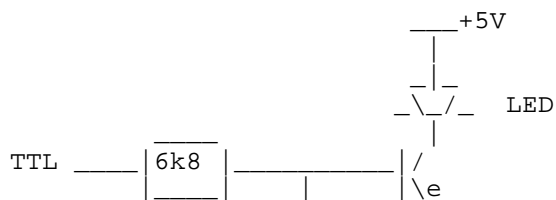
The oscillator period will be approximately linearly related to the inductor value, $Period \approx K1 + (K2 * L)$ [Note also that K1 will not be zero]

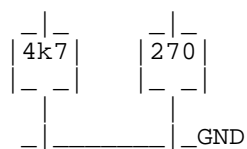


6. Adjustable flashing LED

From: dwg@hpmola.sqf.hp.com (David Grieve)

Use a 555 timer IC as the (resistor controlled) frequency source, choose component values to run at 2 x desired flash rate - get the data sheet for this part, it's pretty comprehensive. Use the output to clock a flip flop (e.g. 74HC74). Feed flip-flop Q and /Q outputs to simple transistor stages, viz...



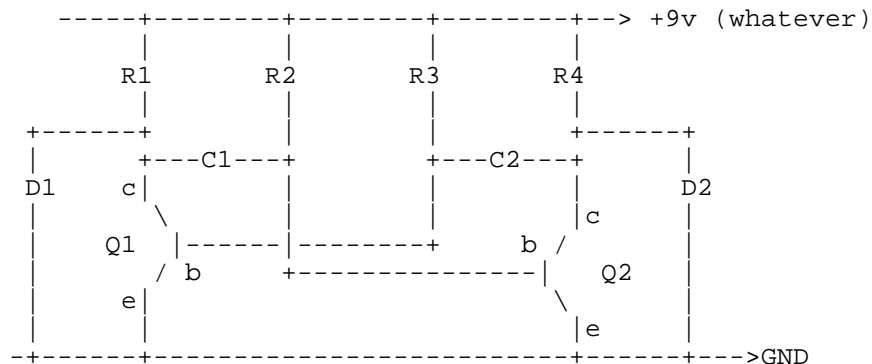


Drive transistor 1 from Q, drive transistor 2 from Q or /Q via a switch. Run the whole thing from +5V. If you want to run it from +9V, no problem, us a 4000 series CMOS flip-flop and change the emitter resistor to 560. If you don't want the hassle of transistors then the ULN2003 darlington driver array could replace the transistor stages.

From: NURDEN1@elaine.ee.und.ac.za (Dale Nurden)

Yes, you do get variable capacitors, but they are usually very low values so they probably won't be much good to you. The easiest way to do this IMO is just a pair of transistors plus 4 resistors and 2 capacitors. I threw one together the other day and it works perfectly. To change the flash rates, you just change two resistor values (one for each LED). To make both LEDs flash together, you would your switch to switch them in parallel.

The circuit is called a **monostable multivibrator** (should find one in a good elementary electronics book), and goes something like this (drawn from memory, so don't count on it being 100% error free):



- Q1, Q2 ... anything NPN : BC108, 2N2222, etc
- R1, R4 ... 1k0
- R2, R3 ... 10k0
- C1, C2 ... 10uF
- D1, D2 ... Your LEDs

I think it is R2 and R3 that you vary to change the frequency, but you can just fiddle a bit to figure it out. Also, the capacitor values will also affect the frequency. If this doesn't work this way round, then try swapping the values of R1 and R2, and R3 and R4. I can never remember which way round they go - I always do it by trial and error.

7. LED Display controller

From: byron@cc.gatech.edu (Byron A Jeff)

driver circuitry. Since it has a built in serial port it could have messages downloaded to it through from a PC through an RS-232 link.

+

8. Info on CO2 lasers wanted (ho hum)

(From Wouter Slegers)

I'd like to get some info CO2-lasers... I read the following on a BBS.. If anyone has a sequel on this, please email it to me:

Supreme 7 (S7) Productions proudly present....
Palm Beach BB Uk - (0303) 265979

LASER WEAPONRY / PART 1 / LASER SIGHTS

by The Deceptor and Flip

WELCOME!.....To part 1 of LASER WEAPONRY - to be included in each issue of ELEKTRIX. This first tutorial deals with building your own laser sights as seen in films such as 'THE TERMINATOR' and actually used by US military and UK M.O.D. for such weapons as ANTI-TANK GUNS, APRLs and other high- power military weapons. The type of sights mentioned here can be strapped onto the barrel/tube and provide perfect targetting - also phreaks people out if you walk down the street pointing the beam at people.

NOTES:

- The laser used is a helium-neon one which emits a bright red beam.
- Pointing it in someone's eyes will probably blind them so be careful with where you point it - unless ofcourse you intend to do damage (!)
- It can't burn skin or paper or anything - it's only really useful in this case as laser sights - although in future issues I others will explain how you can use it for Data Snooping.
- Total project cost is about 40 quid.

