

# Contents of *schematics-20000228*

Note:

There is some duplication in this archive, some schematics show up multiple times in various formats. I know about it, you don't need to mail me, I don't plan on fixing it right now, down the road yes - but not right now.

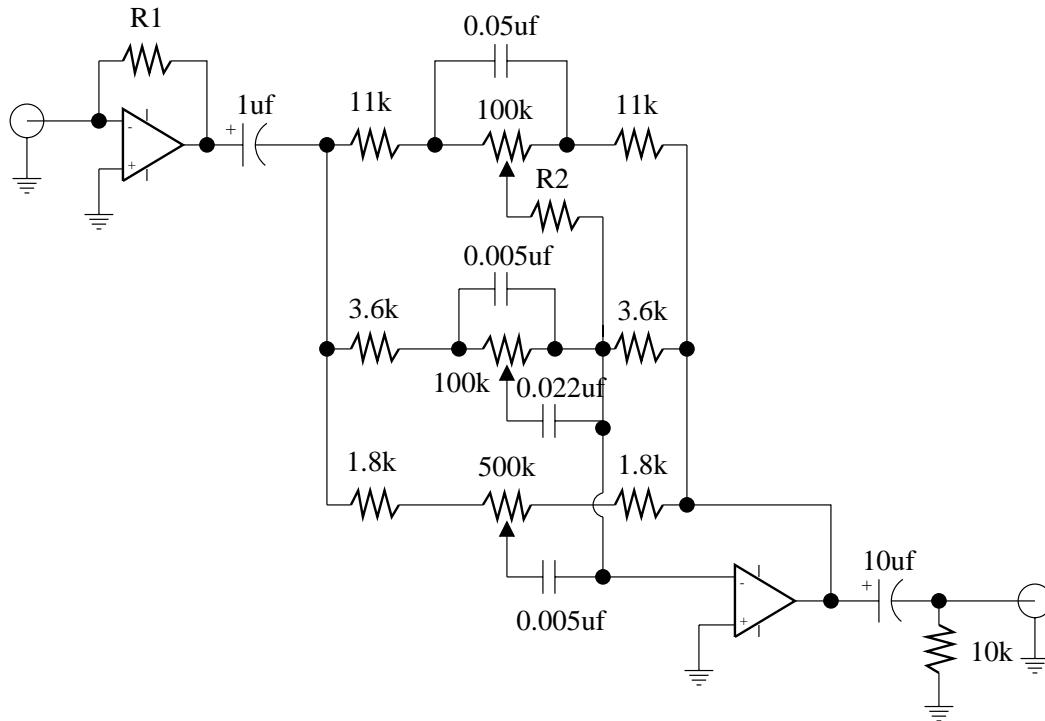
schematics-20000228/

File	Description
3btone.ps	Simple 3 Band Tone Control
4bandeq.ps	PAiA 4 Band EQ, 35Hz to 15kHz range
ab3pcb.ps	Angry Beard 3 PCB
angrybd3.ps	Angry Beard 3, germanium fuzz pedal
axgrindr.ps	PAiA Axe Grinder, distortion pedal
b_gsynth.pdf	EH Guitar & Bass Microsynth
bclipper.ps	Dan Armstrong Blue Clipper, distortion pedal
bigmufpi.ps	EH Big Muff Pi, distortion pedal
biphase.gif	Bi-Phaser
bl_delux.gif	Fender Blues Deluxe
bosssg1.ps	Boss Slow Gear SG-1, attack delay effect
brighten.ps	2 Frequency Brighteners
cln9powr.ps	Ultra-Clean 9VDC Power Supply
controfz.ps	Gretsch Controfuzz, distortion pedal
crybaby.ps	Dunlop Cry Baby Wah-wah pedal
dodcomp.ps	DOD Compressor 280A
dodenvf.ps	DOD Envelope Filter 440
dodfx75.ps	DOD FX25 Flanger
dodoverd.ps	DOD Overdrive 250
dualpabb.ps	Dual Preamp & A/B Box
dublbeat.ps	Roland Double Beat, fuzz wah
eh16secd.ps	EH 16 Second Digital Delay, partial
ehbusters.ps	5 EH Tone Boosters
ehfuzzwa.ps	EH Fuzz-Wah (volume too)
electra.ps	Electra Distortion, guitar overdrive module
eq.ps	10 Band Graphic EQ
fblender.ps	Fender Blender, fuzz pedal
foxfzwah.ps	Foxx Fuzz-Wah
fuzz001.ps	Unknown fuzz pedal
fuzz002.ps	Unknown fuzz pedal
fuzzface.ps	Dallas Arbiter Fuzz Face
geuoctv.ps	Guitar Effects Unit, octaver fuzz pedal
grnringl.ps	Dan Armstrong Green Ringer, pseudo ring modulator
harmswtn.ps	Harmonic Sweetener
ibnzbel10.gif	Ibanez BE10, 7 Band EQ
ibnzpt90.gif	Ibanez PT90, phase shifter
ibnzts9.ps	Ibanez TS9 Tube Screamer, distortion pedal
jhfface.ps	Dunlop Jimi Hendrix Fuzz Face
jordan.ps	Jordan Boss-Tone
jordan_bosstone.gif	Jordan Boss-Tone
jshfuzz.ps	JSH Fuzz, model FZII
kaytrem.ps	Kay Tremolo Model T-1
korgngt1.gif	Korg NGT-1 Noise Gate
korgoct1.gif	Korg OCT-1 Octaver
korgpeq1.gif	Korg PEQ-1 Parametric EQ
korgphs1.gif	Korg PHS-1 Phase Shifter
korgtnb1.gif	Korg TNB-1 Tone Booster
lbgmuff.ps	EH Little Big Muff, distortion pedal
maefuzz.ps	Maestro Fuzz
mboomer.ps	Maestro Boomerang, wah-wah
mboomer2.ps	Maestro Boomerang 2, wah-wah & volume
mfuzrite.ps	Mosrite Fuzz-Rite, distortion pedal
motionff.ps	PAiA Motion Filter/Follower
mtsfuzz.ps	Modified Tube Sound Fuzz
mu-tron3.jpga	Mutron Mu-Tron III
mufffuzz.ps	EH Muff Fuzz

mxrdistp.ps	MXR Distortion +
mxrhott.ps	MXR Hot Tubes
obphaser.ps	Oberheim PS-1 Phase Shifter
octavia.bmp	Bob Starr's Octavia
olsonns.ps	Olson New Sound
panner.ps	G. Forrest Cook's Voltage Controlled Panner
pcrat.ps	ProCo Rat Distortion
pcratb.ps	ProCo Rat Distortion Type B
pipebomb.ps	Pipebomb, silly tone modifier
preamps.ps	3 Simple Preamp Circuits
purple.gif	The Purple Pedal, distortion pedal
rd.ps	Gibson RD-Artist
reverb.gif	Spring Reverb Driver/Reciever
screverb.ps	Stage Center Reverb Unit (spring)
shrdmstr.ps	Marshall Shredmaster
smixer.ps	Simple Mixer
smlstone.ps	EH Small Stone Phaser Issue J
soulprch.ps	EH Soul Preacher, compressor
spreader.ps	EM Stereo Spreader
thrmndat.ps	Theremin Information sheet
thrmnpcb.ps	Theremin PCB layout
thrmnsch.ps	Theremin Schematic
tonebstr.ps	Everyday Electronics Tone Booster
toneccts.ps	2 Tone Control Circuits
tremoloc.ps	Controllable Tremolo Circuit
tubedist.ps	Tube Distortion Pedal
tubehead.ps	PAiA TubeHead Preamp
tubemicp.ps	PAiA Tube Mic Preamp
uniflash.bmp	Bob Starr's UniVibe Lamp Flasher Circuit
univibe.ps	Unicord UniVibe
unvbachk.ps	R.G. Keen's UniVibe check plot Lamp Version
unvbaovr.ps	R.G. Keen's UniVibe overlay Lamp Version
unvbapcb.ps	R.G. Keen's UniVibe PCB layout Lamp Version
unvbbchk.ps	R.G. Keen's UniVibe check plot LED Version
unvbbpcb.ps	R.G. Keen's UniVibe overlay LED Version
uvspfuzz.ps	R.G. Keen's UniVibe PCB layout LED Version
voxtb.ps	Vox Tone Bender
voxtreb.ps	Vox Treble Booster

# Simple 3 Band Tone Control

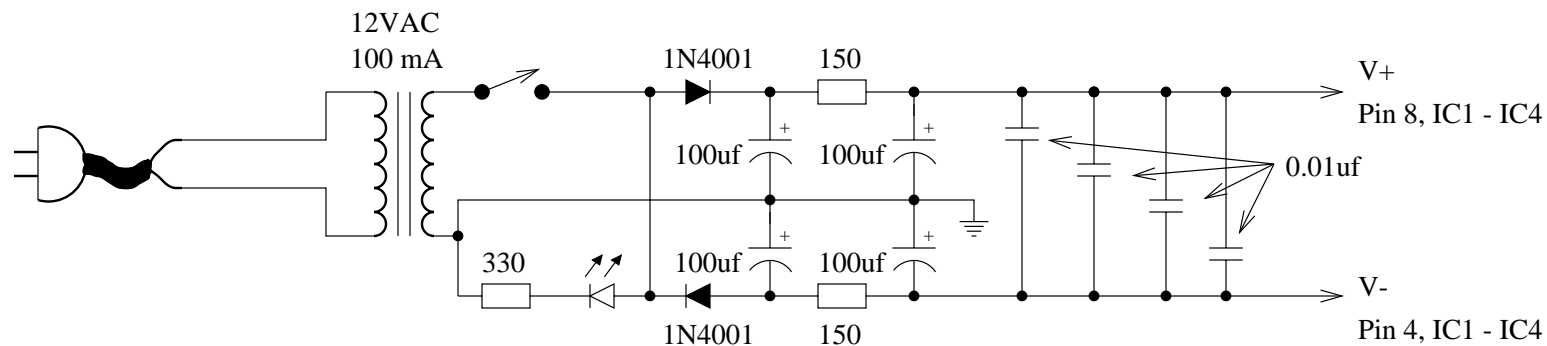
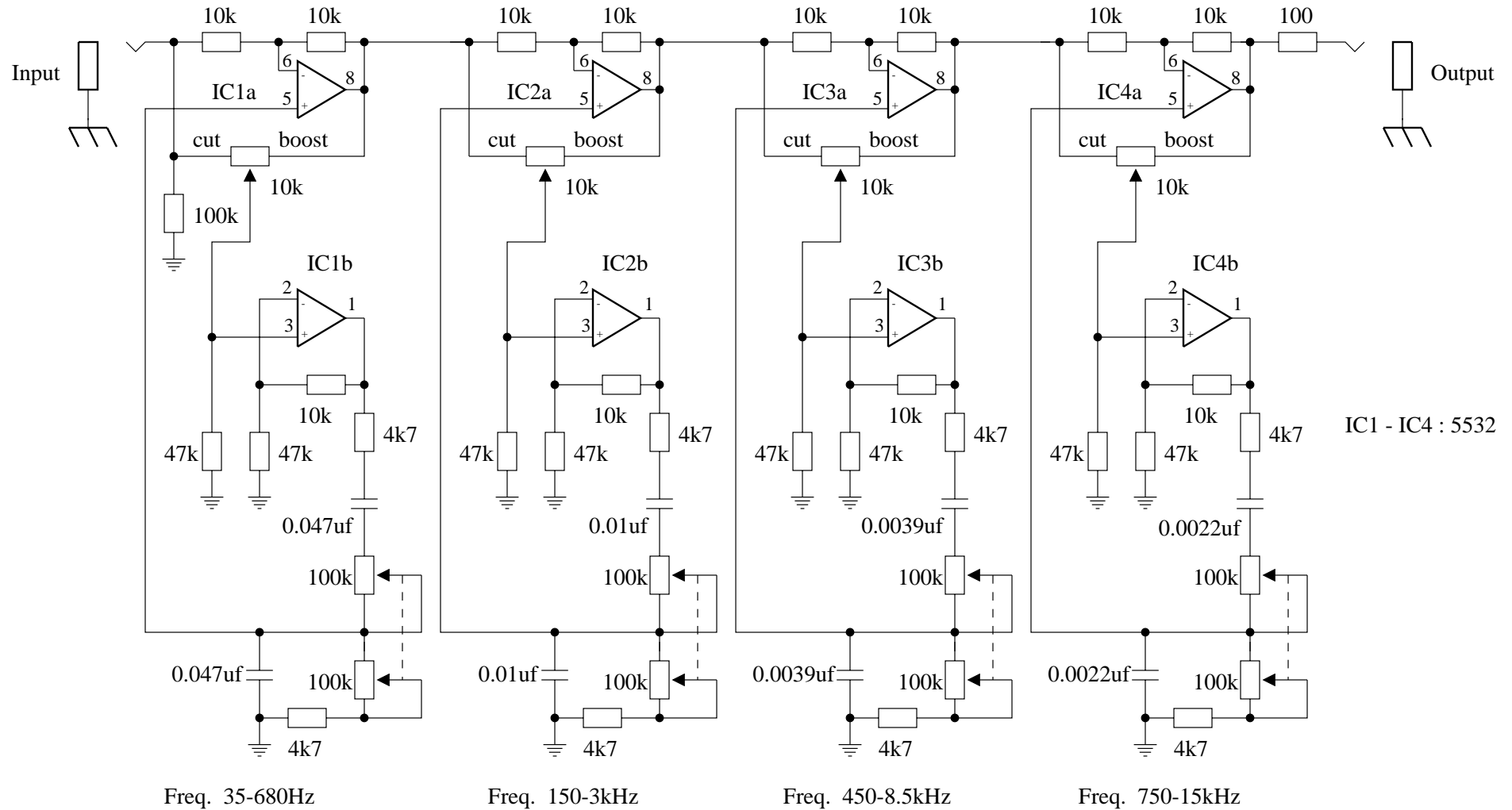
from Graff's Encyclopedia of Electronic Circuits / Popular Electronics

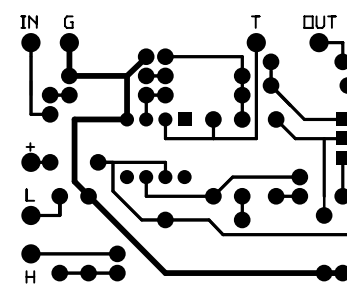


R1 is left up to the user depending on gain needs, R2 is unknown - experiment, the op-amps are not critical, any standard ones could be used. This circuit was originally intended for home audio use, but should be able to be hacked into an effect circuit with very minor modification.

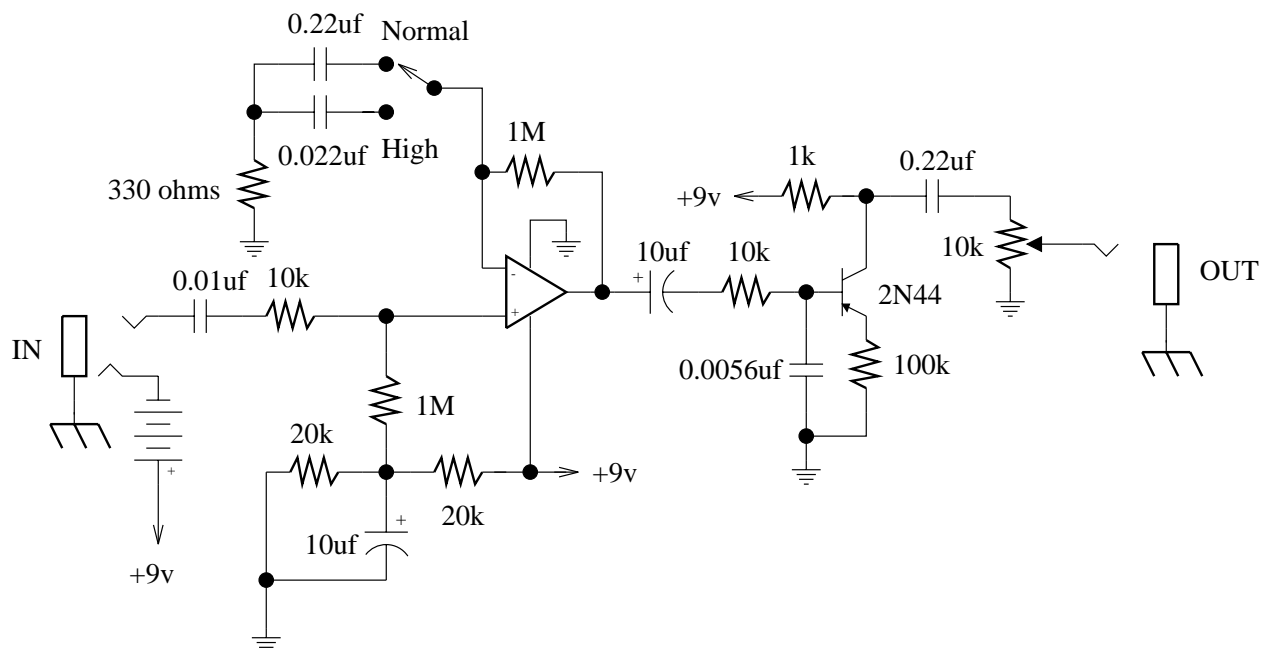
Name: Four-Band EQ	Manufacturer / Designer: PAiA Electronics	Revision: 9/21/95	Model # 9303
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Originally designed by Jules Rychkebusch