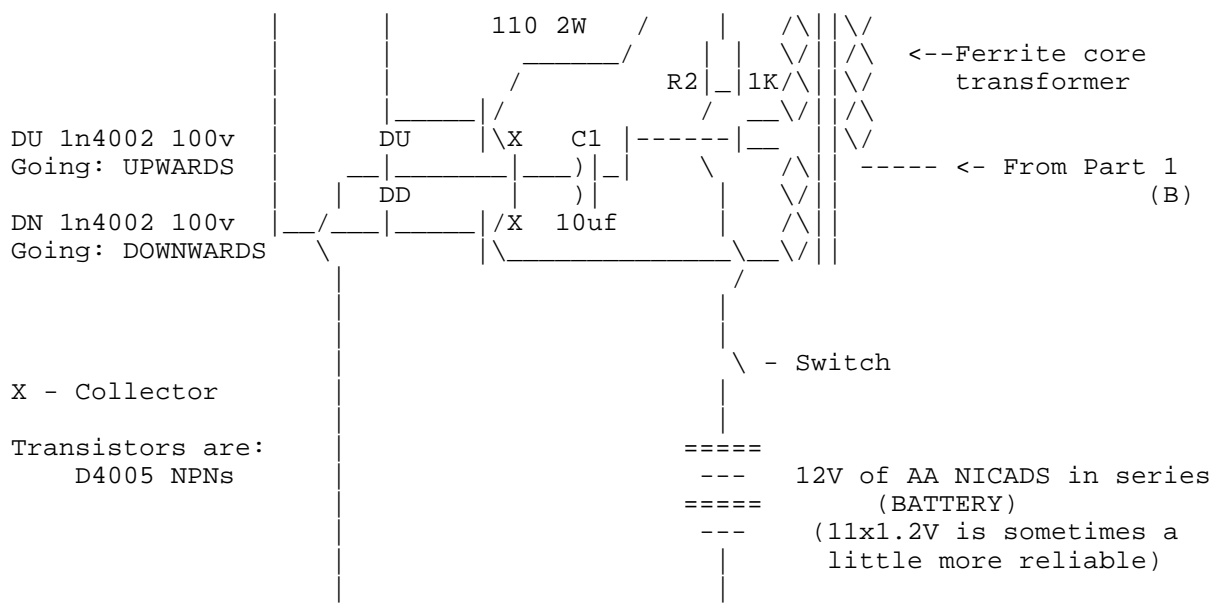
WHAT YOU NEED:

- A Helium-Neon laser tube.
- A portable power supply (easily transformed into a backpack)

A fairly decent tube can be obtained from BULL ELECTRICAL for about 25 quid

J&N BULL ELECTRICAL
250 PORTLAND ROAD
HOVE, BRIGHTON
SUSSEX BN3 5QT

The specs. of the JN BULL tube are as follows:



I hope people understand those schematics - TXT files make life so hard!...

If you can't understand something then contacts us at Palm Beach and we'll send u a photocopy of our own docs if you like (fax optional).

Use:

Strap the tube (maybe put it in a protective casing too) to the barrel/tube and then FIRE AWAY!!!!

If you point it at someones eyes or your own then you/they can say goodbye to them for good.

Phun with your tube:

As well as being GR8 for sights you can use it for other things:

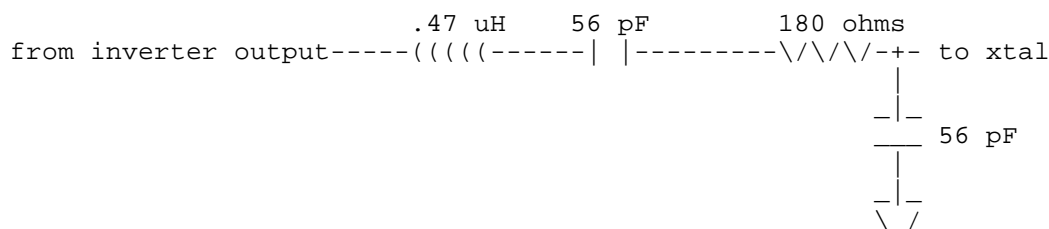
- Shine it at a neighbours window while they're sleeping and the room will fill with a eerie red light!! haha - gr8....and this can be done from a few hundred feet with excellant results.....
- Another good use is to point it just in front of someones feet while they are walking....The red dot on the ground will make them REAL paranoid!
- Picking up conversations in buildings by bouncing the beam off a window and via modulation of the beam and conversion at the opposite end you can hear very high quality conversations without being seen or heard - this is a bit more tricky though....details in the next ELEKTRIX issue.
- PLAIN TERROR! YERRRRR! PHUCK this is the bit I love.....walk down the road real casual or through a town centre....carrying your nice laser....aiming the beam at people as they go by....This really phreaks them out...best if you and a m8 piss about and make out he's gone blind. People will run fer their lives - you need to add a nice buzz noise to

can be large. It is not critical, but a low value will increase power dissipation. Use 1000 times the series resistor if you have no other preferences. Note that the inverter *must not* be a Schmitt trigger. Also note that one of the capacitors is adjusted to correct for the input capacitance of the inverter. In an actual circuit, corrections should also be made for other stray capacitances. The frequency is fine tuned by trimming the capacitors.

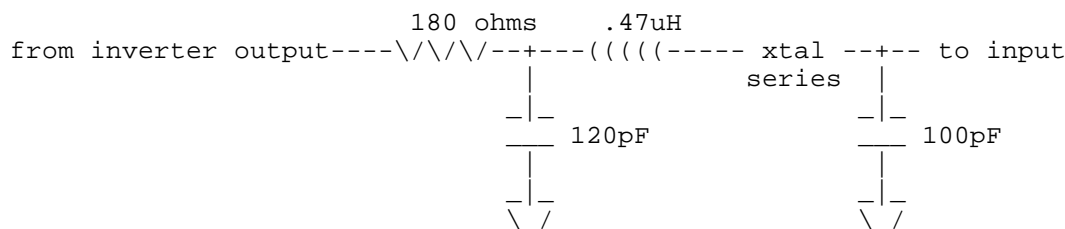
At higher frequencies account must be taken to the phase shift of the inverter. The phase shift for a gate when operated as a linear amplifier is certainly not to be found in any data sheet. Just note that 8 ns delay corresponds to 45 degrees phase lag at 16 MHz. Use this type of info as a starting point for adjustment by reducing the R & C:s.

An 4000 series CMOS inverter is usable up to around 5 MHz. Use HC to 25 MHz, AC to 40 MHz. Above that you are into F, ALS or AS families. The same principles apply, but the DC feedback must be arranged by a voltage divider, and the impedance is much lower, on the order of kohms.

To use a 3:rd or 5:th harmonic crystal, you need to insert a bandpass filter into the feedback to avoid oscillating at the fundamental or other harmonic. A series resonant LC filter is something that easily could be inserted between the output and the resistor in the above circuit. Zero degrees phase shift at the center frequency means that the other design criteria still hold. The Q of the filter should be low, around 1-3. Example for 30 MHz: (Just the filter.)



A C-L-C pi filter and series resonant crystal is another solution:



Component values should not be taken literally. (No indication of inverter type given!)

Some additional hints:

Don't distribute the inverter output node over a large PC board. Instead use free inverters of the same chip for buffering.

If you use the other inverters of the same chip for other signals, be aware that there is crosstalk that causes phase jitter in the oscillator output that might be disturbing in critical applications. For a clean noise-free output, a local voltage regulator to supply the inverter is

VR1 100 K, linear taper

As with all VHF circuits, pay particular attention to construction technique. I recommend cutting little square islands on one side of a two-sided copper-clad board. Use the remainder of that side as the ground plane, and leave the bottom side to serve as a shield. If you keep all lead lengths short, the circuit is quite stable.

With the parts listed here, effective frequency range extends well beyond the FM broadcast band in both directions. If a 6V zener is substituted for CR2, the circuit will run from a 9V battery, with a slightly smaller tuning range. The output is hot enough that the signal can easily travel a city block using just a clip lead for an antenna.

12. Video amplifier

From: iisakkil@gamma.hut.fi (Mika Iisakkila)

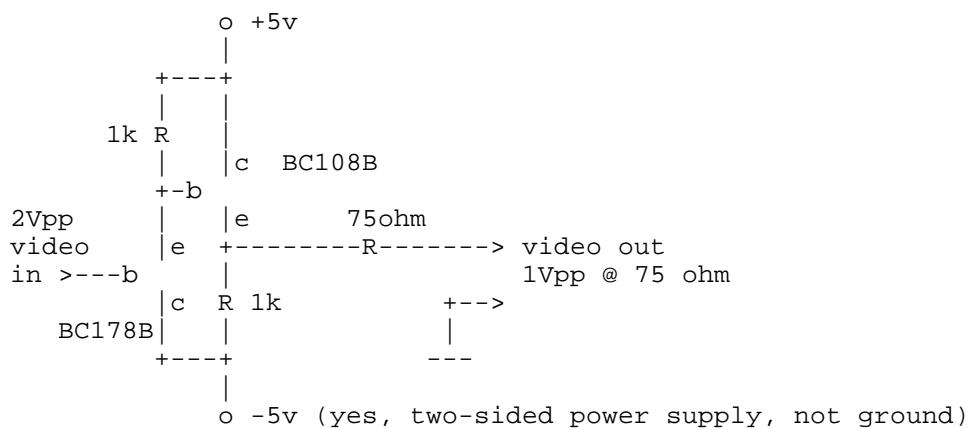
" Got some questions about video amps. I've seen an NE592 used as a video buffer amp at the end of a 75 ohm line. Used so that the 75 ohm line could drive all kinds of neat processing stuff without affecting the signal (that's what a buffer is after all, right?) Now National Semiconductor makes an LM592 that's also a video amp. Do these two chips cross reference to eachother? "

They are the same chip. Sources for NE/SE/LM/uA592 include TI, Harris, Philips (Signetics) and Motorola. Be aware that there are 8 and 14 pin versions of it, the difference being that the larger package has two additional gain control pins. It's not really an op-amp, so you can't use feedback to control the gain. Additionally, they're *_fast_* circuits, so use a ground plane and ceramic bypassing caps as close as possible to the supply pins.