# Angry BeardIII

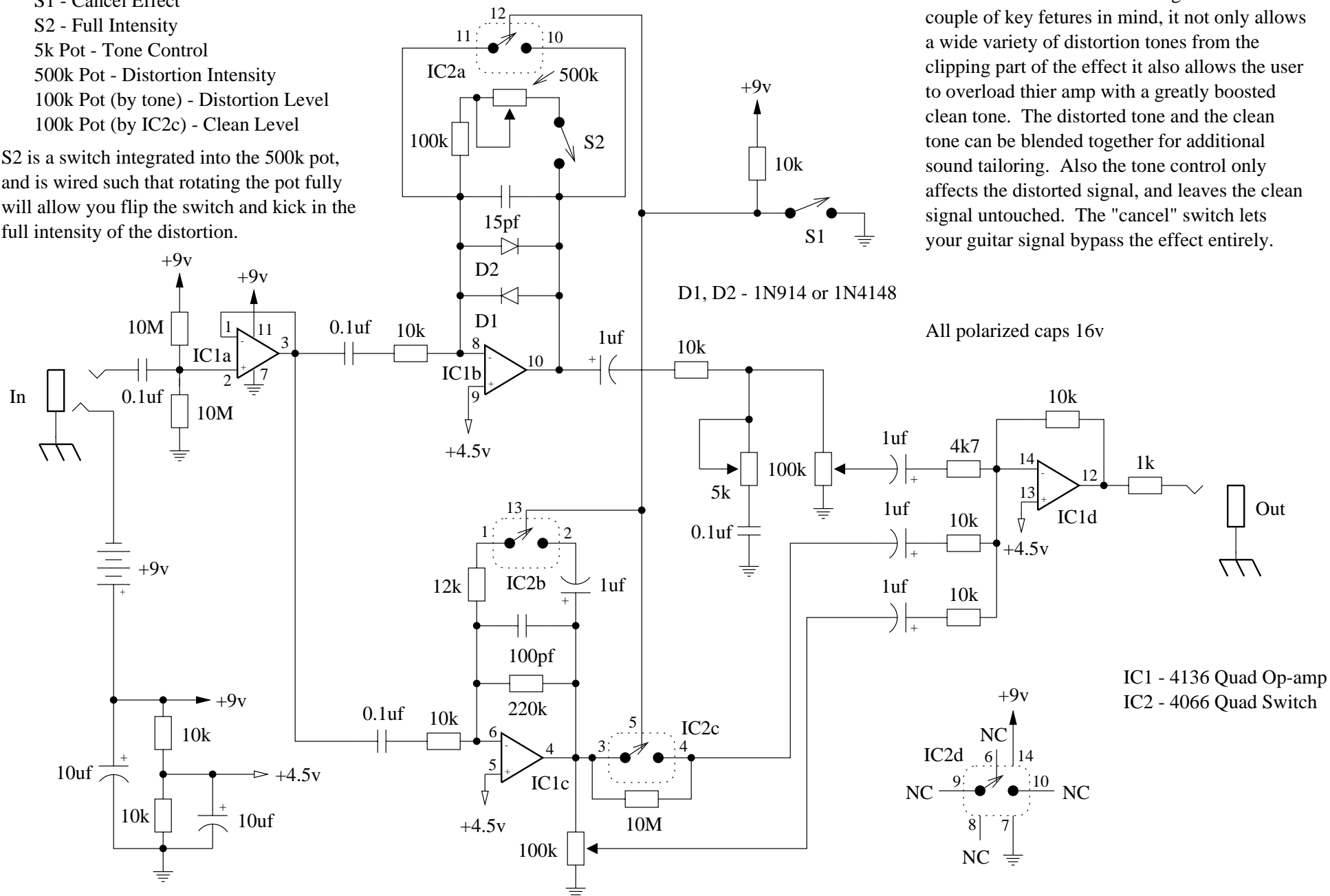


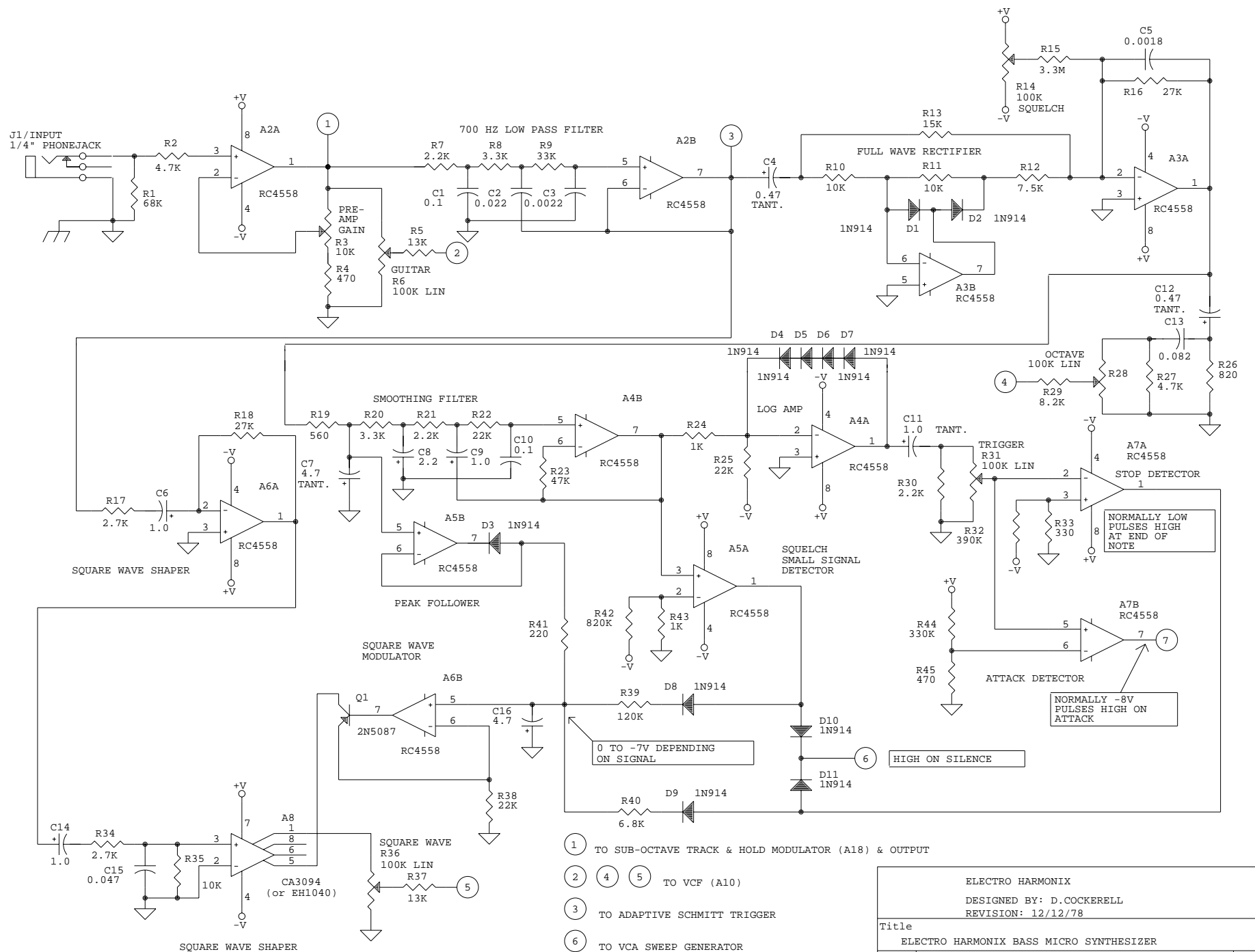
The op-amp can be any lownoise single op-amp, the original used a NE5534. The 2N44 could probably be replaced by other PNP germanium transistors with out much change in sound. The switching aspect has been left out of this schem, but you will probably want to add a bypass of some type to this effect. The emphasis switch chooses a tone flavor, this could be expanded to include a wider range of frequencies, but too small a cap value may cause oscillation. Any attempt at taming the internal gain of this effect has been left out, but could be easily added. This can be noisy depending on your rig, so a 10-15pf cap could be placed in the feedback loop of the op-amp if your concerned about too much squeaking.

-Jamie Heilman  
n9343176@cc.wvu.edu

100k Pot (by IC2c) - Clean Level

The Axe Grinder has been designed with a couple of key fetures in mind, it not only allows a wide variety of distortion tones from the clipping part of the effect it also allows the user to overload thier amp with a greatly boosted clean tone. The distorted tone and the clean tone can be blended together for additional sound tailoring. Also the tone control only affects the distorted signal, and leaves the clean signal untouched. The "cancel" switch lets your guitar signal bypass the effect entirely.

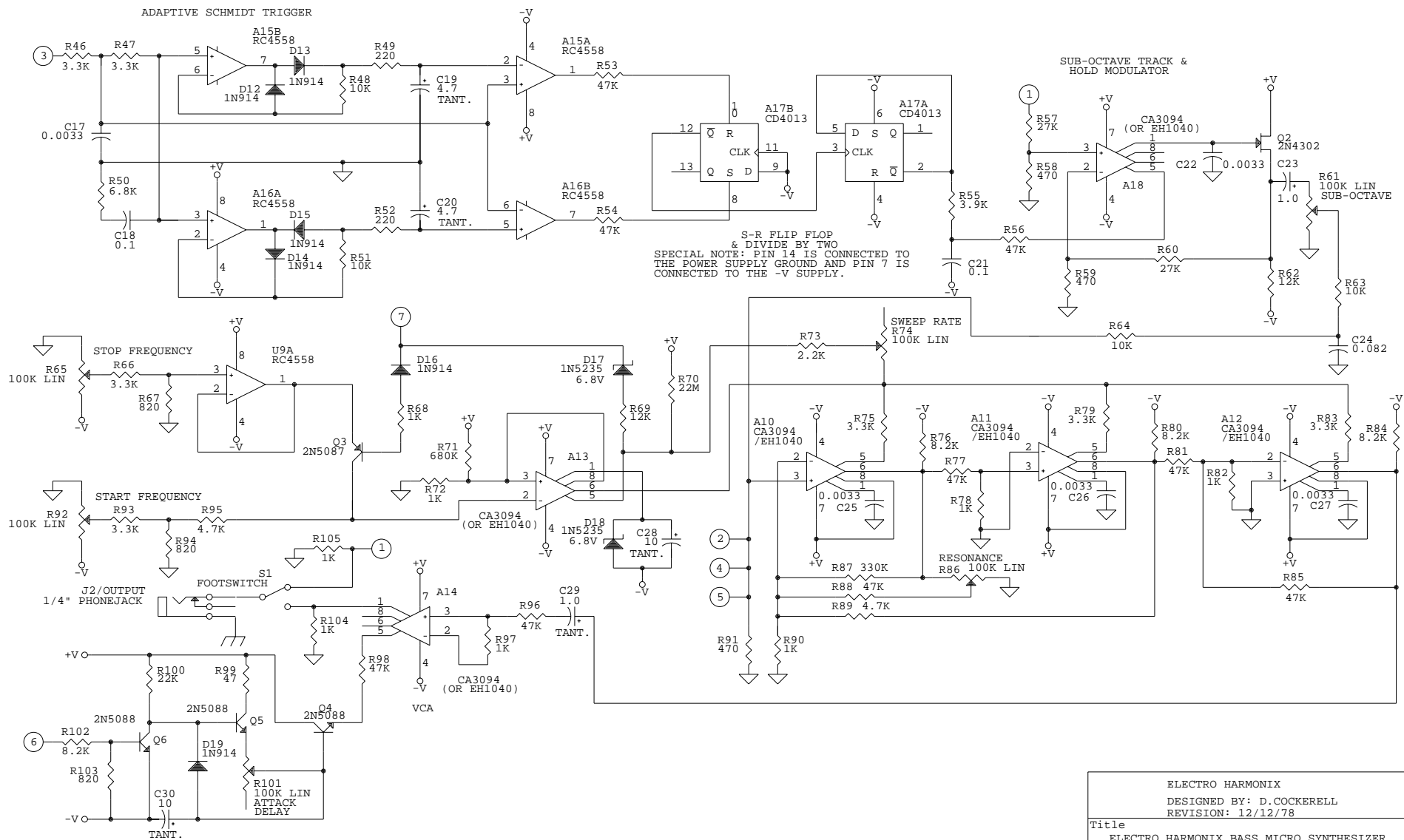




\* ALL CAPACITOR VALUES IN MICROFARADS

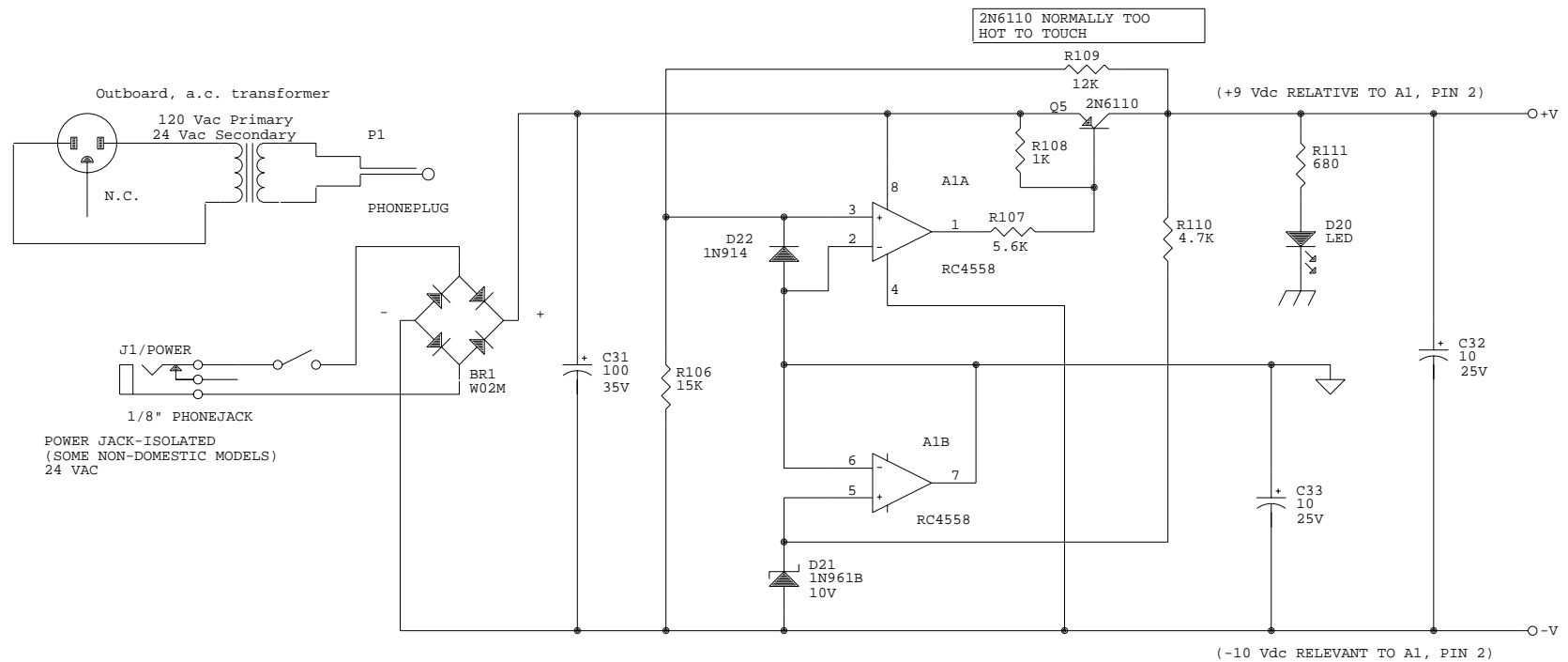
ELECTRO HARMONIX		
DESIGNED BY: D. COCKERELL		
REVISION: 12/12/78		
Title		
ELECTRO HARMONIX BASS MICRO SYNTHESIZER		
Size	Document Number	REV
A	DRAWN BY: FABIAN P. HARTERY	1
Date:	September 28, 1996	Sheet 1 of 3



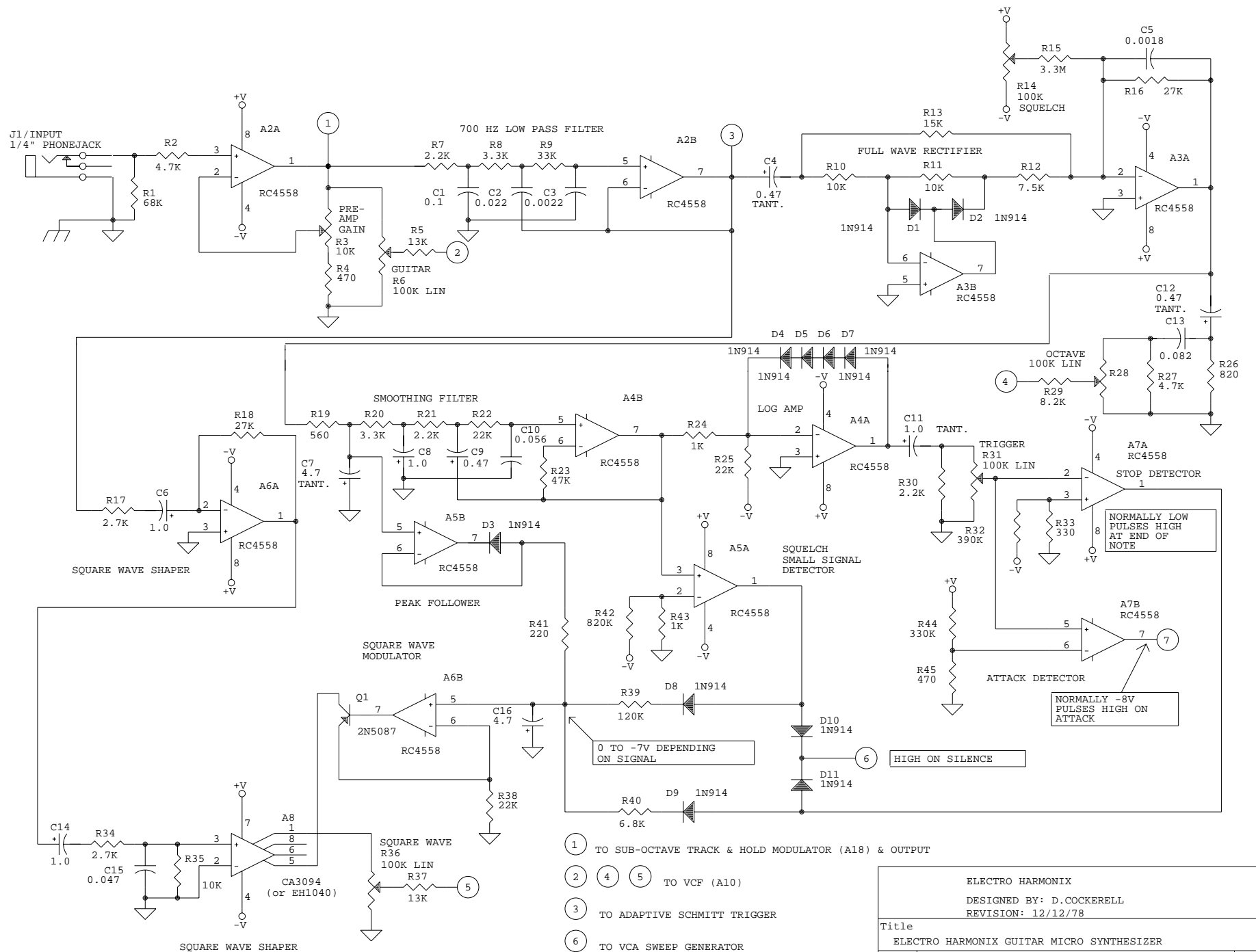


\* ALL CAPACITOR VALUES IN MICROFARADS

ELECTRO HARMONIX		
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B	DRAWN BY: FABIAN P. HARTERY	1
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ELECTRO HARMONIX		
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A	DRAWN BY: FABIAN P. HARTERY	1
Date:	September 28, 1996	Sheet 3 of 3



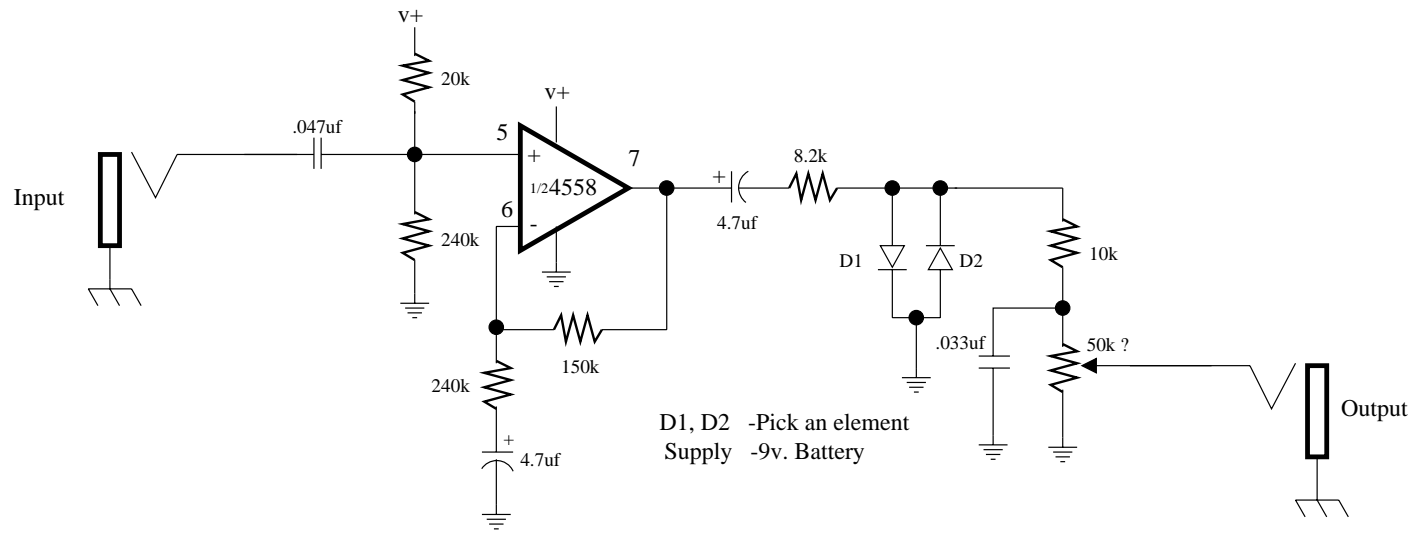
\* ALL CAPACITOR VALUES IN MICROFARADS

ELECTRO HARMONIX		
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REVISION: 12/12/78		
Title		
ELECTRO HARMONIX GUITAR MICRO SYNTHESIZER		
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Date:	September 28, 1996	Sheet 1 of 3