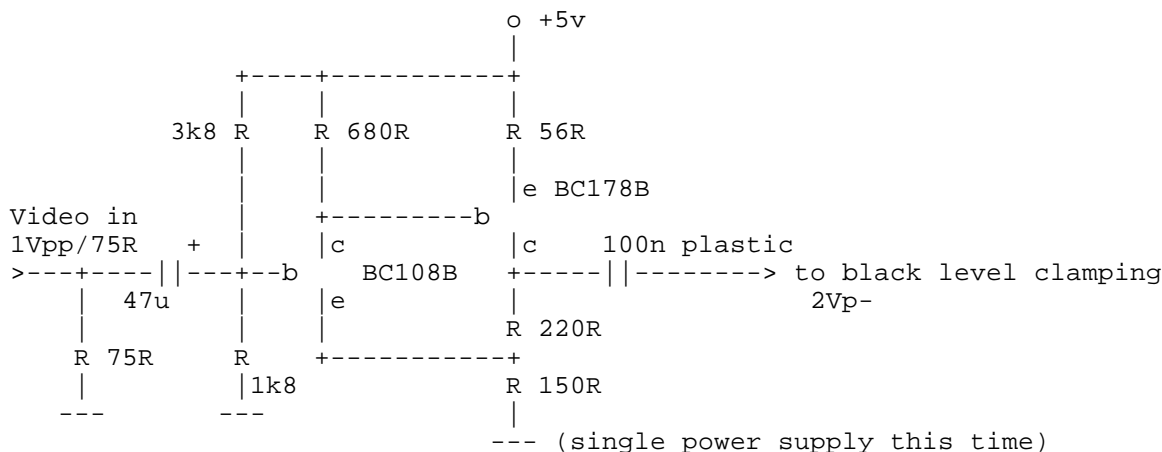
" Also, is there a relatively simple video buffer amp I could make with discrete components? I really don't want capacitive coupling, since video has DC components. "

The DC components in video are normally a non-issue. Most video equipment are AC coupled (at least the input), which is the reason why you can't get away without black level clamping if you plan to process the video signal. Nothing is said about the actual voltage levels of the video signal, they are just referenced to the black level which may float anywhere (well if I remember right, you're guaranteed to have less than 1W power dissipation in the terminating resistor with standard video...). A typical video input has a 75 ohm terminating resistor to ground and then the signal is fed to the input buffer via a ~50uF electrolytic cap.

Anyway, here's a simple discrete video output stage. Can't get much simpler than this. Note that there's a serial matching resistor on the output, so you'll have to feed 2Vp-p video into the buffer to get the usual 1Vp-p into the equipment you're driving. This is the way it's usually done. Sorry for the crude transistors, but I hate doing ASCII graphics.



And while I'm at it, here's the input stage to go with it. It provides the 2x voltage gain you need to feed the output buffer above.



The simplest black level clamp consists of a signal diode (1N4148) reverse-biased to ground from the output line of the input buffer above and a 4k7 resistor in parallel with it. That forces the sync tips to be at (gnd - threshold voltage of the diode), which shifts the black level of a 2x amplified video reasonably close to ground. Add that and you can connect the two circuits above together and see how they work. They should be very good as far as the signal quality goes (maybe not broadcast quality, but no visible signal degradation). Don't forget good power supply bypassing, use at least 220u of electrolytics and 100n ceramic caps near the transistors on both circuits (the output stage needs them on both supplies).

13. 'Nixie' display tubes

From: mkuhn@news.weeg.uiowa.edu (Martin W Kuhn)

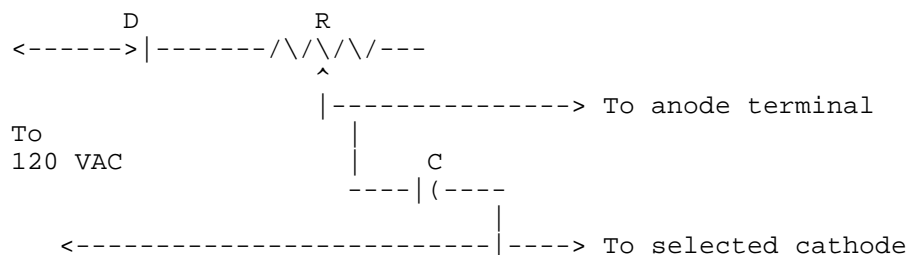
Nixies are lots of fun. I just recently built a digital clock out of Nixies, so I think I can help you here. (BTW, if anyone is interested in details of the clock, let me know)

There is no heater connection; these are not like vaccuum tubes. There may be some unused

pins, however, or perhaps they are for a decimal point or other symbol the old equipment didn't use.

Nixies have a cathode for each symbol, and one anode which is used for all the symbols (usually a grid-shaped element in the middle of or in front of the symbol elements.)

Here's a super-simple power supply to try experimenting with them:



D : any rectifier diode of ≥ 250 PIV
 R : 100 K or so variable resistor
 C : 20 uf (or more) at at least 250 WVDC (observe polarity!)

CAUTION: Take care when using the above circuit! If you have an isolation transformer around, use it! Output of this supply can be **over 150 VDC!** Also, make sure you discharge C when you are done using it--- It is a good idea to wire a resistor across C when you use this circuit as a shunt. (something like 100K to 1M or so is fine) Make sure you connect it to the tube **BEFORE** plugging it into an outlet, in order to avoid a nasty shock by accidentally touching the output leads! A .5 amp or so fuse might be a good idea too, to protect against short circuits.

NOTE: This might not be the best possible circuit, and others might want to suggest changes to it, but it works, and is simple enough.