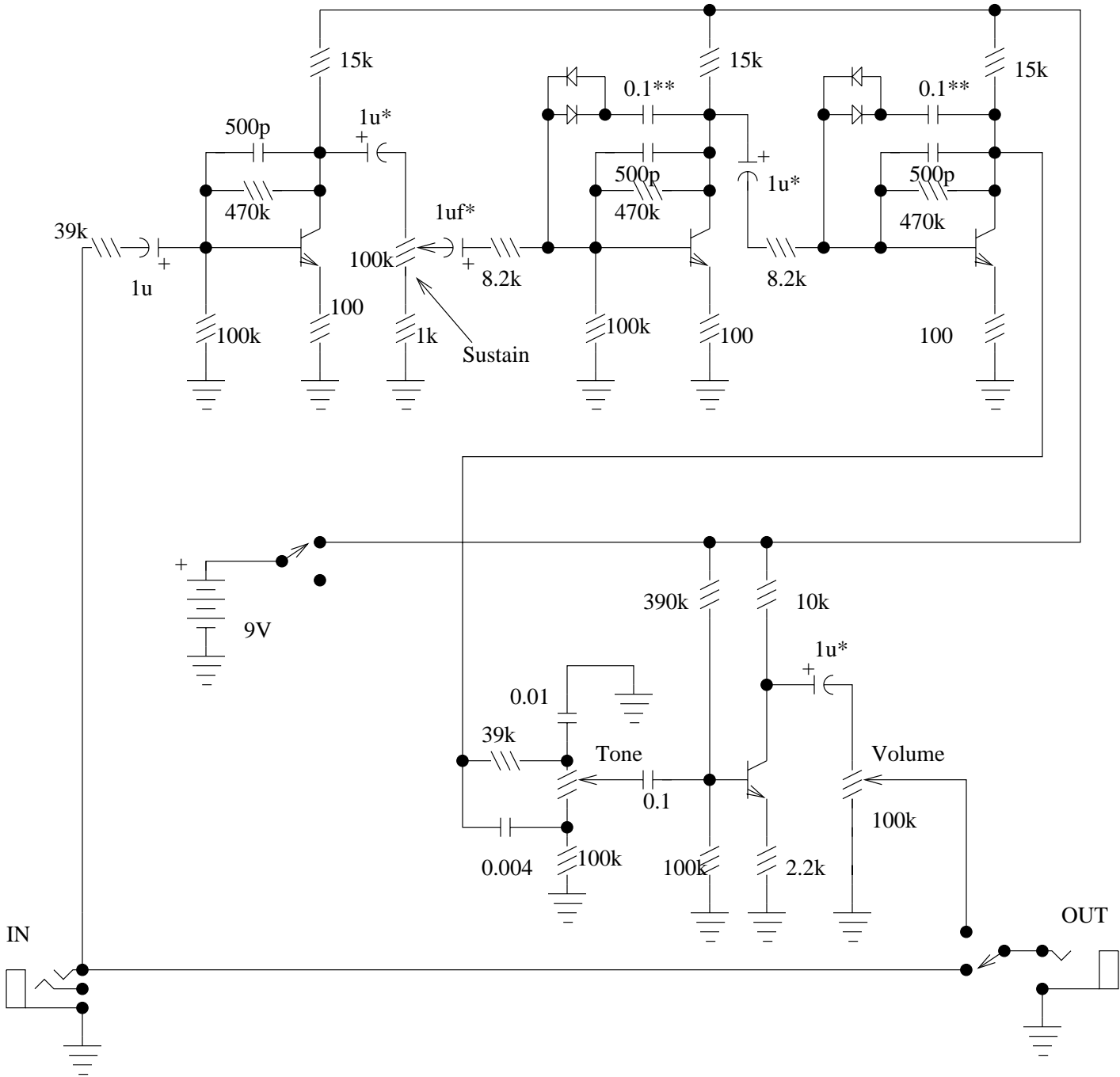




## Blue Clipper



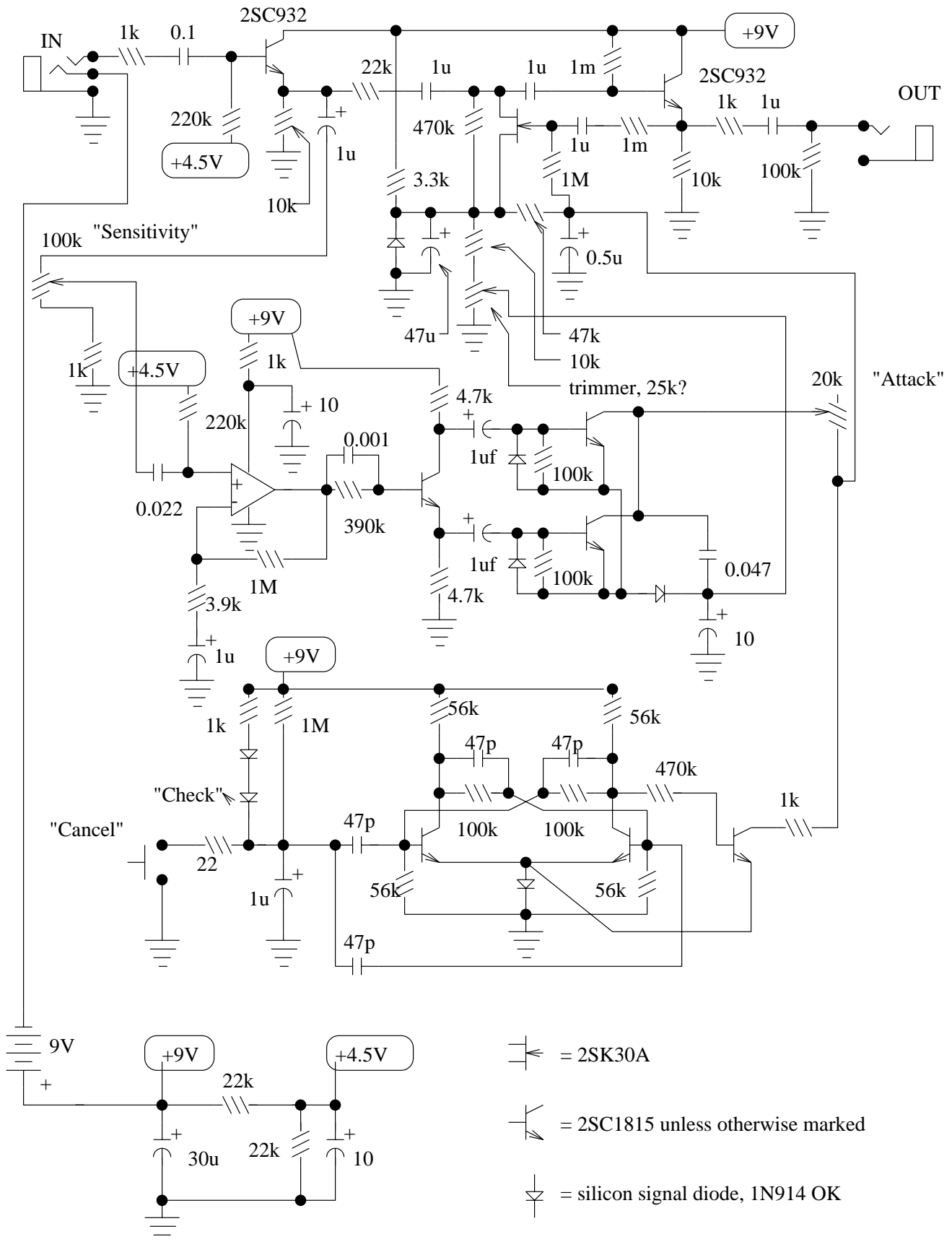
## ELECTRO-HARMONIX BIG MUFF PI



The EH Big Muff Pi would probably be improved by modern input-jack power switching and a DPDT bypass switch.

This is the original schematic. The diode and transistor types are unknown. Probably any high gain NPN and 1N914s work. Coupling caps marked by a \* have been reported to sound better if changed to 0.1uf as have the \*\* marked ones if changed to 1.0uf. The original transistors were marked SPT 87-103, and the original diodes were marked 525GY or 523GY (hard to read).

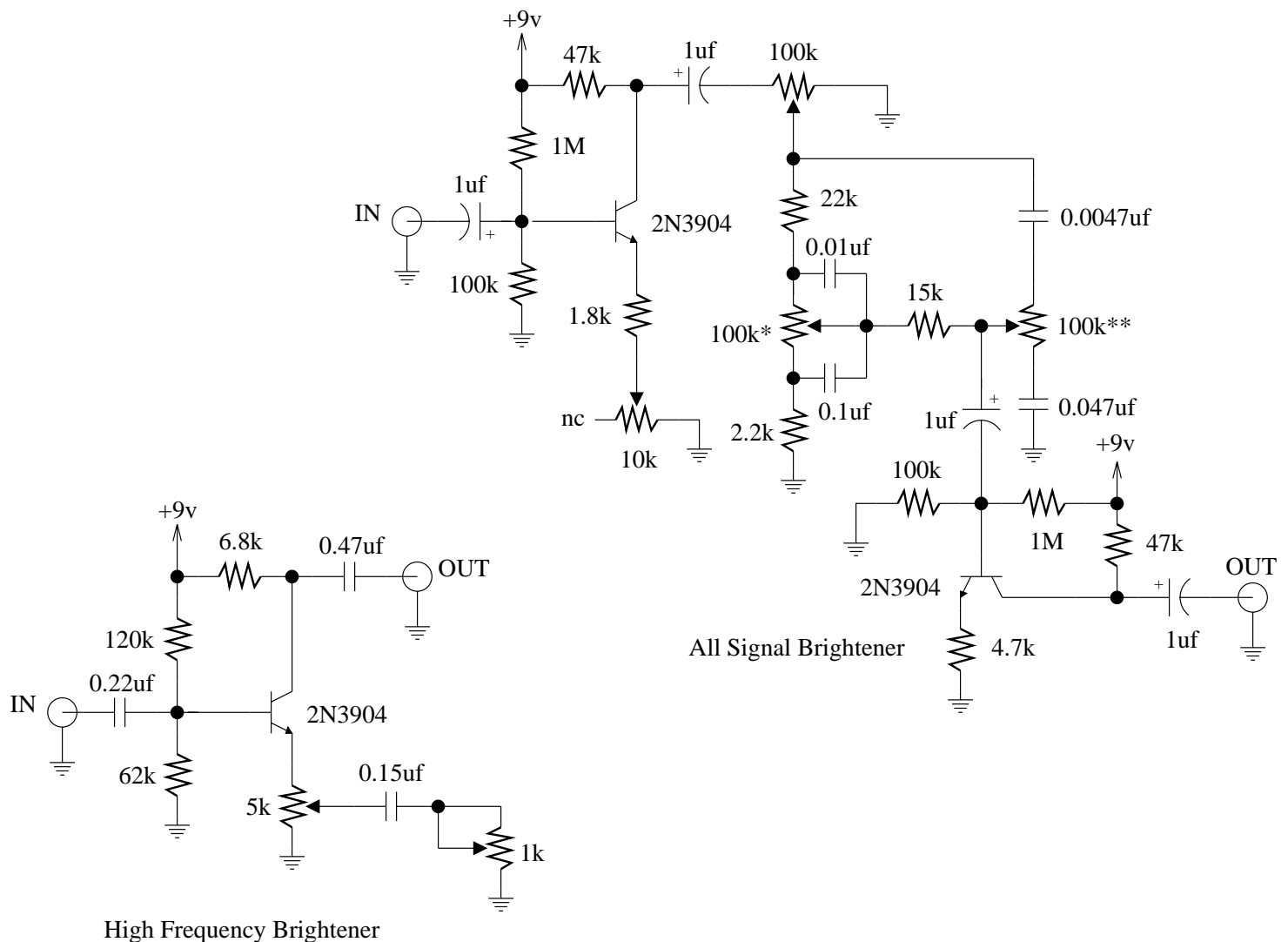
## BOSS Slow Gear SG-1 Attack Delay



The SG-1 is an attack delay unit. A struck note is at first inaudible, then fades up, similar to a reversed tape recording.



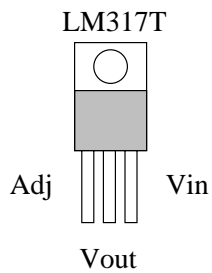
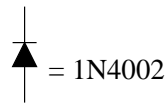
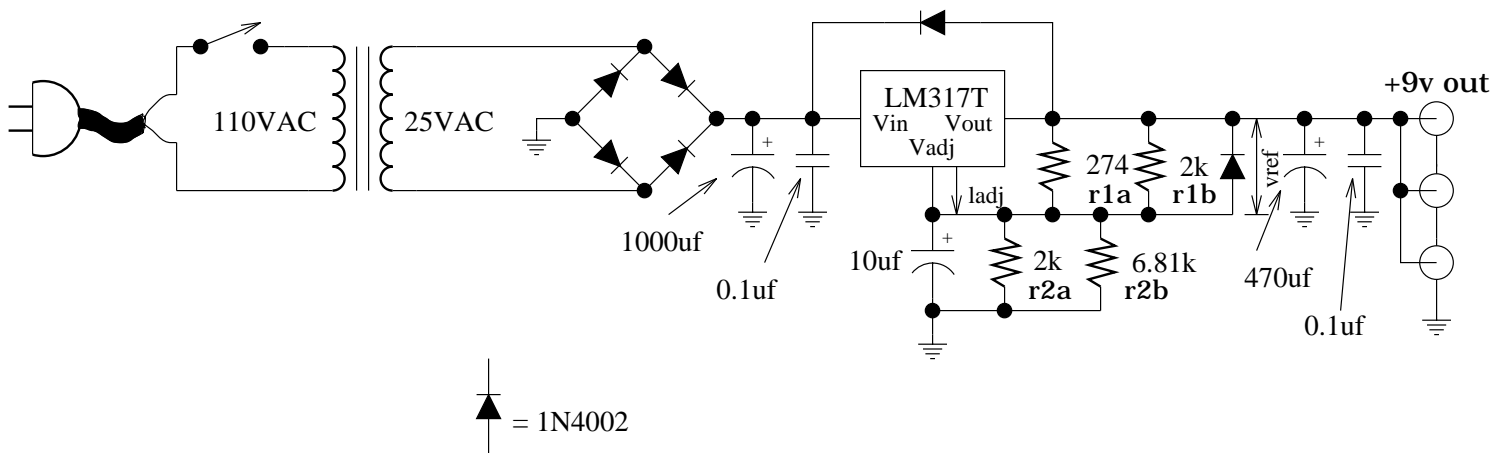
# Frequency Brighteners



These two effect modules are not actually "guitar" effects per say, but rather synth modules that will work on any analog signal. The input and output impedances may need altering depending on your needs. The high frequency brightener is nothing more than a simple treble booster with a gain control (1k) and an intensity control (5k). The all signal brightener, however, has a separate control for brightening the low end (100k\*) as well as the high end of the frequency spectrum (100k\*\*). The 10k trimmer is a set and forget type adjustment. Set it so the circuit breaks into oscillation, then back up the setting to the point where the oscillation just stops. These two modules were excerpted from *Music Synthesizers - A Manual of Design and Construction* by Delton Horn; TAB Books, 1984.

# Ultra-Clean 9vdc Power Supply

Designed by Rick Barker



274 2k

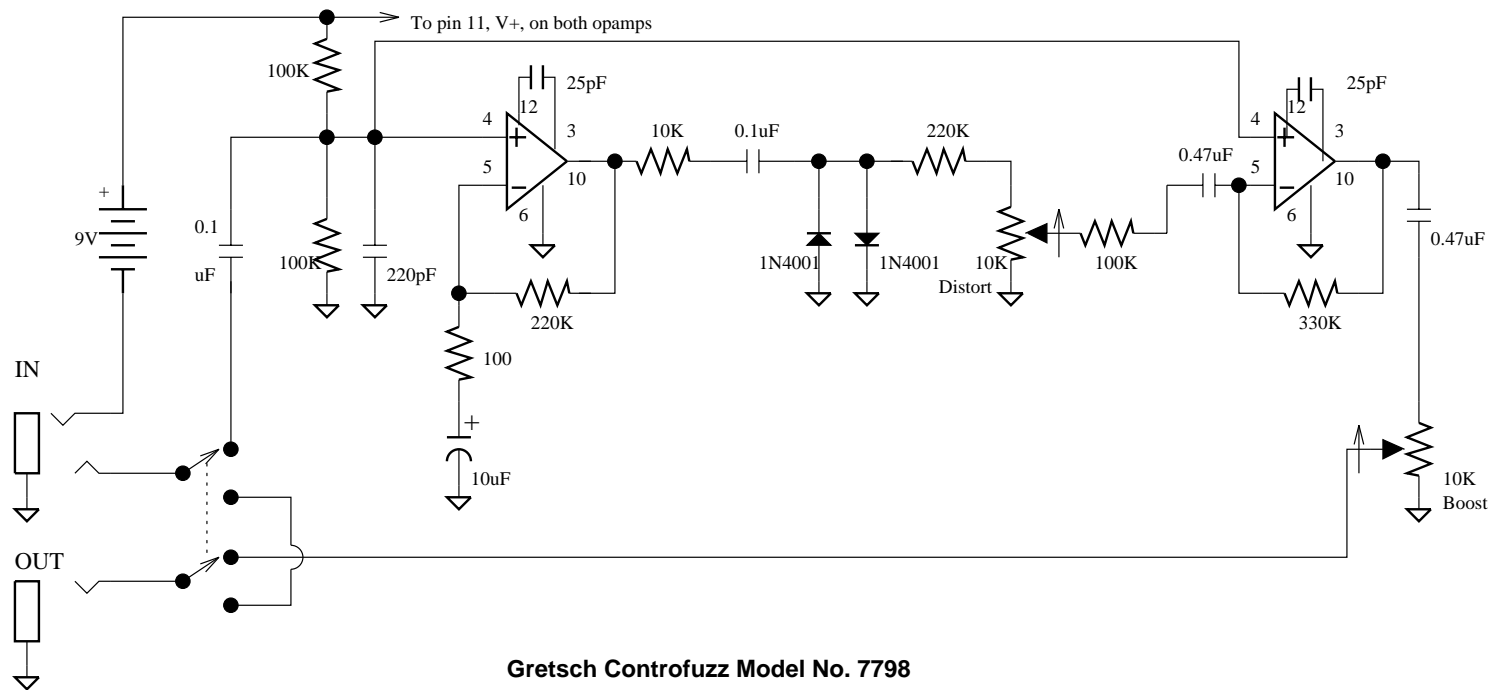
$R1 = r1a \parallel r1b = 241 \text{ ohms}$

$R2 = r2a \parallel r2b = 1456 \text{ ohms}$

**Vref = 1.25V**

$I_{adj} = 50\mu A$

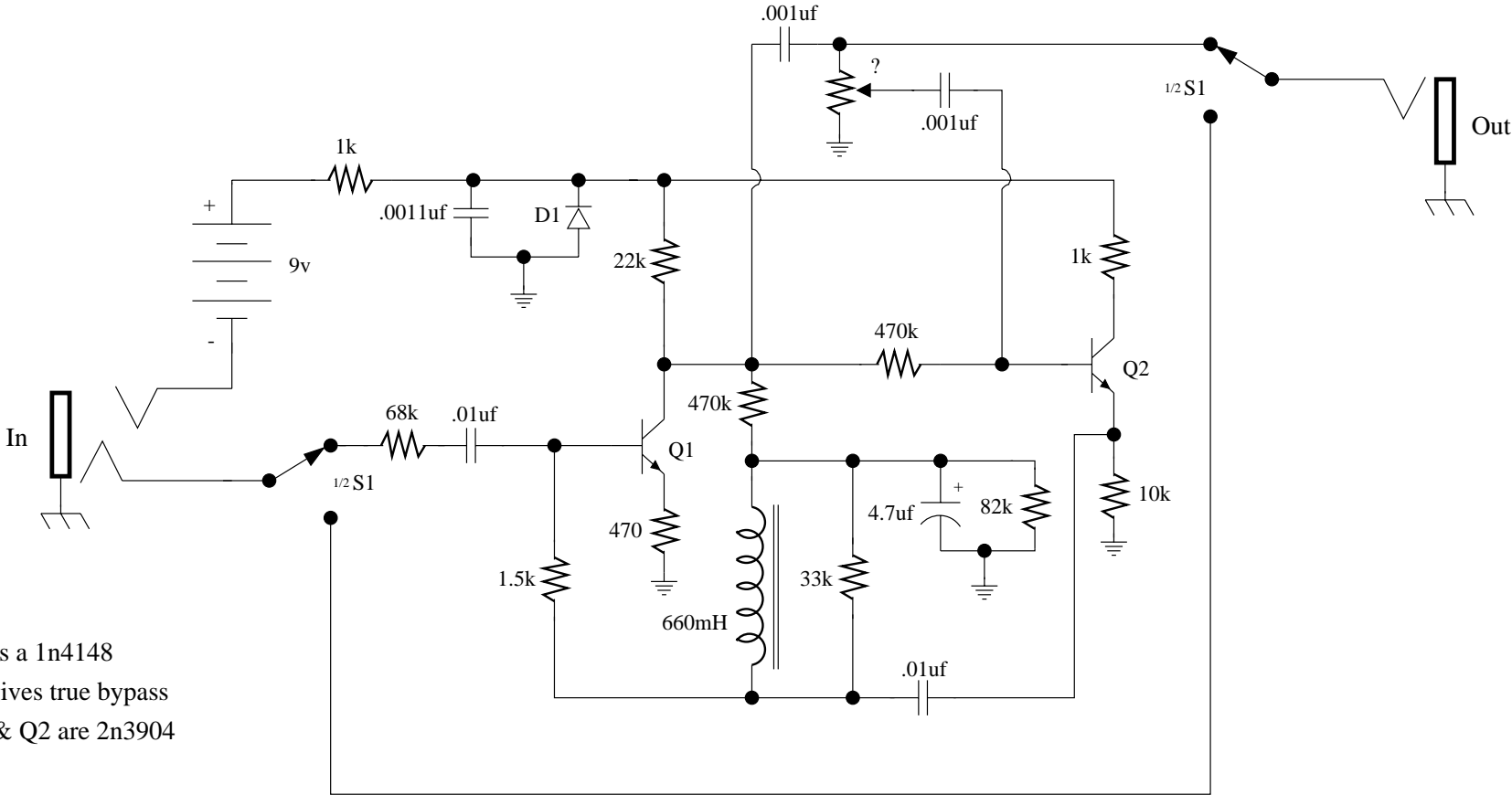
$V_{out} = V_{ref}(1 + R2/R1) + I_{adj} * R2 = 9.35VDC$



The Gretsch Controfuzz is a variant of the op-amp-driving-diode-clipper type of distorter. The only unusual features are that the distortion is run at high boost all the time in the first opamp, and then subtracted from the dry signal in the second opamp. The amount of distortion mixed in is determined by the "Distort" control, and the overall volume level when the distortion is switched in is set by the "Boost" control.