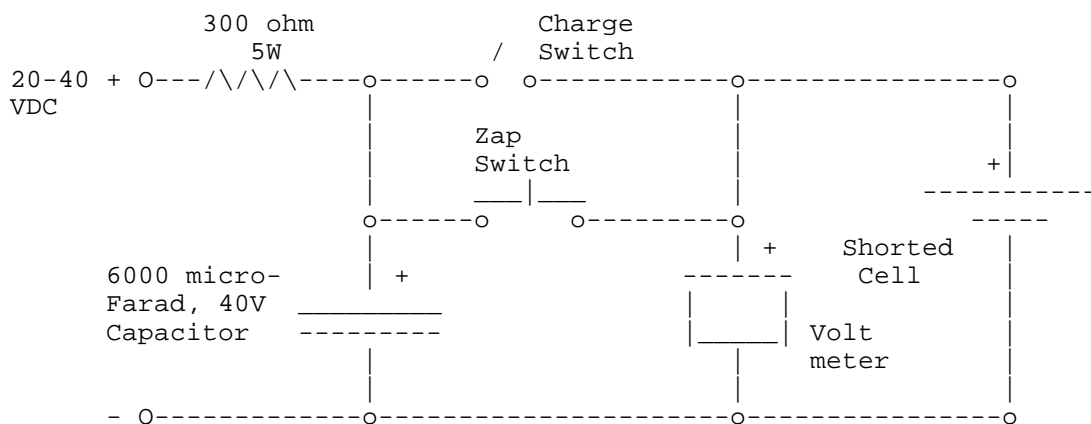
After you wire it up, connect it to the anode and one of the cathodes. Make sure R is at its **MAXIMUM** resistance. After you plug it in, slowly adjust R until the selected digit just manages to glow completely. If the wire lead connecting the number to the pin on the base of the tube also glows, then R is too low; turn it back! The exact voltage necessary to light the tube will depend on the particular tube you are using. Also, you may want to wire an ammeter in series with the tube when you first try this out. The tube should only draw a few mA. If it draws much more than 5mA or so, something is probably wrong!

BTW, the Nixies should glow a "pure" even amber-orange color. If they are sort of a lighter color with blueish fringes, then they are somewhat gassy, but still usable. If you see blue "clouds" in the tube and/or the symbols are fuzzy and indistinct, then the neon has gotten too contaminated, and the tube should not be used.

If you are planning to use Nixies in something like a logic circuit, you can easily drive them with any NPN transistor with a CEO of at least 200V and an Ic of at least 10mA or so. (actually, low-power high-voltage transistors of this type are not so easy to get these days)

If you have any specific problems/questions let me know; I am not sure what sort of info you are looking for. Hope this helps, anyway.

Now comes the problem! Suddenly, the weakest cell sees an increasingly heavy load, which causes its voltage to drop even faster. This avalanche continues until the cell is completely discharged, even as the other cells continue to force current to flow. The inevitable result is that the weak cell begins to charge in reverse, which eventually causes an internal short. Once an internal short develops, recharging the cell at the normal rate is futile. The short simply bypasses current around the cells active materials. (Even though the cell is apparently dead, most of its plate material is still intact.) If the small amount of material that forms the short could be removed, the cell would be restored to virtually its original capacity once again.



Using the circuit shown, the internal short can be burned away in a few seconds. In operation, energy stored in the capacitor is rapidly discharged through the dead cell to produce the high current necessary to clear the short. Current is then limited by the resistor to a safe charge rate for a small A cell.

Several applications of discharge current are usually necessary to clear a cell. During the "zapping" process, it is a good idea to connect a voltmeter across the cell to monitor results. Momentarily close the normally open pushbutton switch several times to successively zap the cell, allowing sufficient time for the capacitor to charge up between zaps, until the voltage begins to rise. Then, with the toggle switch closed, watch as the potential across the cell climbs to 1.25 volts. If the potential stops before full voltage is reached, some residual short remains and another series of zaps is in order. If you observe no effect whatsoever after several zaps and shorting out the cell and taking an ohmmeter measurement indicates a dead short, the cell is beyond redemption and should be replaced.

Once full cell potential is achieved, remove the charging current and monitor battery voltage. If the cell retains its charge, it can be returned to charge and eventually returned to service. But if the cell slowly discharges with no appreciable load, the residual slight short should be cleared. To do this, short circuit the cell for a few minutes to discharge it, zap again, and recharge it to full capacity.

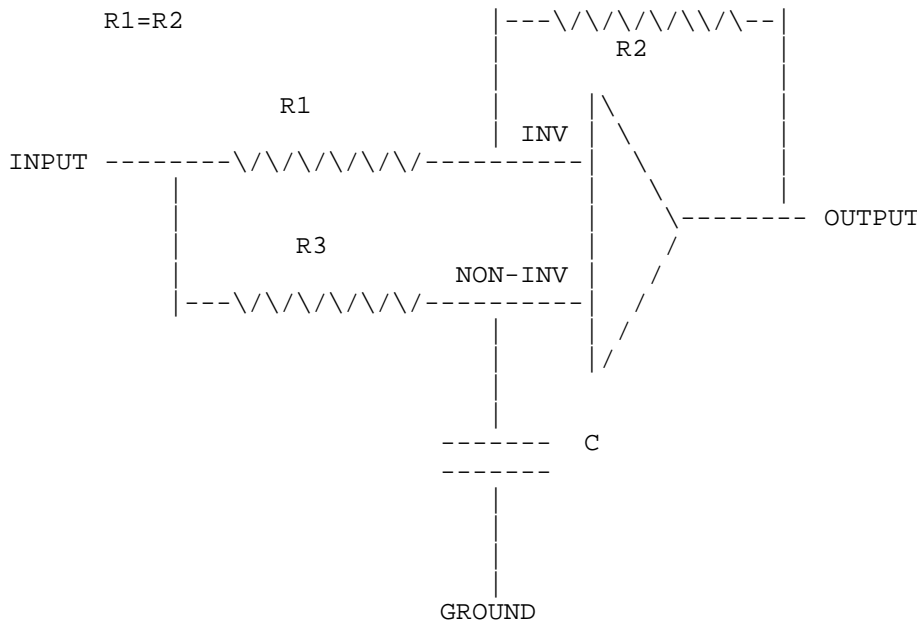
16. Phase shifter circuit

(From Richard Karlquist)

Here is a well known op-amp phase shifter. I am surprised no one has posted it yet, so I guess I will have to. The circuit will have 90 degrees phase shift at:

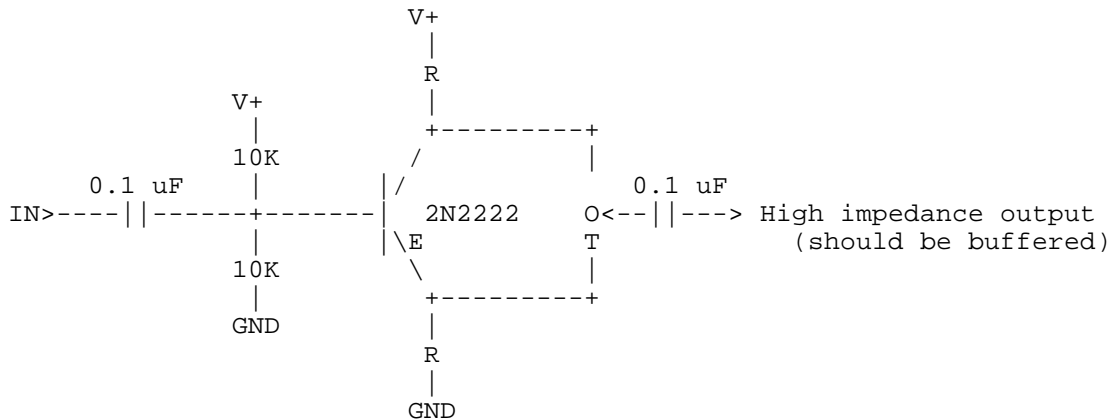
$$FREQ = 1 / (2 * PI * R3 * C)$$

At low frequencies it has 0 degrees of phase shift and at high frequencies it has 180 degrees of phase shift. By making R3 a pot, you can vary the phase at a given frequency from nearly 0 to nearly 180 degrees. Since you want to work at 1 MHz., you will need to use a high frequency op amp, like the Burr-Brown OPA620.



(From David Medin)

How about the simple single-transistor phase splitter?



The circuit uses the inverting properties of an emitter follower with a collector load. You have to experiment for a value of R and the pot that will keep the transistor's power dissipation

within limits given the V+. The output stage should be buffered by another emitter follower stage, or an op amp, etc. Note that this circuit induces some loss in the p-p value of the signal, too. It is not completely distortionless, but reasonable if you do it right.

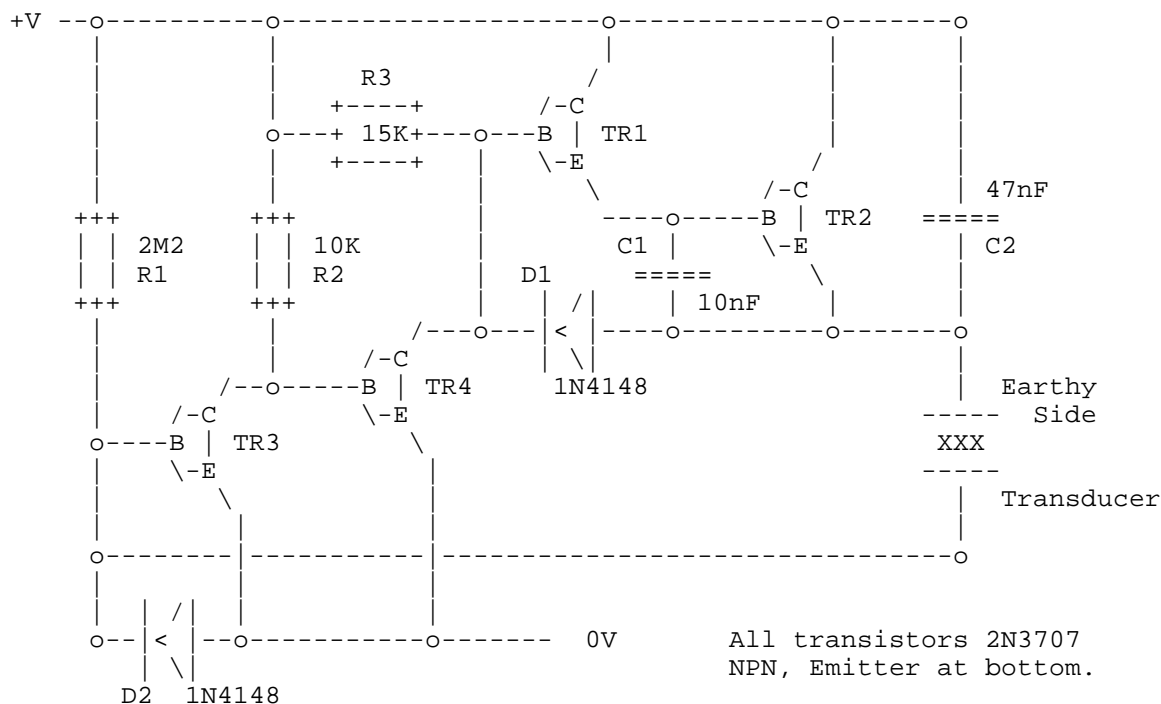
The same topology can be employed with op amps: One inverting and one non-inverting with the pot between their outputs, buffered by a third op amp.