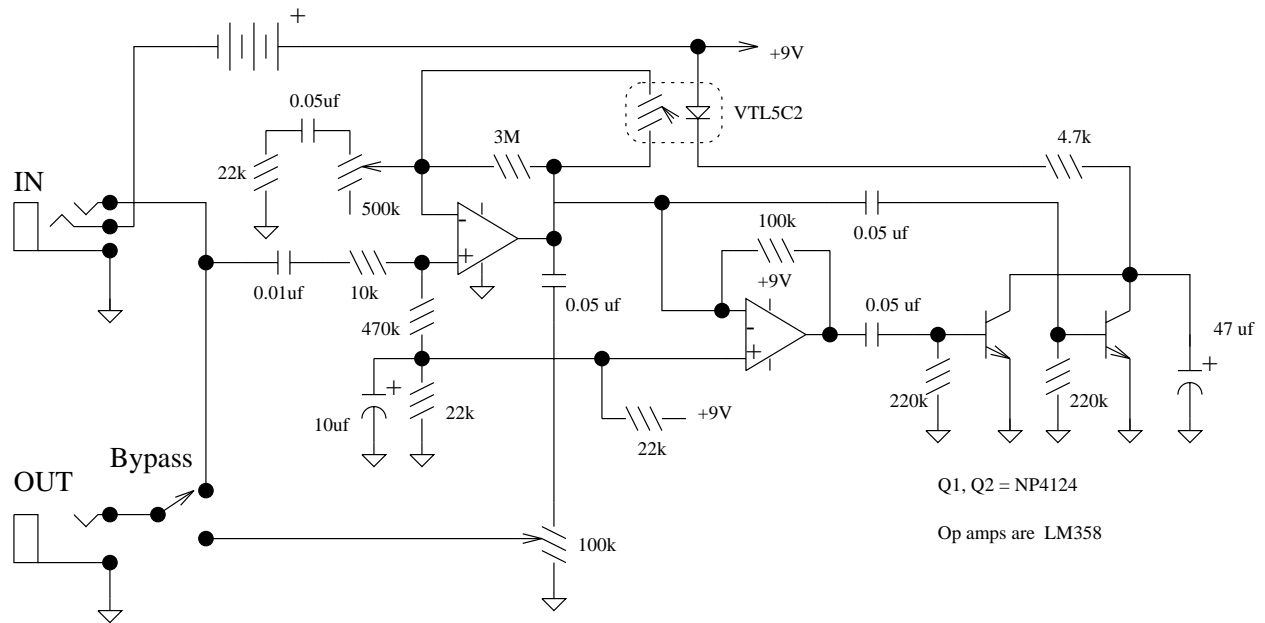
The op amps are both type 748, which needs a compensation capacitor (25 pF in this case) to be stable. Other modern opamps should work.

# *Dunlop Cry Baby Wah Wah*



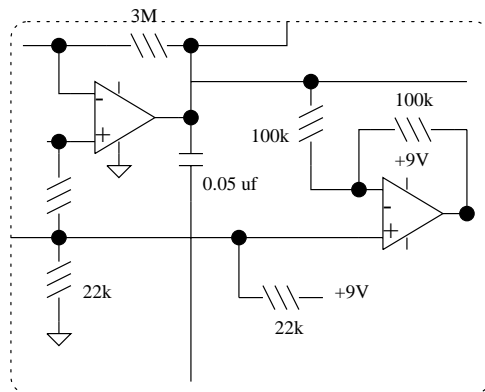
- D1 is a 1n4148
- S1 gives true bypass
- Q1 & Q2 are 2n3904

## DOD Compressor 280A

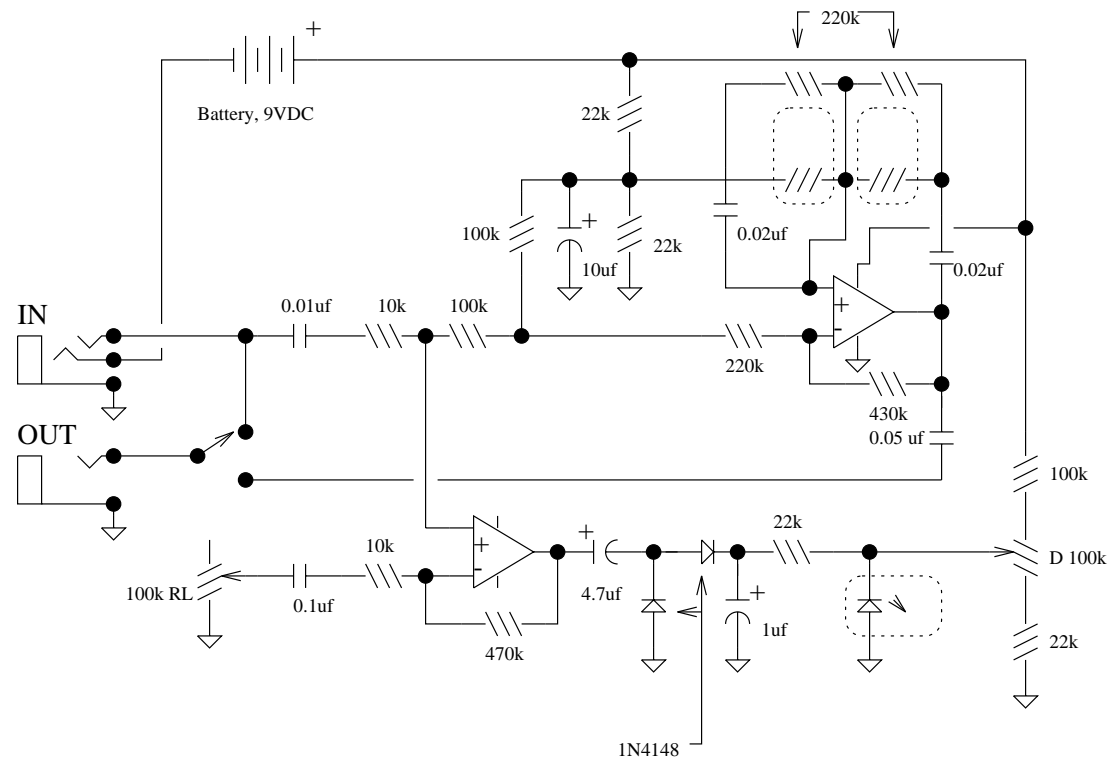


This is the original schematic, but it looks funny to me. I think that there should be a 100k resistor at the (-) input of the second opamp to make it a pure inverter. As it is, that stage would have a very large voltage gain, unbalancing what I think works as a full wave rectifier/current source for the LED in the compression feedback loop. I would expect that the proper circuit is as shown in the fragment below.

I think the VTL5C2 LED/LDR module could be replaced with a CLM6000 if you could find one of those.



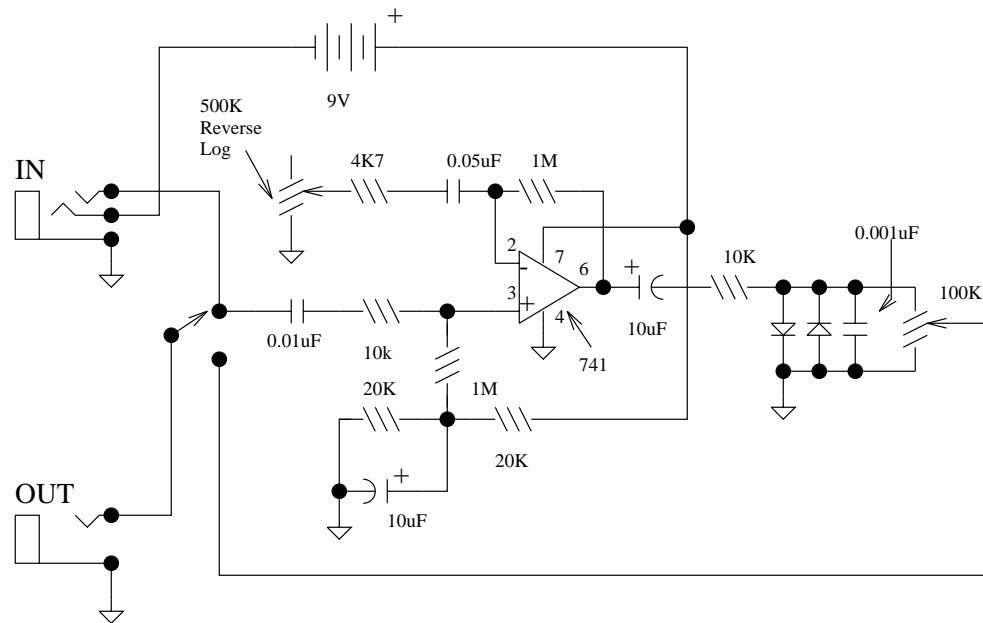
## DOD Envelope Filter 440



Opamps are each 1/2 of TL022 dual low power opamp. LED/LDR module is unknown, but is probably a Vactec VTL module with LED to center-tapped LDR.



## DOD Overdrive 250

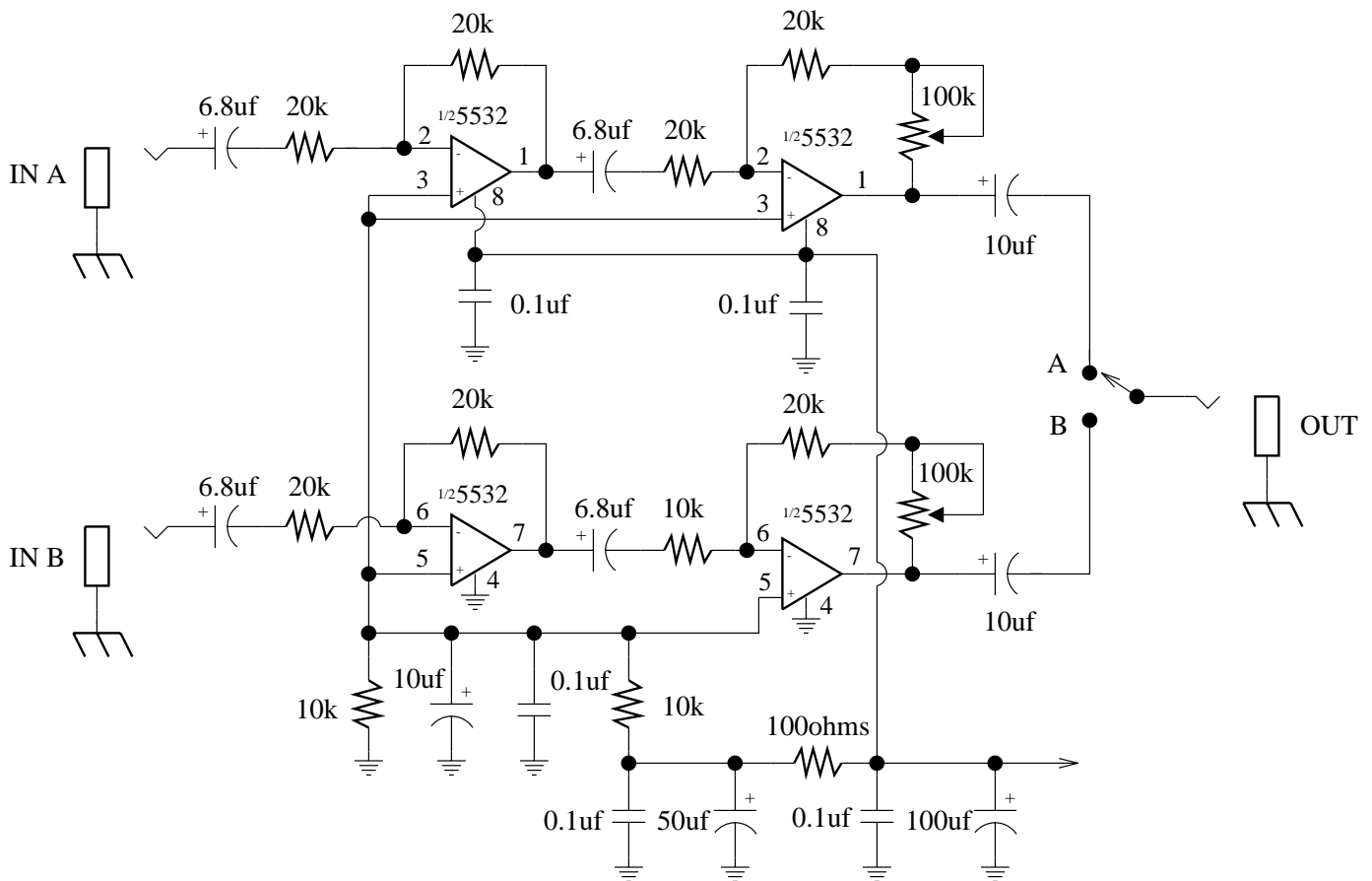


The DOD Overdrive 250 is Yet Another 741 With Two Diodes On The Output. It is almost exactly the same as the MXR Distortion Plus, and a number of other units.



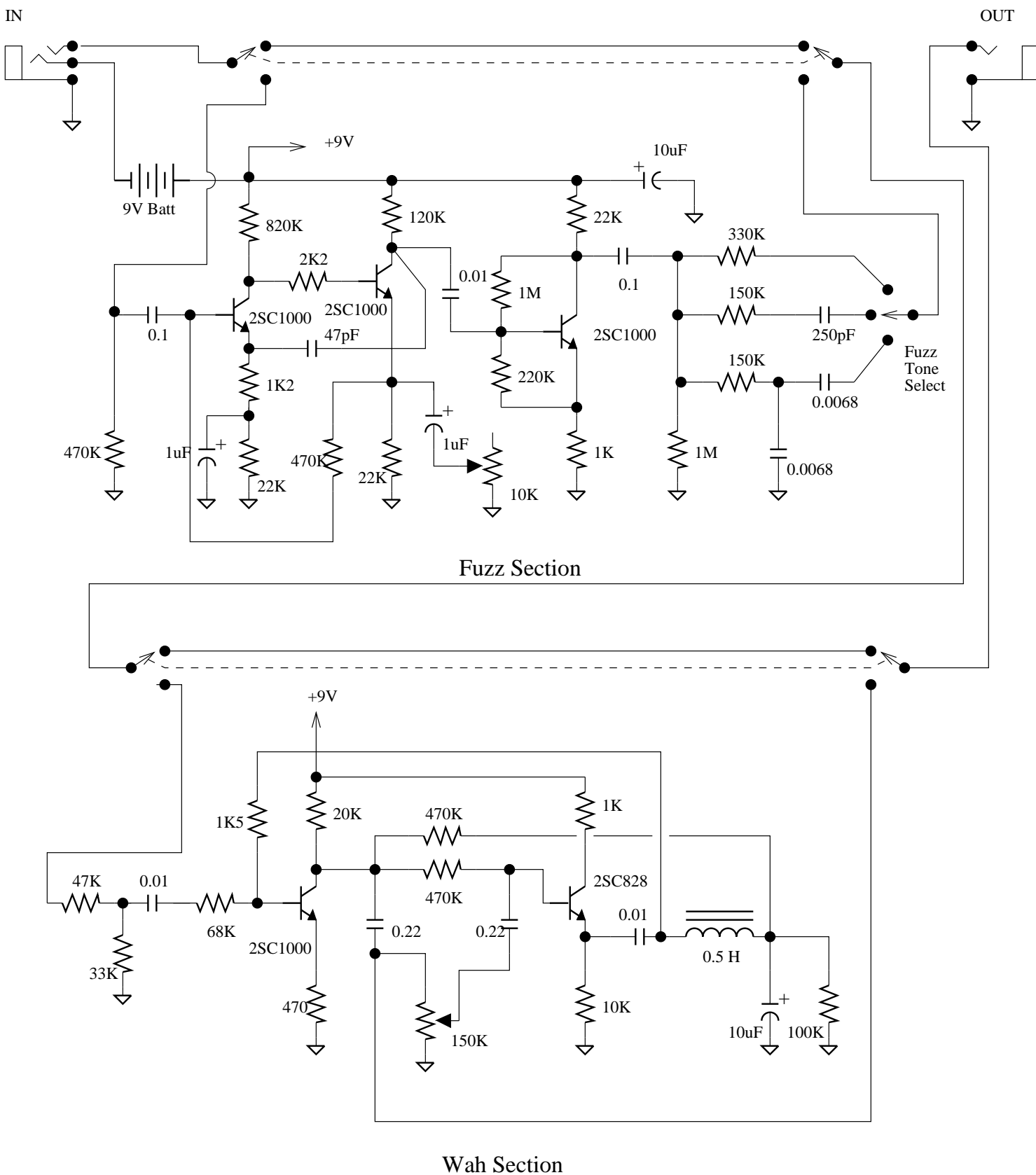
# Dual Pre-Amp & A/B Box

Designed by Rick Barker



This low noise preamp & a/b box was originally designed for switching between different harmonica mics.

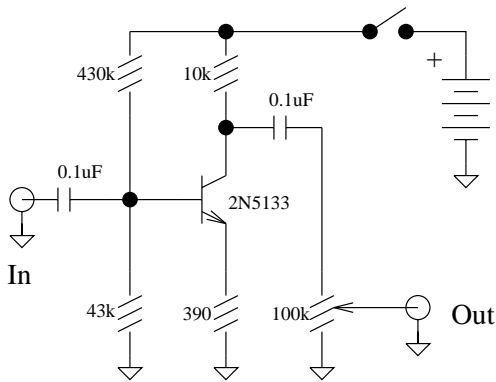
# Roland Double Beat



The Double Beat is another of those funky, funky Fuzz Wahs. The wah function is pretty standard, if a little quiet because of the resistive divider in front of the wah section cutting the signal down. The Fuzz section is pretty good, though. It has a good sound - no surprise as the first section is a lot like a Fuzz Face, but is followed up by yet another gain stage to distort even more. The three fuzz tone selections are **RADICALLY** different from each other.