17. Ultrasonic transducer oscillator circuit

(From Chris Abbott)

Allows the transducer to oscillate at its self-resonating point, with no tedious setup.

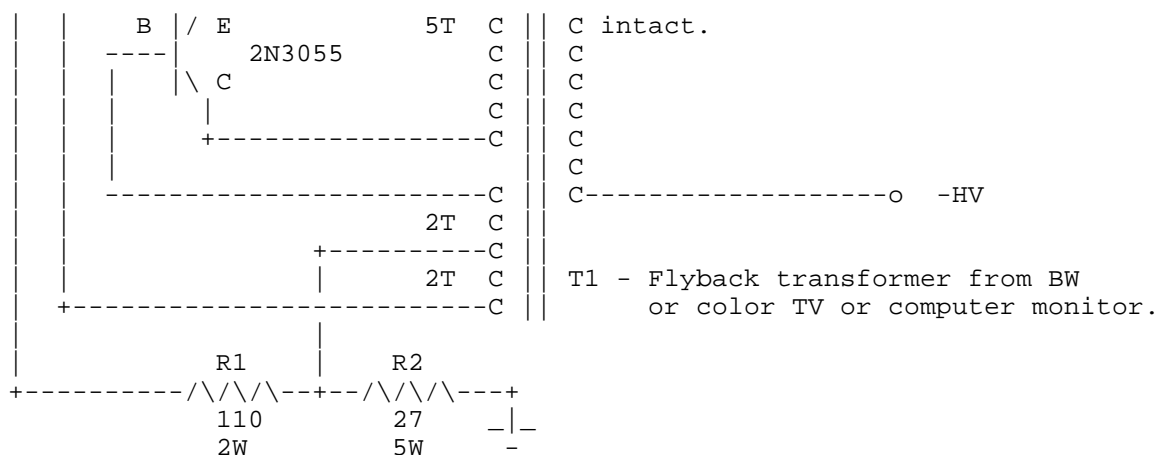
As far as I can tell, the circuit will run on 5V-9V.



18. RR LED flasher (alternating)

(From Darren Leigh)

You can get a 50% duty cycle if you use a CMOS version (a 7555 for example). CMOS has a rail-to-rail output swing which lets you get away with this:



Read in Entirety!

1. Obtain flyback transformer with known good HV secondary winding. primary may be left intact if it is known to be in good condition - non shorted. A flyback removed due to failure may be used if it was the primary that failed and the primary turns can be removed without damaging the HV secondary or losing the secondary return connection! Flybacks fail in both ways (primary and secondary).
2. Wind 10 turn center tapped drive winding and 4 turn centertapped feedback winding using #16-20 guage insulated wire. Make sure both halves of each coil are wound in same direction.
3. VCC should typically be in the range 12-24 volts at a couple of amps. Circuit should start oscillating at around 5 volts VCC or so. If you do not get any HV out, interchange the connections to the transistor bases. Heat sinks are advised for the transistors. Be aware of the capability of your flyback (BW monitors up to 15KV, color up to 30 KV). You risk destroying the secondary windings and/or HV rectifier if you get carried away. Running this on 24 volts will probably cause an internal arc-over in a small flyback, at which point you start over with more caution and a new flyback.
4. Actual output will depend on turns ratio of the flyback you have. For typical monochrome computer monitors or video display terminals, you should be able to get around 12,000 volts with 12 volts input. I made one from a dead MacPlus flyback from which I removed the (dead) primary windings.
5. Frequency of operation will be in the KHZ to 10s of KHZ range depending on VCC, load, and specific flyback characteristics.
6. You can experiment with # turns, resistor values, etc. to optimize operation and power output for you needs.
7. **CAUTION:** contact with output will be painful, though probably not particularly dangerous due to low (a few mA) current availability. **HOWEVER**, if you add a high voltage capacitor to store the charge, don't even think about going near the HV!

Parts list:

Q1, Q2

2N3055 or similar NPN power transistors (reverse polarity of VCC if using PNP transistors.) Maximum stress on transistors are about 2-3 times VCC. Heat sinks will be needed for continuous operation.

R1

110 ohms, 2W resistor. This provides base current to get circuit started.

R2

27 ohms, 5W resistor. This provides return path for base feedback during operation.

T1

Flyback transformer from/for BW TV, color TV, or computer monitor modified according to text above. Most modern flybacks include built-in HV rectifier diode(s) so output without additional components will be high voltage positive pulses. Note: this kind of flyback transformer drives the CRT directly and uses its glass envelope as the high voltage filter capacitor. (A foot square piece of 1/8" Plexiglas with Aluminum foil plates makes an adequate filter capacitor.)

Wire

A couple of feet of #16-#20 hookup wire, magnet wire, or any other insulated wire for home made primaries. Use electrical tape to fix windings to core. Wind feedback winding on top of drive winding.