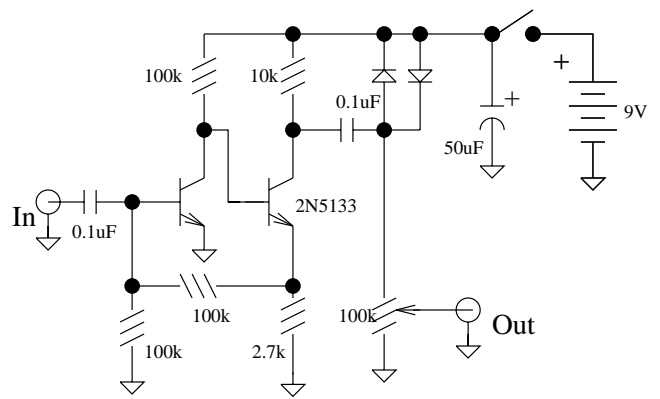


## ELECTRO HARMONIX BOOSTERS

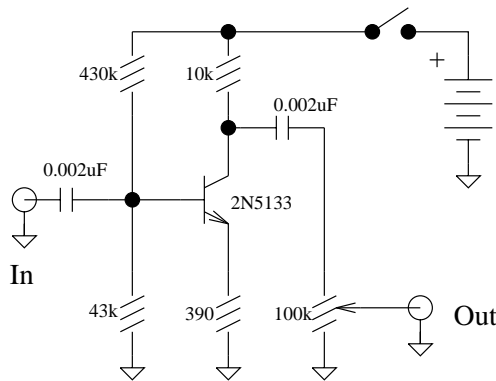


LPB-1, LPB-2, EGO

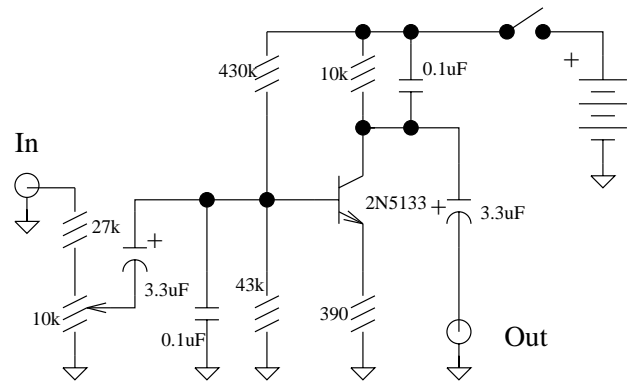
Other variations on the LPB-1 include a BC239 with a 100k resistor from base to ground and a 1M resistor between base and collector.



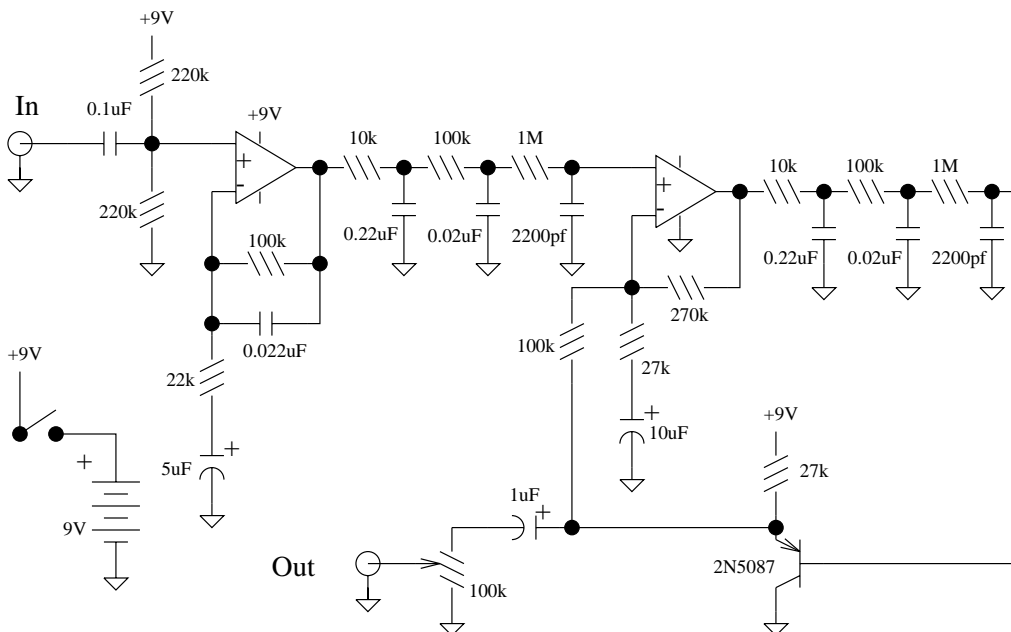
Muff Fuzz / Little Muff Pi (early)



Screaming Bird/Tree



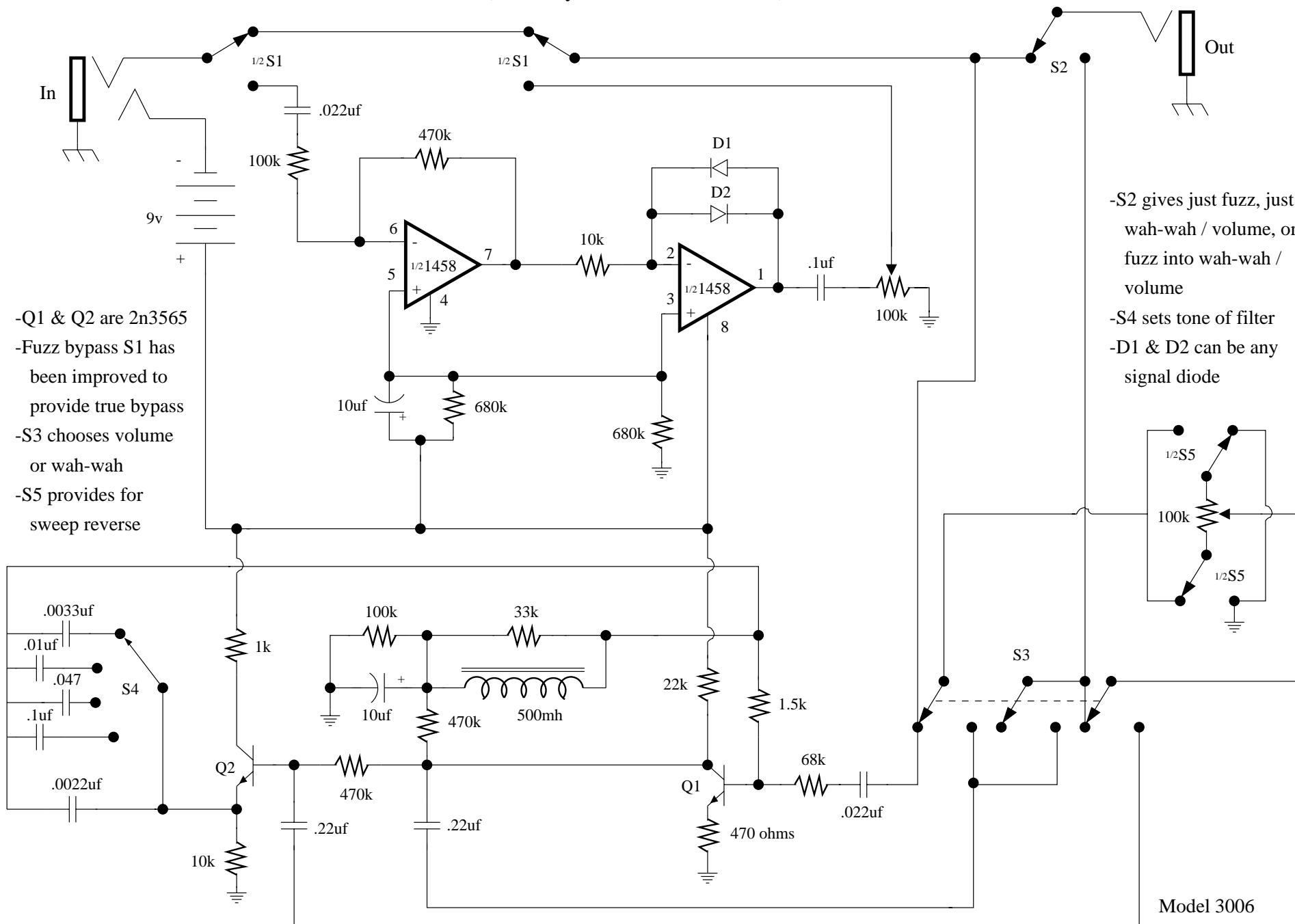
Mole/ Hog's Foot (Old Version)



Hog's Foot (new)

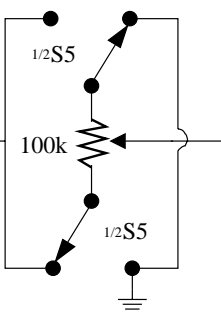
# Electro Harmonix Fuzz-Wah

(Actually Fuzz-Wah/Volume)



- Q1 & Q2 are 2n3565
- Fuzz bypass S1 has been improved to provide true bypass
- S3 chooses volume or wah-wah
- S5 provides for sweep reverse

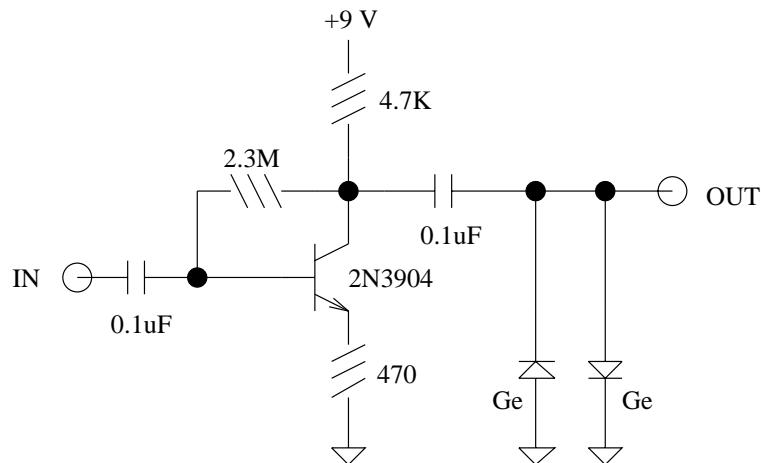
- S2 gives just fuzz, just wah-wah / volume, or fuzz into wah-wah / volume
- S4 sets tone of filter
- D1 & D2 can be any signal diode



Model 3006

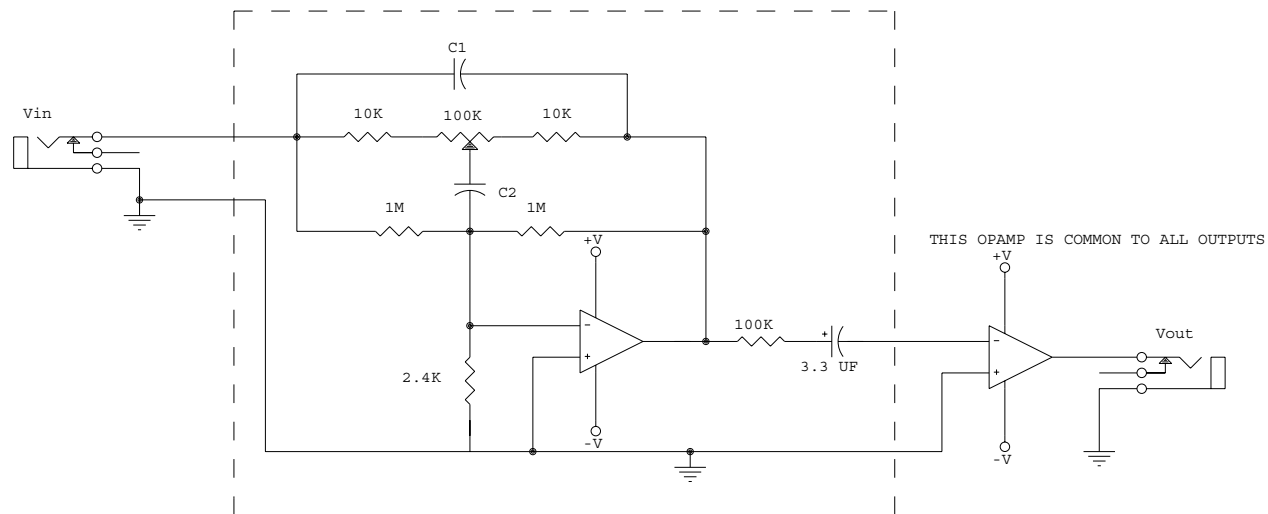


## ELECTRA DISTORTION



This distortion was posted to the net by Bruce E. (?), bew4568@zeus.tamu.edu on 5/14/94. It is supposed to sound amazingly like a Tube Screamer. With the exception of the diodes, the circuit is the same as the circuit for the Electra Power Overdrive module, which was fitted inside some Electra guitars in the 70's. It's important to use germanium diodes to get the right sound. Silicon is supposed to produce more power and less distortion. Ge gives 0.4 volts of signal out, Si gives 1.4 volts. The values of the collector and emitter resistors can be changed to give more or less gain and distortion. The unit is not just a hard diode clipper, as the diodes load the output of the transistor and modify its gain as they turn on, giving softer clipping than you would expect.

REPEAT CIRCUIT IN BOX FOR ALL FREQUENCIES.  
THE TABLE GIVEN BELOW SPECIFIES COMPONENT  
VALUES FOR C1 AND C2.



\* A SUGGESTED OPAMP WOULD BE A TL082 OR SIMILIAR LOW NOISE OPAMP

CHANNEL CENTRE FREQ. (IN Hz.)	C1	C2
32	180nF	18nF
64	100nF	10nF
125	47nF	4.7nF
250	22nF	2.2nF
500	12nF	1.2nF
1000	5.6nF	560pF
2000	2.7nF	270pF
4000	1.5nF	150pF
8000	680pF	68pF
16000	360pF	36pF

FROM ENCYL. OF ELECTRONIC CIRCUITS (VOL. 2)

DESIGN FIRST PUBLISHED IN  
ELECTRONICS TODAY INTERNATIONAL

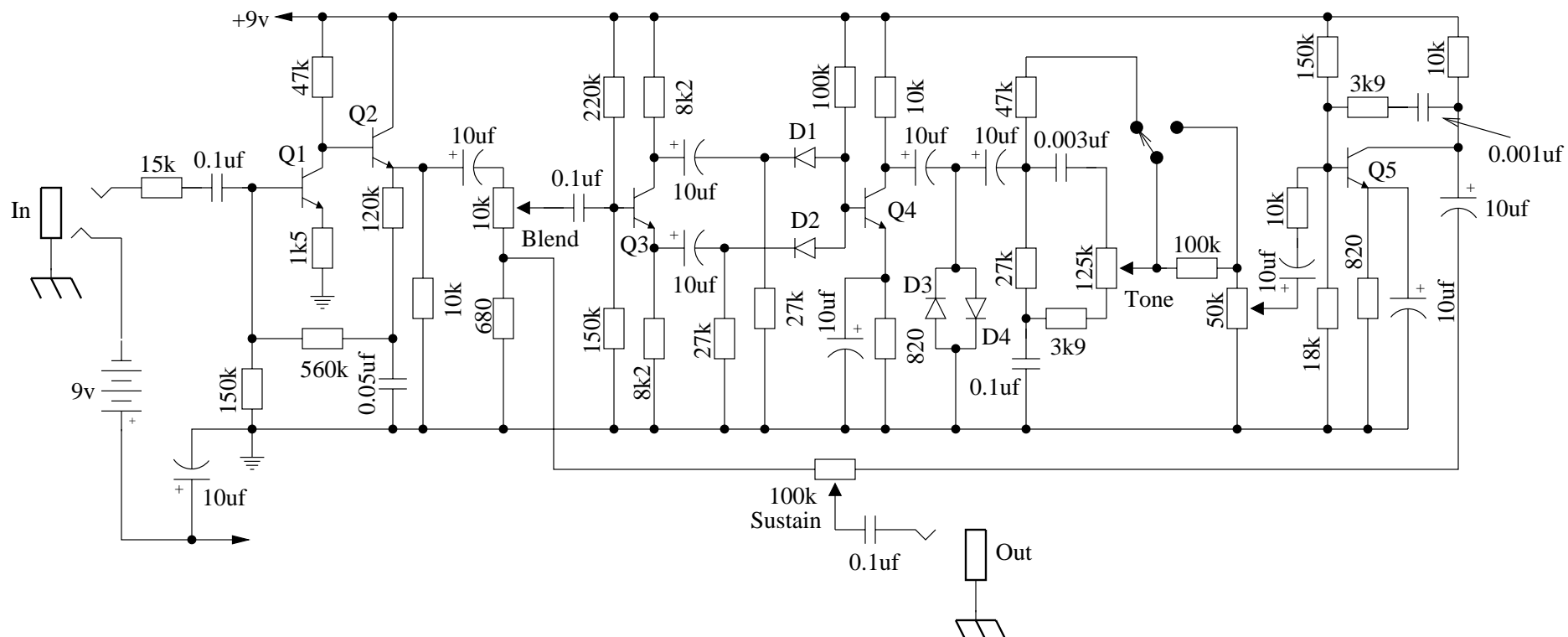
Title

TEN BAND GRAPHIC EQUALIZER

Size	Document Number	REV
A	DRAWN BY: FABIAN P. HARTERY	1
Date:	February 16, 1995	Sheet 1 of 1



Name: Fender Blender	Manufacturer / Designer: Fender	Revision: 11/18/95	Model #
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All resistors 5% (many of the originals were actually 10%) 1/2W

All capacitors minimum 25V

Q1 & Q2 - 2N3391A

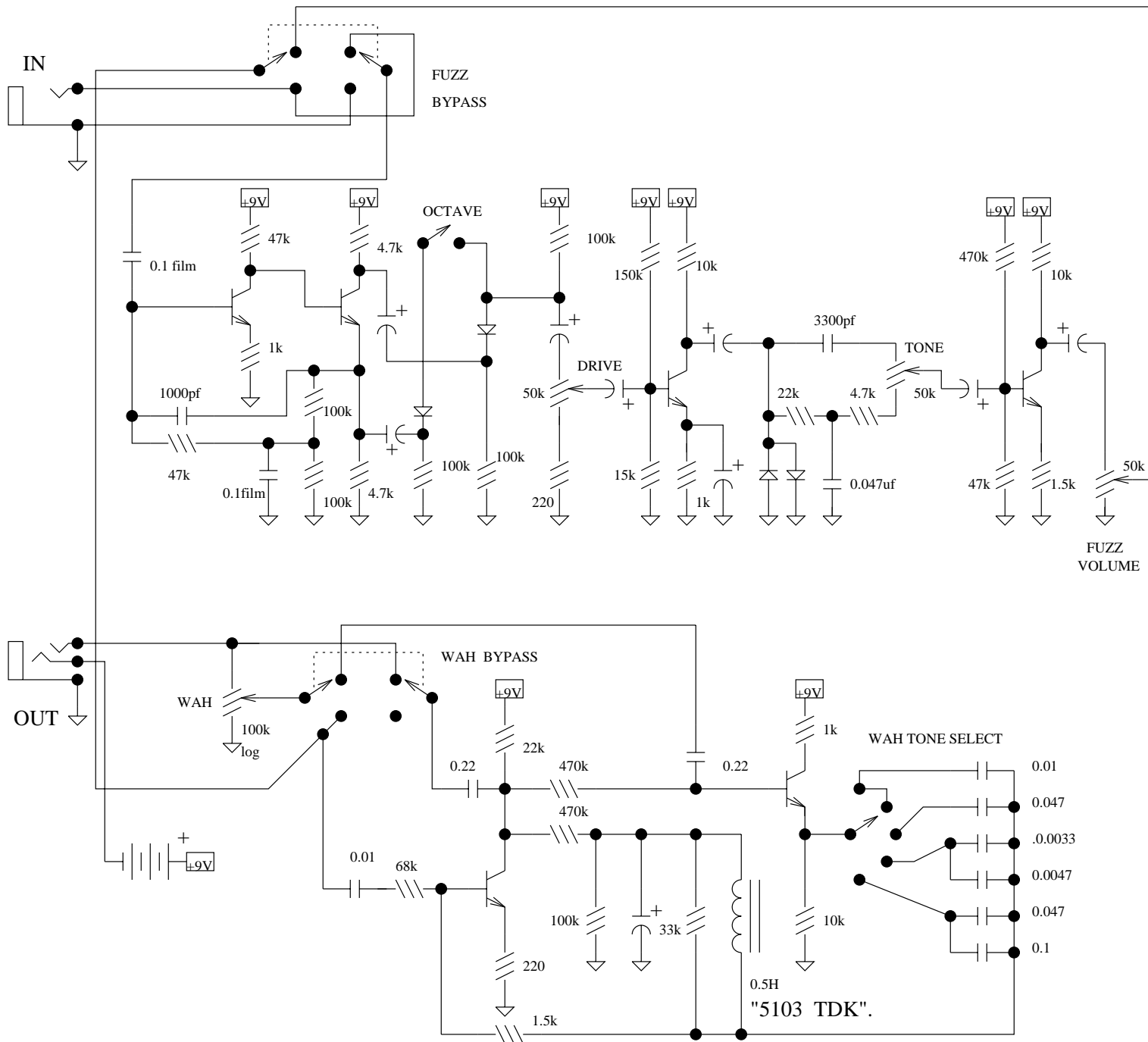
Q3 to Q5 - 2N3391

D1 to D4 - 1N276

Original switching scheme was a spdt, not true bypass. This effect would benefit from a true bypass mod.

The effect itself is a distortion with octaving.

## FOXX FUZZ-WAH



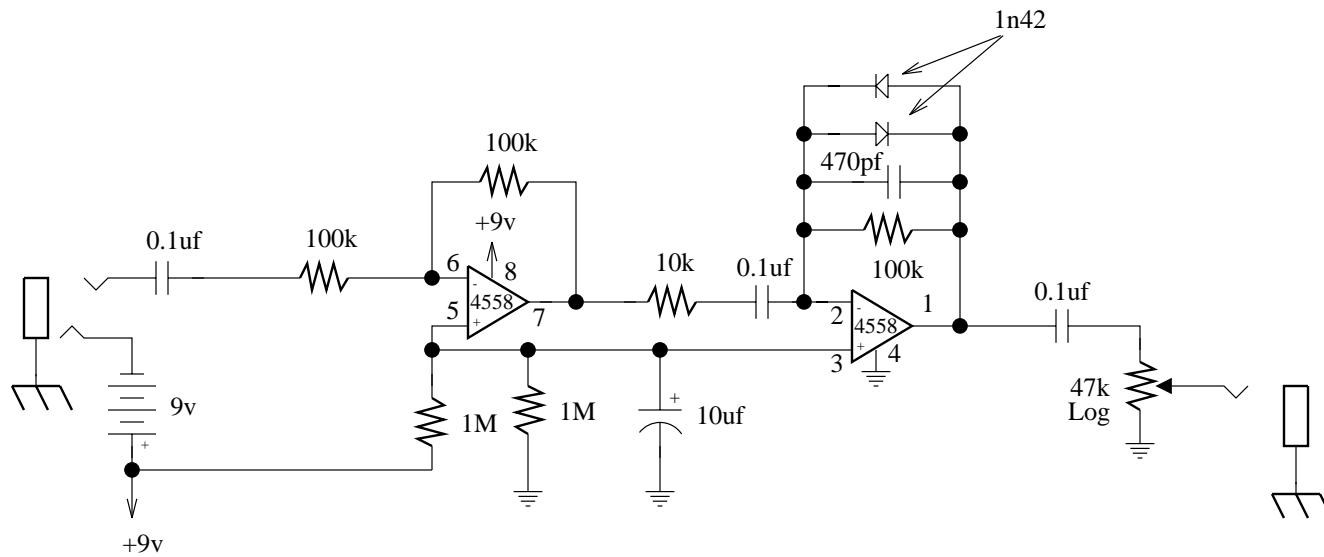
The Foxx Fuzz Wah includes a fuzz, an octave effect, a wah pedal, and in later versions a volume pedal all in the same box. The box, by the way, is covered in blue or red no-fussing stiff plastic fuzz. The wah has four different resonant frequencies selected by a rotary switch. The inductor should be relatively easy to find, as it looks to be a somewhat standard part. The volume pedal action is the default when wah is bypassed. Max volume is with the pedal all the way back, very odd.

- All transistors 2N3565-R249, NPN silicon in little plastic button packages.
- All diodes germanium
- All unmarked electrolytic capacitors 10 uF, 16Vdc.

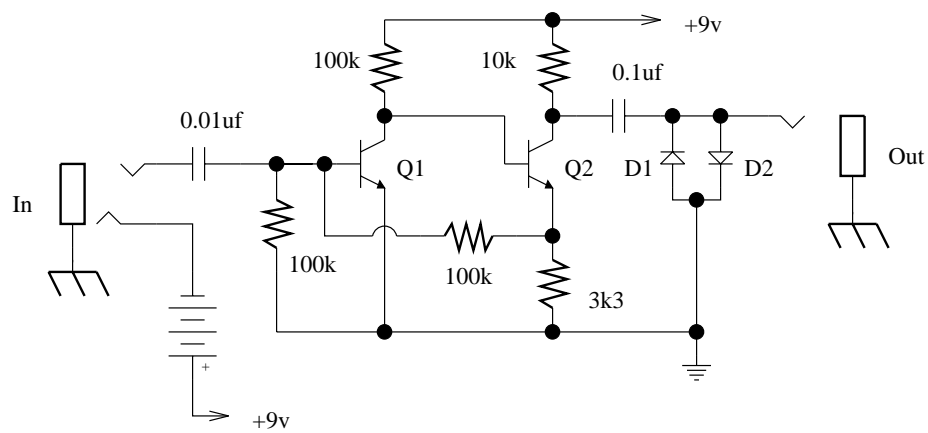
The fuzz and octave section MAY be a copy of the Octavia pedal.

Note that the Wah pot is log (audio) taper. The wah sound is really sensitive to the positioning of the wah pot's rotation in the rack-and-pinion.

## Fuzz 001 - Unknown Commerical Source



# Distortion Booster



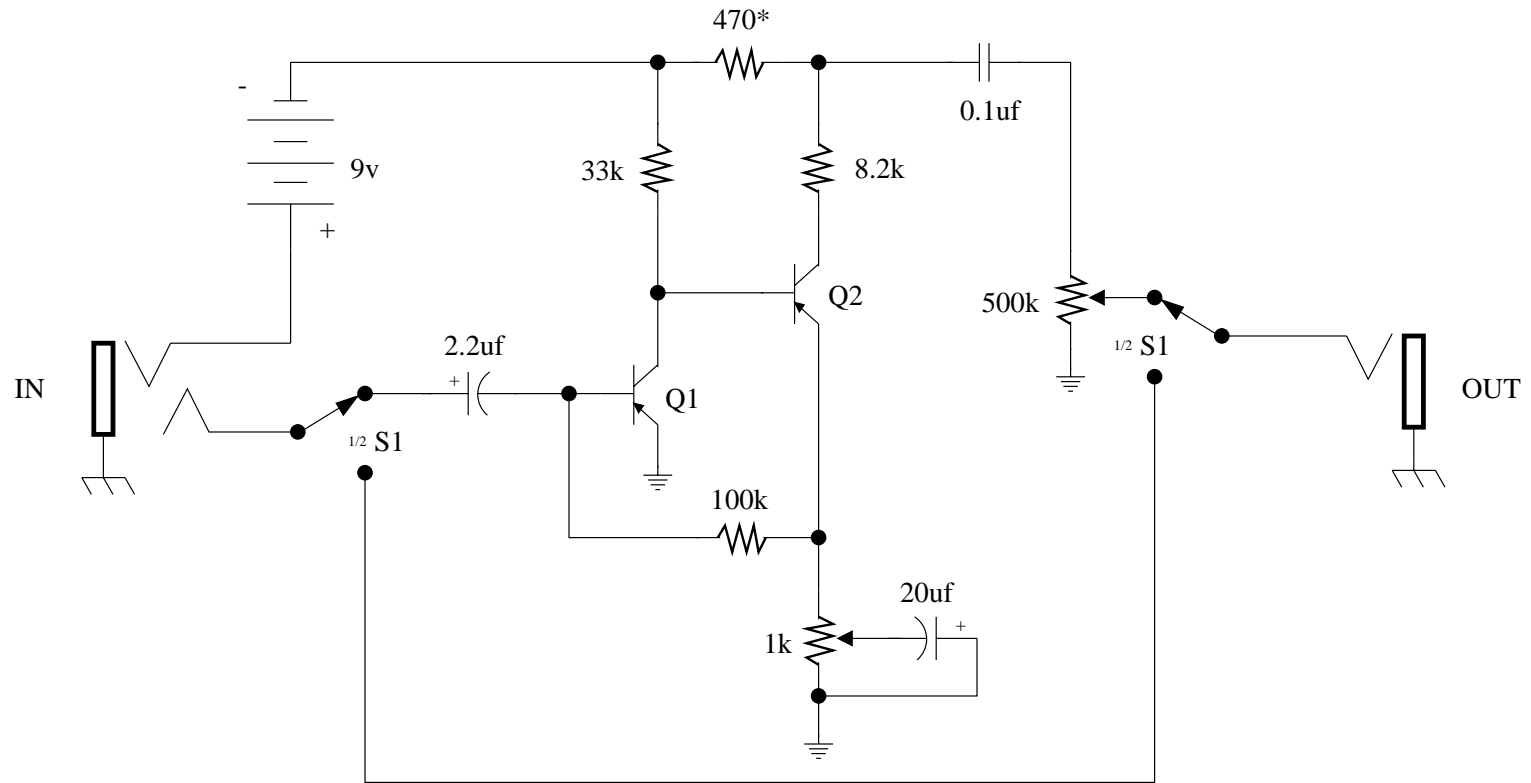
Q1 and Q2 are BC108

D1 and D2 are silicon or germanium (pick your favorite flavor) signal diodes.

-make unknown...

# ***Fuzz Face***

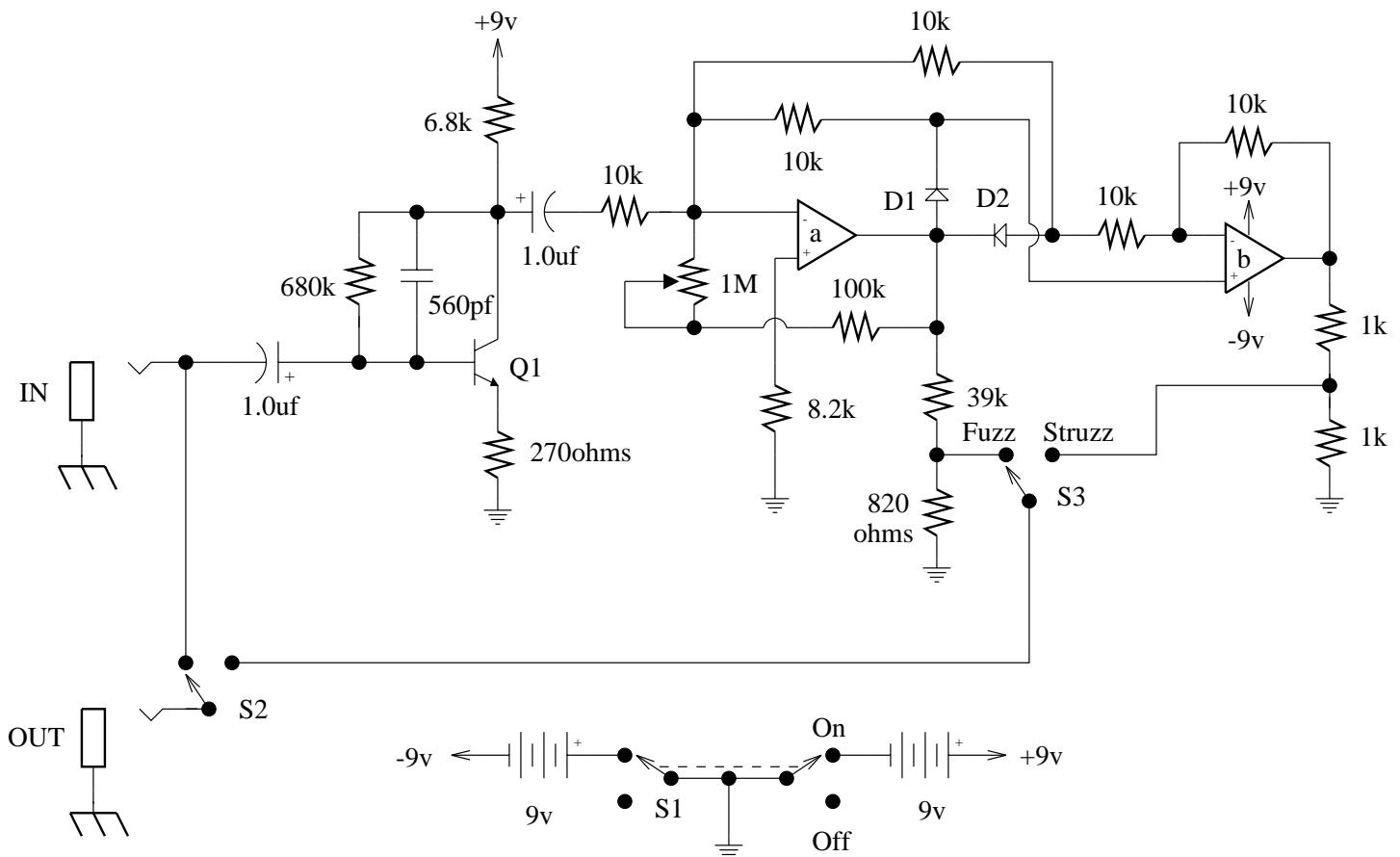
## *Dallas Arbiter*



There are apparently two similar versions of the fuzz face. In one Q1 and Q2 were PNP germanium AC128 or NKT275 types in the other they were NPN silicon BC108C types. Now depending on which type you choose to build will influence some of the other components. For a PNP version the schematic is as shown, but if you build the NPN version then the 470 ohm resistor marked by a \* must be changed to 330 ohms and the battery and all the polarized capacitors must be reversed. The original schematic is not exactly what is shown above, it had a very complex switching system which has been simplified (nothing has been lost don't worry) and a unique grounding setup. Aside from that the schem is exact with minor differences in components on various units (eg. some had the 0.1uF cap listed as .047uF, which shouldn't make a difference as long as you feed a high impedance amp). The transistors are hard to find, the thing to look for is germanium transistors with a decent gain factor (gain > 80). Note silicon transistors will clip harshly and may not sound good, though 2n3906 has been said to work.

# Guitar Effects Unit (Octaver-Fuzz)

extracted from ETI-Canada, January 1980



Q1 is MPS6515

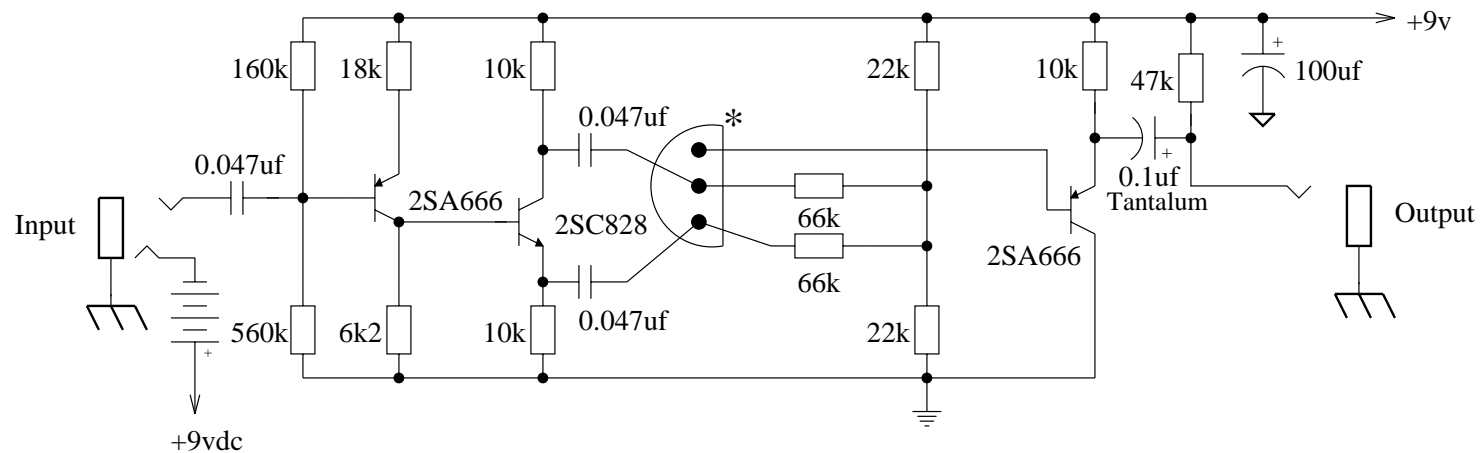
D1 and D2 are 1N4148

The IC is any lownoise dual op-amp, shown is the 4558.

Switching could be improved with a full bypass mod.

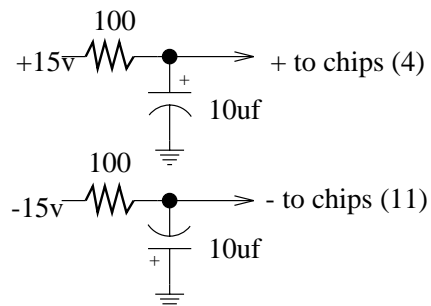
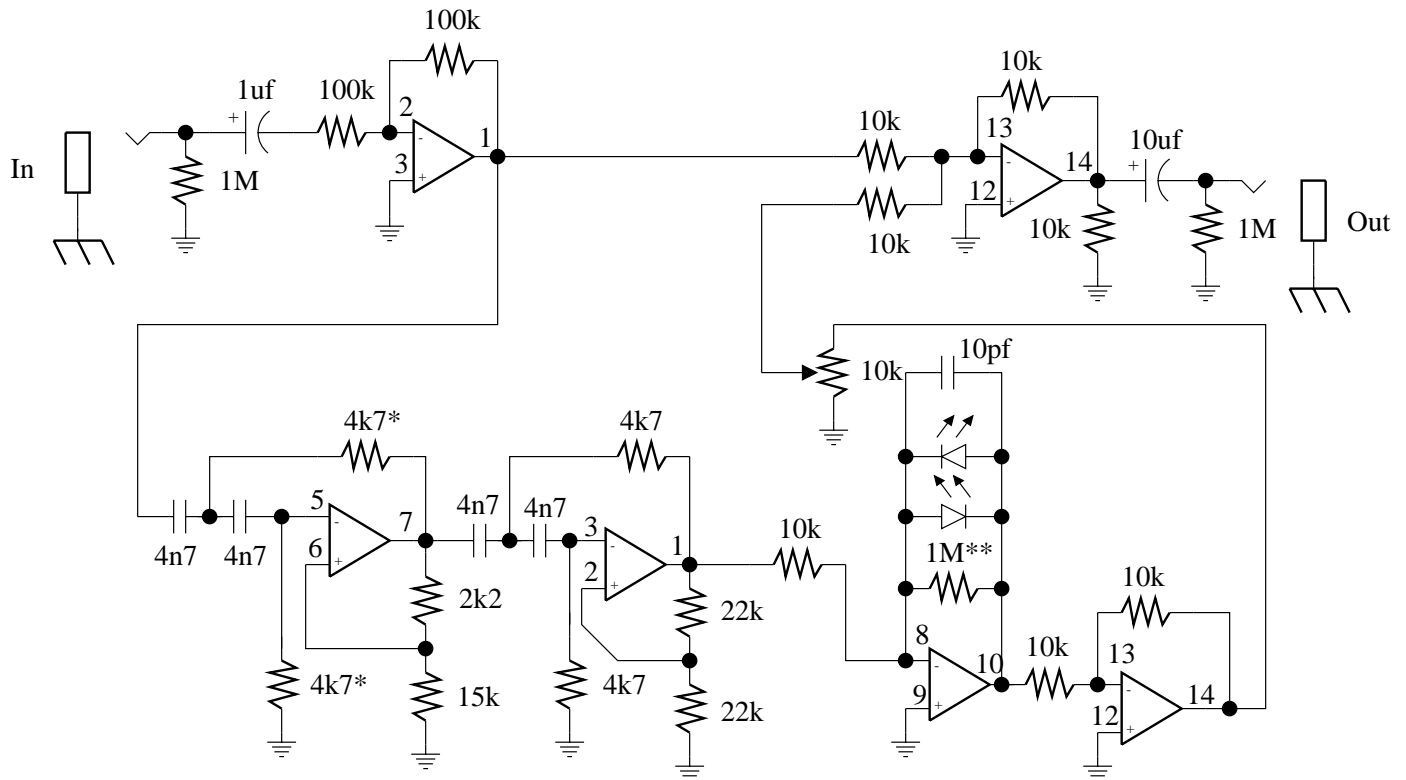
The GEU is good sounding octave fuzz, with an optional mode of just fuzz. The fuzz is a fully rectified signal and is quite chewy. For some the Fuzz alone might not be loud enough, this can be fixed by raising the value of the 820 ohm resistor and lowering the 39k one. Or one could just replace both with a normal volume pot for a more standard approach. The "struzz" is the fuzz with an octave higher signal mixed in. Good for singal notes and leads.