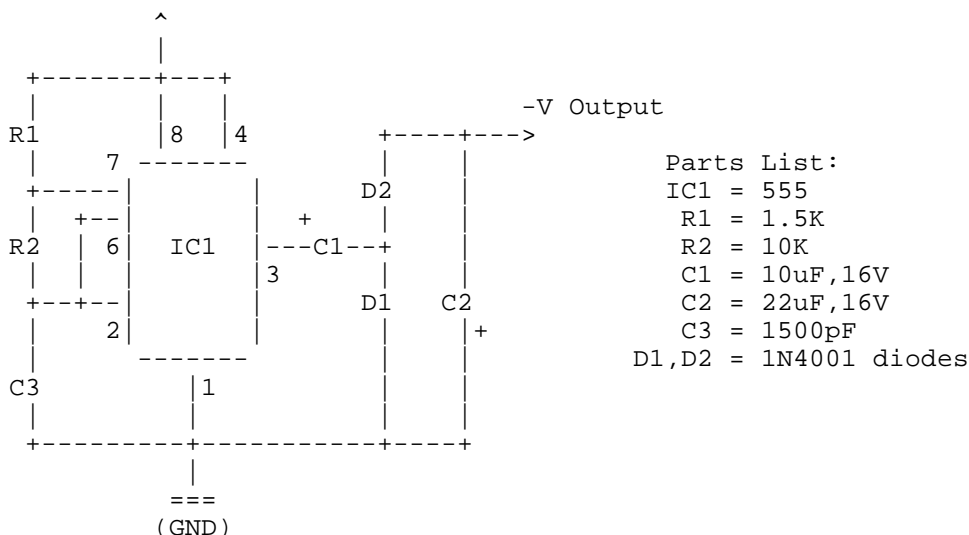
20. Generating -5VDC from +5VDC

(From Richard Friesen)

If you happen to have the March 1984 issue of Radio-Electronics, turn to page 78. This issue has the very first instalment of Robert Grossblatt's "Designer's Notebook" column. In it, he shows a simple circuit which will supply a negative voltage, given a positive voltage. It's basically a 555-based oscillator, and a voltage-doubling rectifier. He claims the negative-voltage output should be good for about 60ma. No-load voltage should be pretty close to the input voltage (but negative), although the voltage will drop a bit, depending on the load. If you put +5V into the circuit, it'll give you around -5V out. load. If you put +5V into the circuit, it'll give you around -5V out. If the load makes the voltage drop too low (-3V or -4V), you could always just feed the circuit with a higher voltage (like maybe 9V or 12V) and then just regulate the output down to -5V using a 7905 regulator. I've used this circuit a couple of times for powering op-amp's, and it works great!

I'm not that great at ASCII-art, but I'll give it a shot. If the following schematic doesn't make sense, let me know, and I'll try it again...

+V



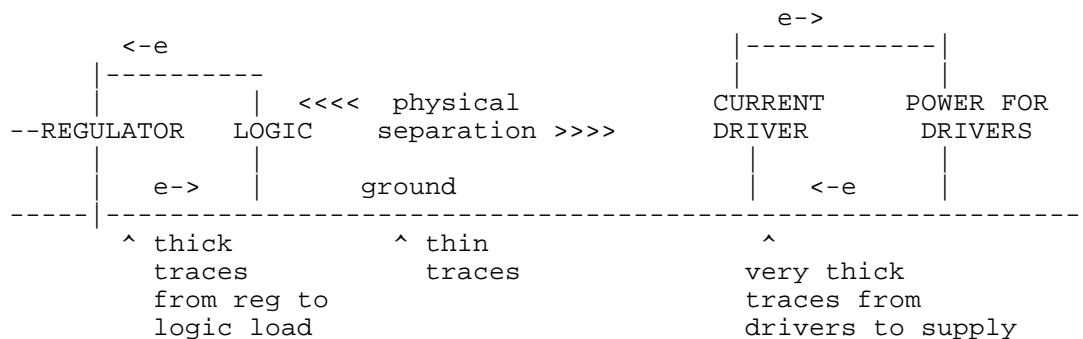
Note: In the above "diagram", both diodes point down (the anodes are at the top). Also, watch the polarity of C1 & C3.

The circuit is set up to oscillate at about 45kHz, with a duty cycle pretty close to 50%. None of the values of any of the parts are terribly critical, so if the capacitors or resistors are "in the ballpark", it should still work okay.

21. Ground loops

(From Thomas Maier)

When you have two circuits that are tied together electrically, but one of them is high current then you should direct the ground and power paths to "feed" them separately. You want the current of the driver to stay on the driver side and the current of the logic to stay on it's own side. The thin trace inbetween is still needed because this is not galvanic isolation.



The common mistake is to "daisy chain" the ground by having the ground of the high current item seek it's current path through the ground of the logic. This causes ground spikes on the logic and thus logic errors due to bad voltage levels at the logic chips.

===== <-- ceramic
(cold side)

The device works by depleting the cold side of thermally-generated carriers and moving them to the hot side; in essence, the device is a heat pump. When a fixed potential is placed across the device's terminals, a fixed temperature difference will be maintained between the hot and cold sides. If the hot side has a sufficiently "beefy" heat sink, this temperature difference can be several tens of degrees C.

The process is reversible -- placing a temperature difference across the device will cause a voltage to develop across its terminals.

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