Name: Green Ringer	Manufacturer / Designer: Dan Armstrong	Revision: 9/23/95	Model #
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The transistor marked "\*" has no markings other than three stripes; green, blue, white, from top to bottom. It is PROBABLY a low gain NPN used as a dual diode with the anodes connected together at the base of the final transistor. The continuity test on the device shows no conductivity except that the topmost pin conducts when it is positive of the pins in the middle and other side; otherwise, no conduction. This is what would be expected if it were an NPN with the same pinout (base, collector, emitter) as the other transistors.

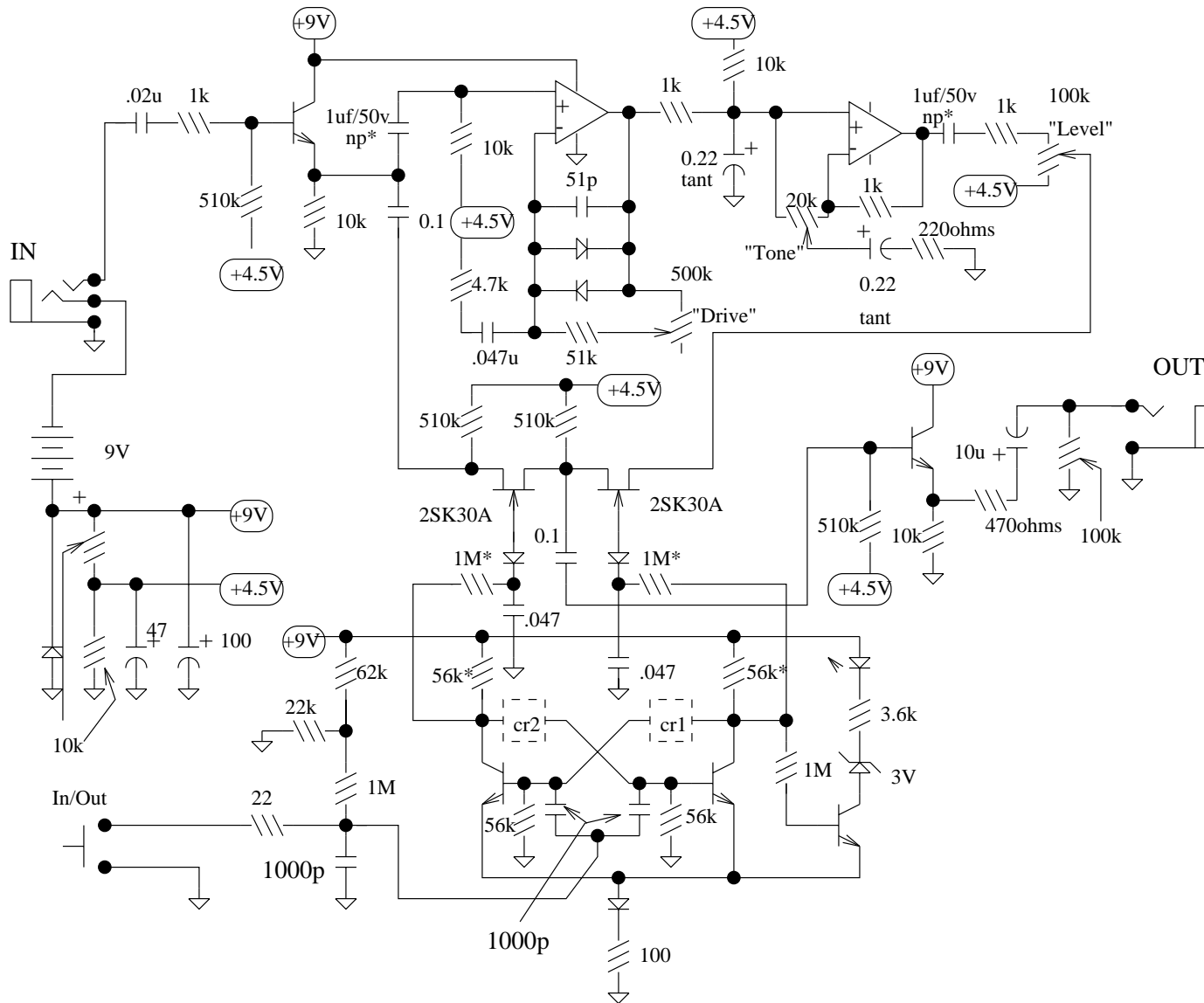
# Harmonic Sweetener



A couple of red led's will work nicely for the clipping section. The op-amps shown are TL074 types with 3 of the 4 amps used. Possible modifications include changing the resistors marked \* to a 10k dual-ganged pot for a tunable filter, and/or changing the resistor marked \*\* to a 2.5 M pot for a drive option.



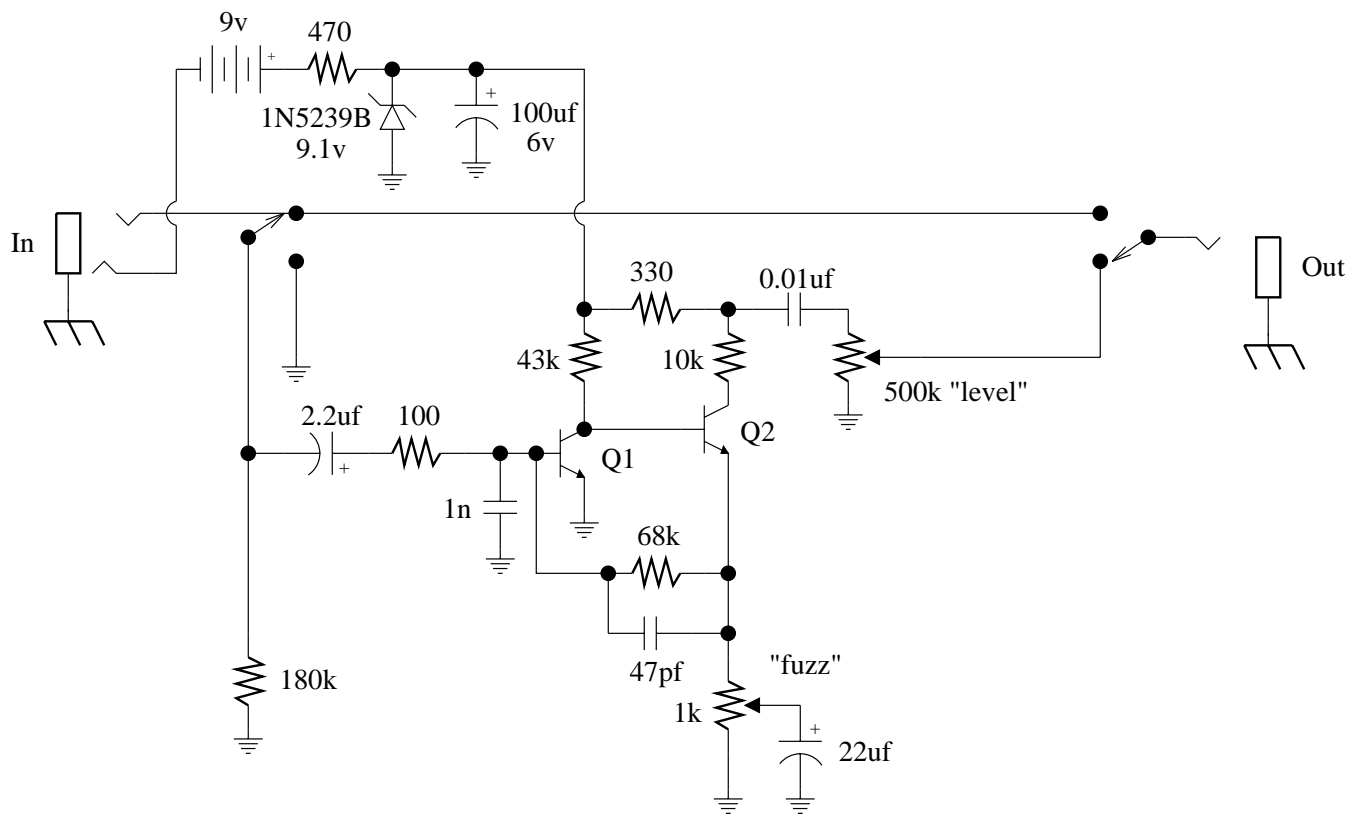
## TS-9 Tube Screamer



Opamps are in a dual 8 pin dip, 4558. All transistors 2SC1815. All diodes silicon signal diodes, 1n914 or similar.  
np\* = nonpolarized resistors denoted by \* marked as 1M on original might be 22k and those marked as 56K  
might be 10k. crf1 and cr2 are a special cap and resistor in parallel, the cap is 51p the resistor is 56k.

# *Jimi Hendrix Fuzz Face*

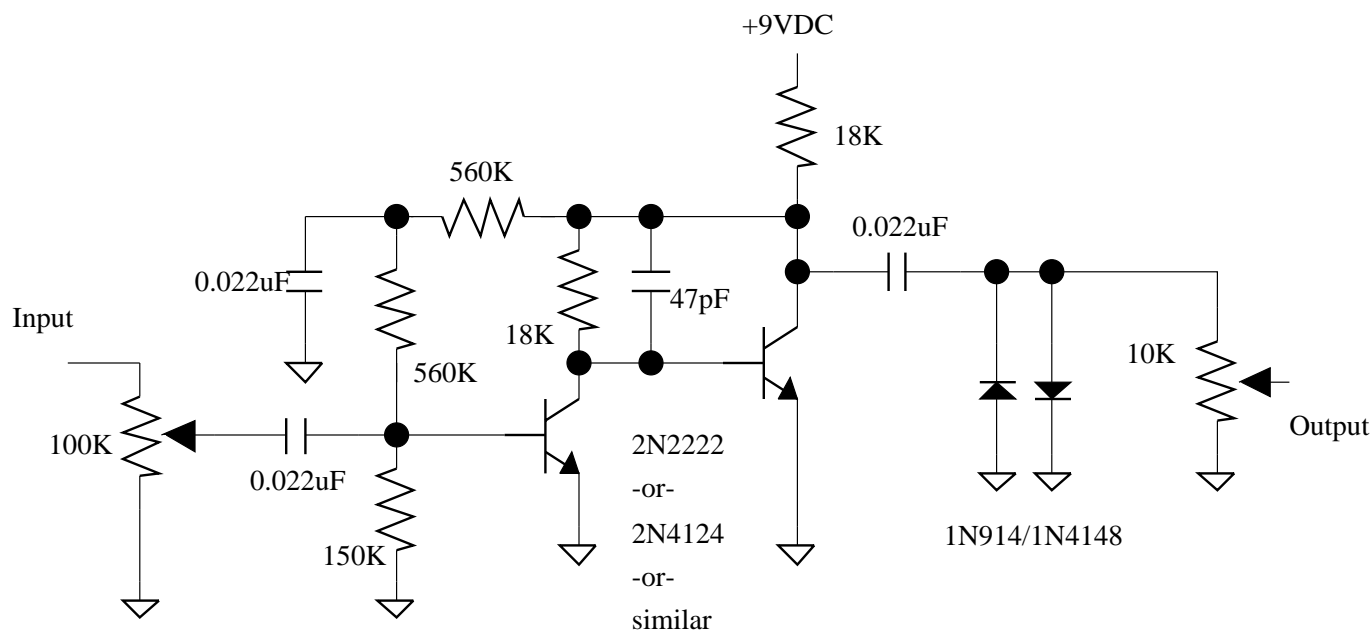
by Jim Dunlop



Q1 & Q2 are MPSA18

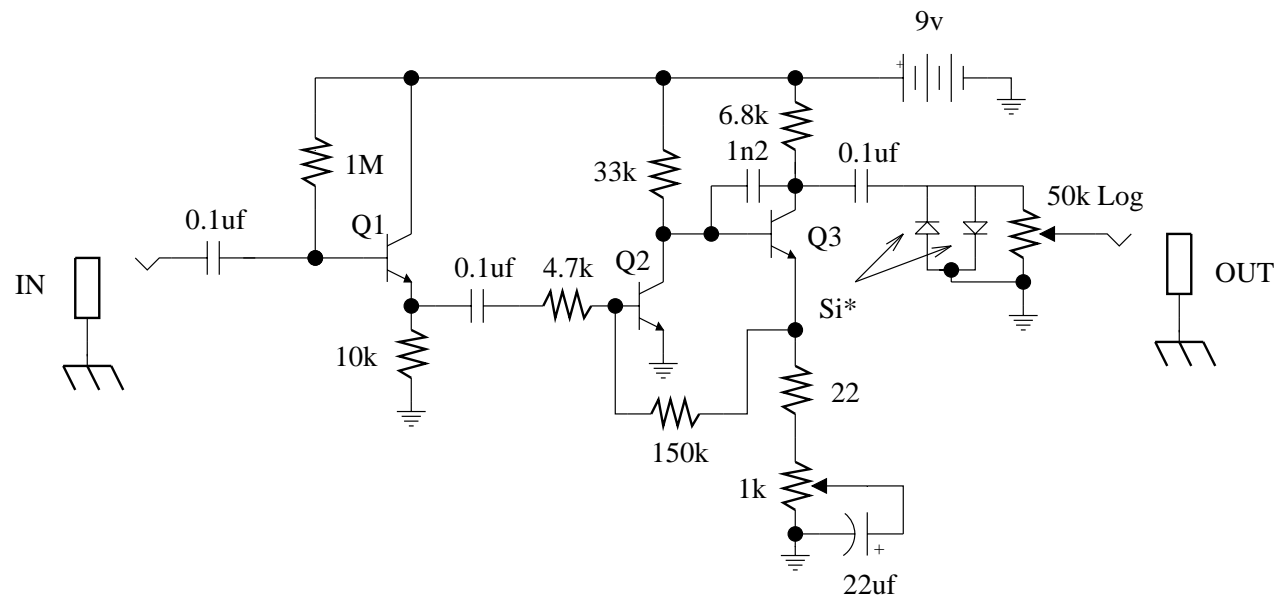
Model JH-2

## Jordan Boss-Tone



The Jordan Boss-Tone is another distorter from the Inna-Gotta-Have-A-Fuzza era of effects. This circuit fragment shows only the effects circuit, not the in/out switching and the battery circuit. A DPDT stomp switch and input-jack battery switching would finish this up nicely. Like many others, the circuit is based on a collector voltage feedback single transistor circuit with a second transistor as a buffer following the first gain stage. Others in this genre are the Vox Tone Bender and the venerable Fuzz Face, although these do not have a diode-clipping limiter after the gain stages.

# JSH Fuzz



\*pretty much any silicon signal diode can be used here

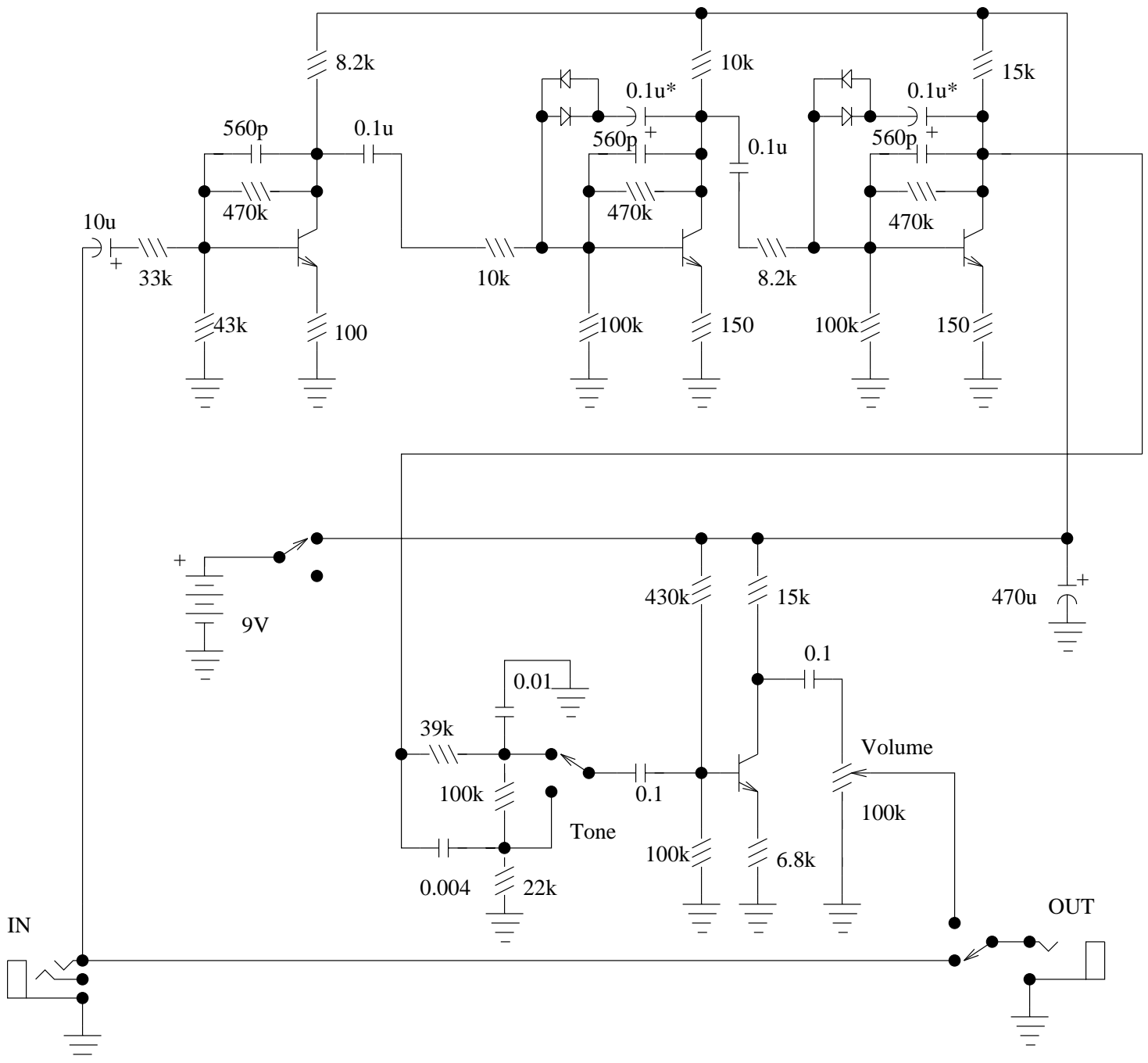
Q1 - BC238B

Q2, Q3 - BC239C

Model FZIII



# Electro-Harmonix Little Big Muff

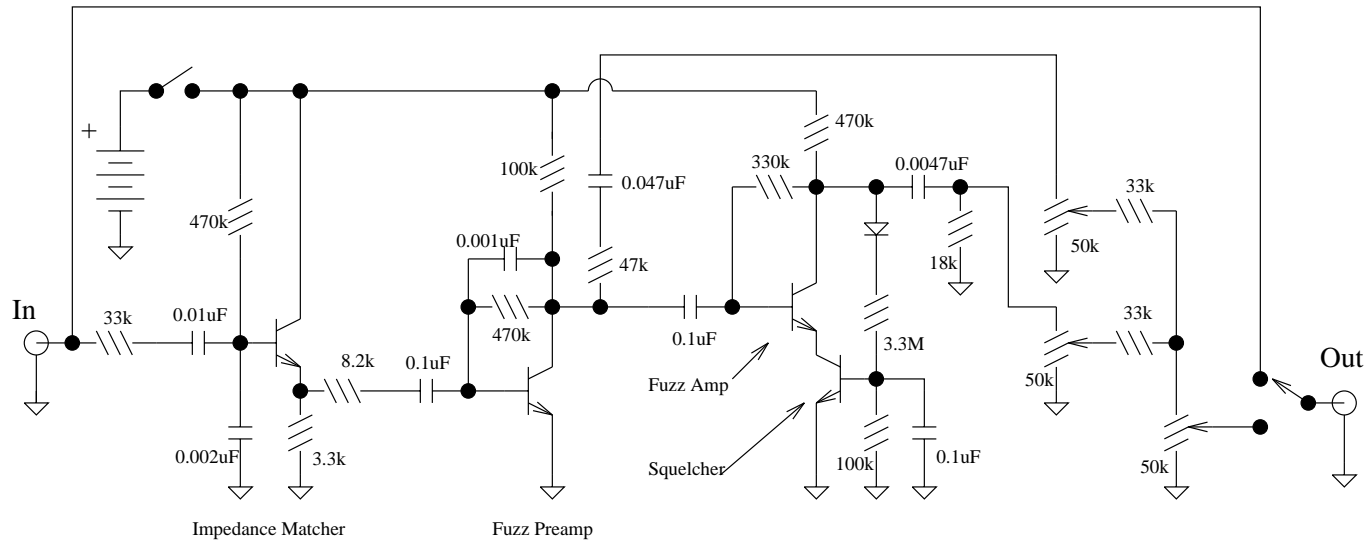


The EH Little Big Muff could probably be improved with modern input jack power switching and a DPDT bypass.

This is the original schematic. The diode and transistor types are unknown. Probably any high gain NPN and 1N914s work.

The caps marked with a \* have been reported to work great at 1.0uf.

## Maestro Fuzz

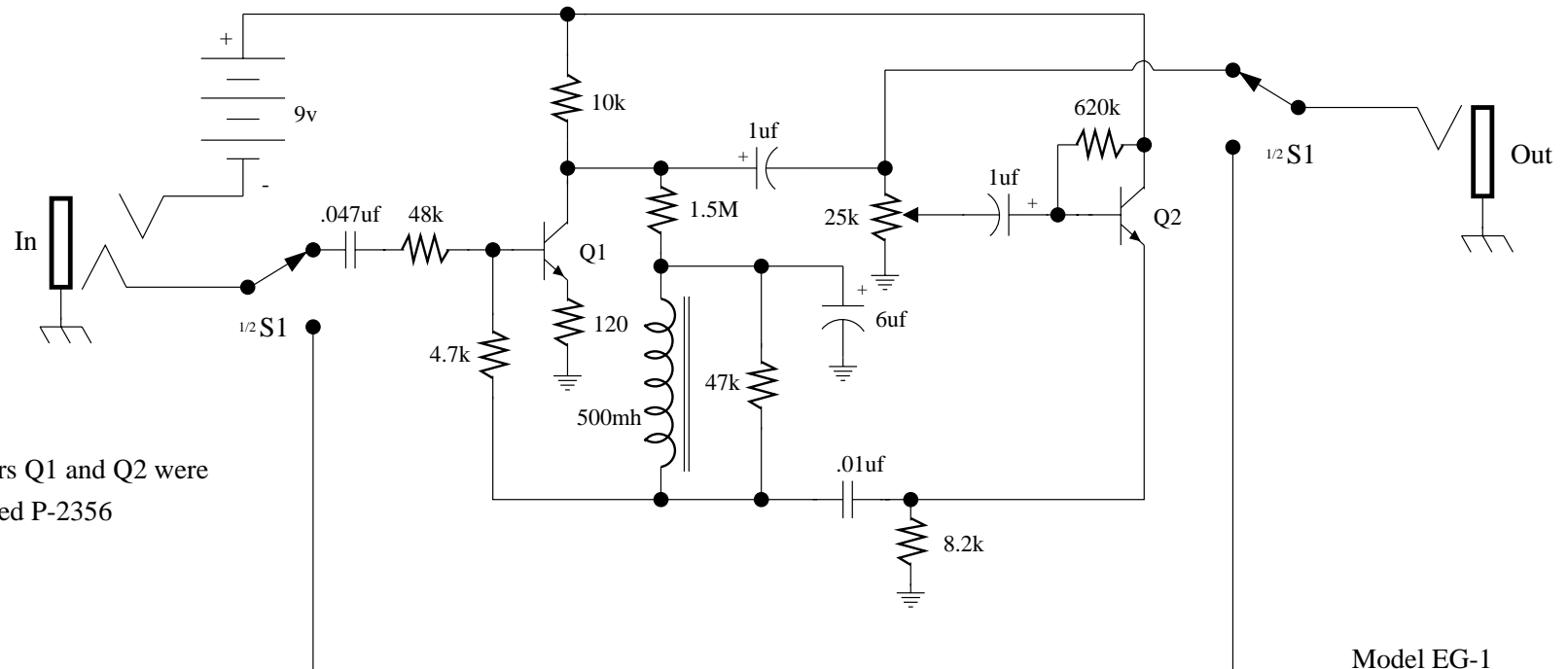


The Maestro Fuzz is reputed to be the fuzz used in the recording of the Stones' "Satisfaction". The transistors are house numbered "991-002298" and the diode is house numbered "919-004799". They are probably all germanium devices. The use of a squelch device is somewhat unique, possibly put there to tame hiss and noise during quiet passages between notes. The two 50K pots which have their wipers connected by resistors are wired so that as one increases, the other decreases, giving a pan from one point in the circuit to another, probably changing the amount of distortion. The last 50K pot is an output level control.

This unit could probably benefit from a modern DPDT switch setup to completely isolate the circuit when it is switched out, and a modern input-jack power switching arrangement.

# Maestro Boomerang

(Wah-Wah)



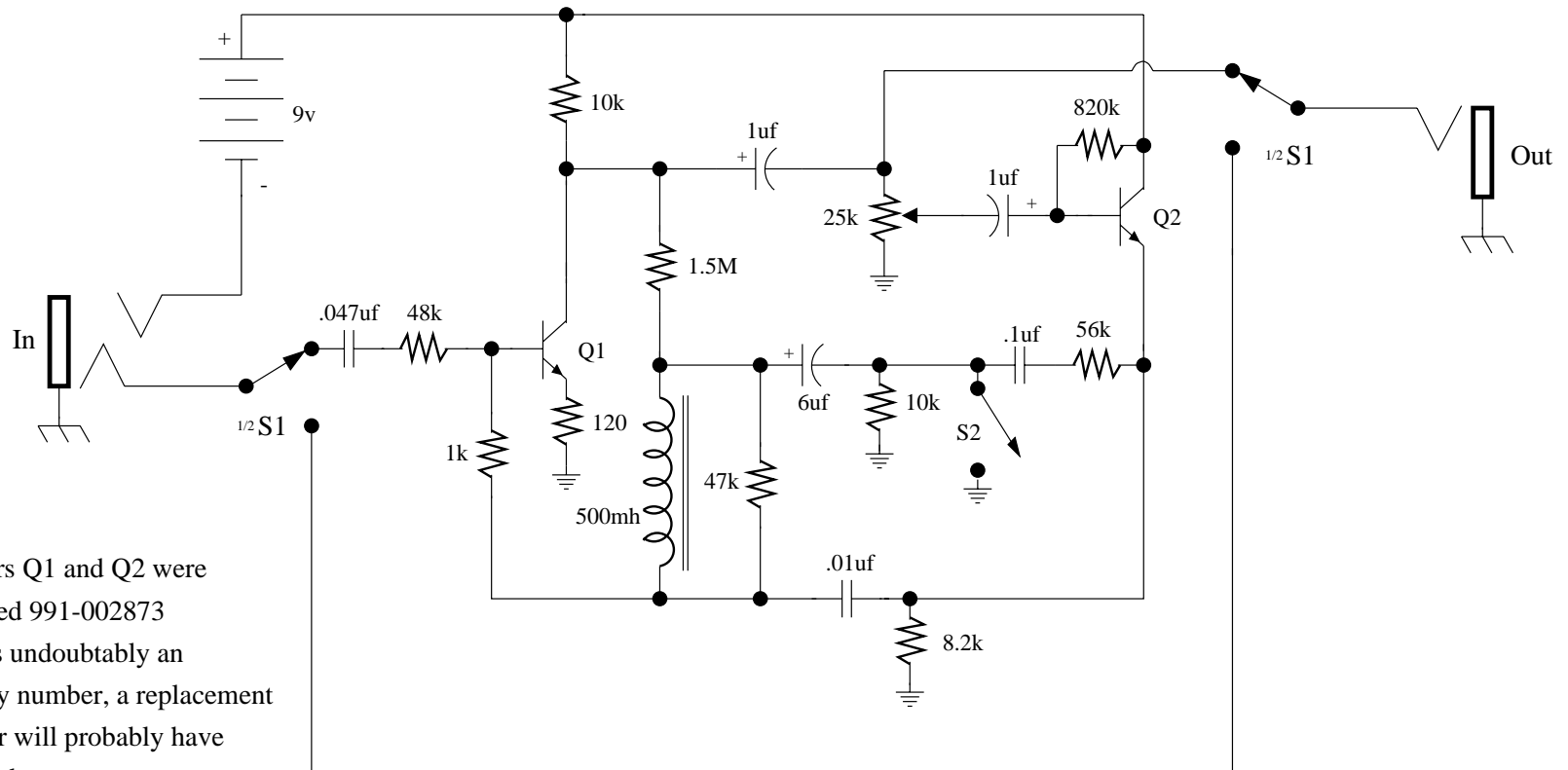
-Transistors Q1 and Q2 were designated P-2356

Model EG-1



# Maestro Boomer 2

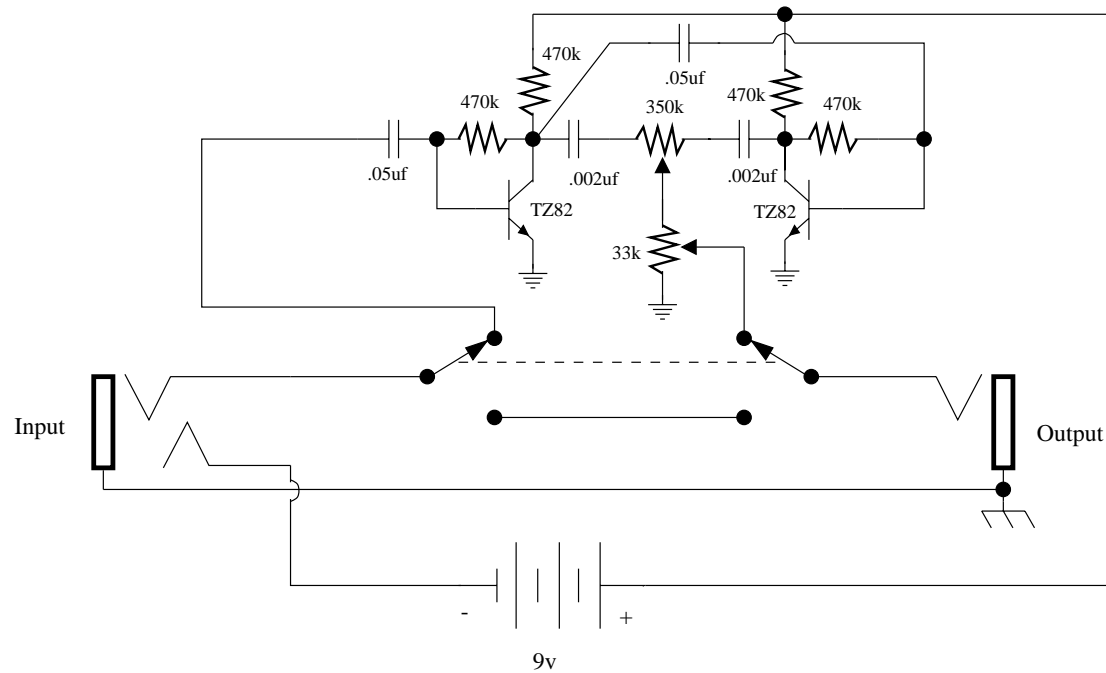
(Wah-Wah / Volume)

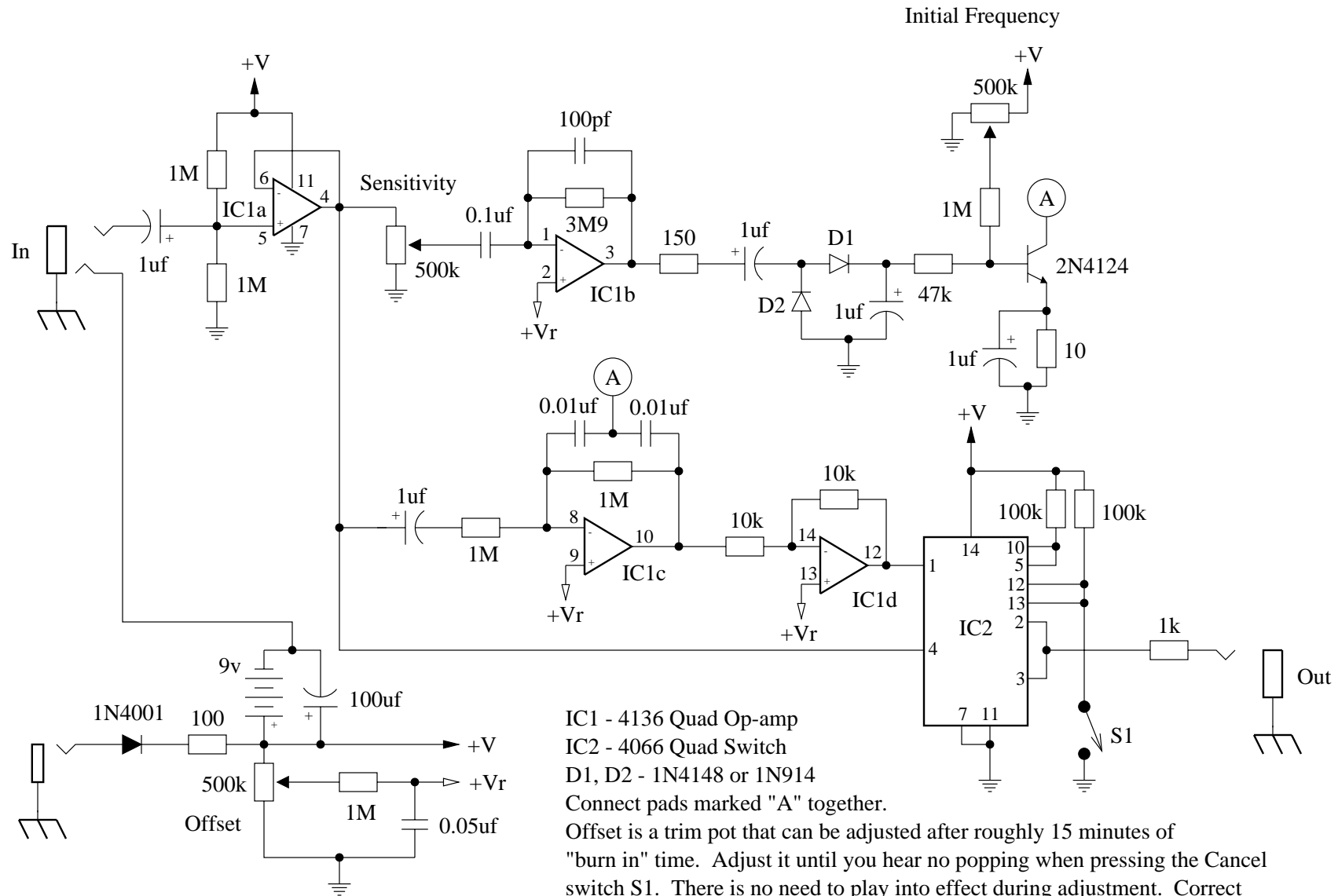


- Transistors Q1 and Q2 were designated 991-002873  
This was undoubtedly an inventory number, a replacement transistor will probably have to be used.
- S2 is used to switch the pedal between its modes of wah-wah (off as shown) and volume (on).

Model EG-2

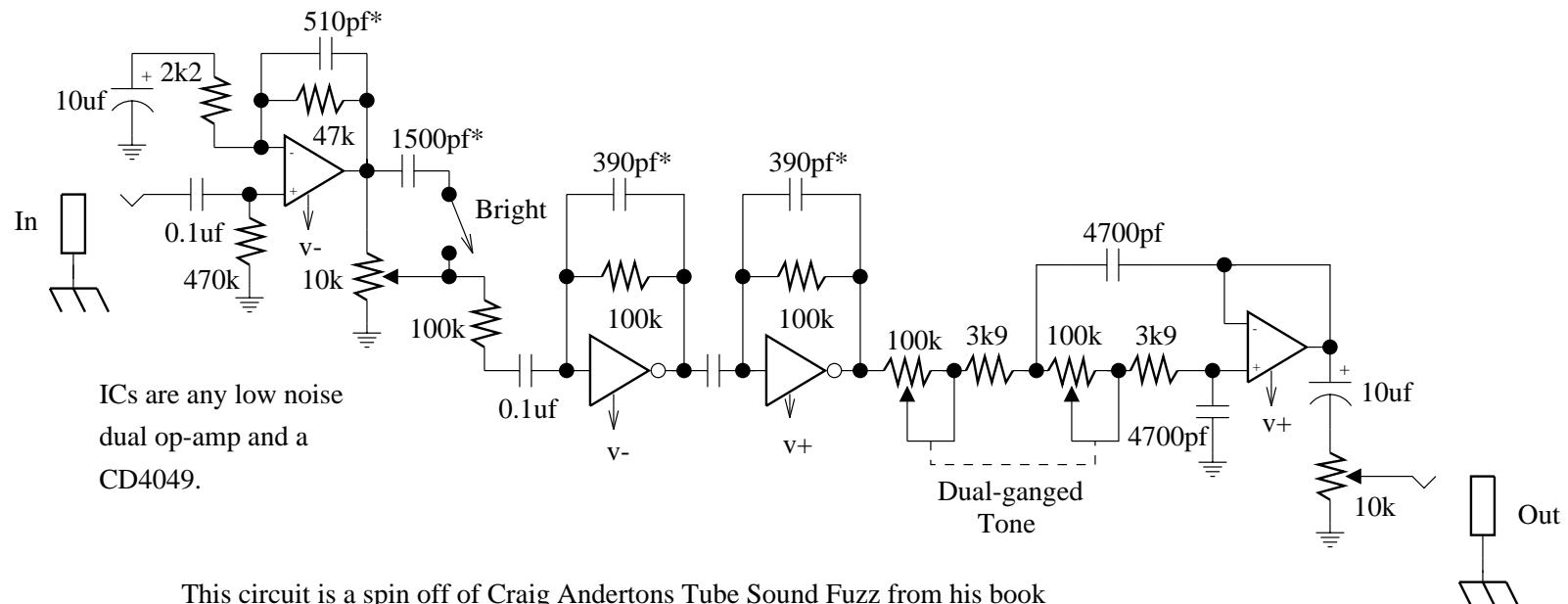
# Mosrite Fuzz-Rite





# Modified Tube Sound Fuzz

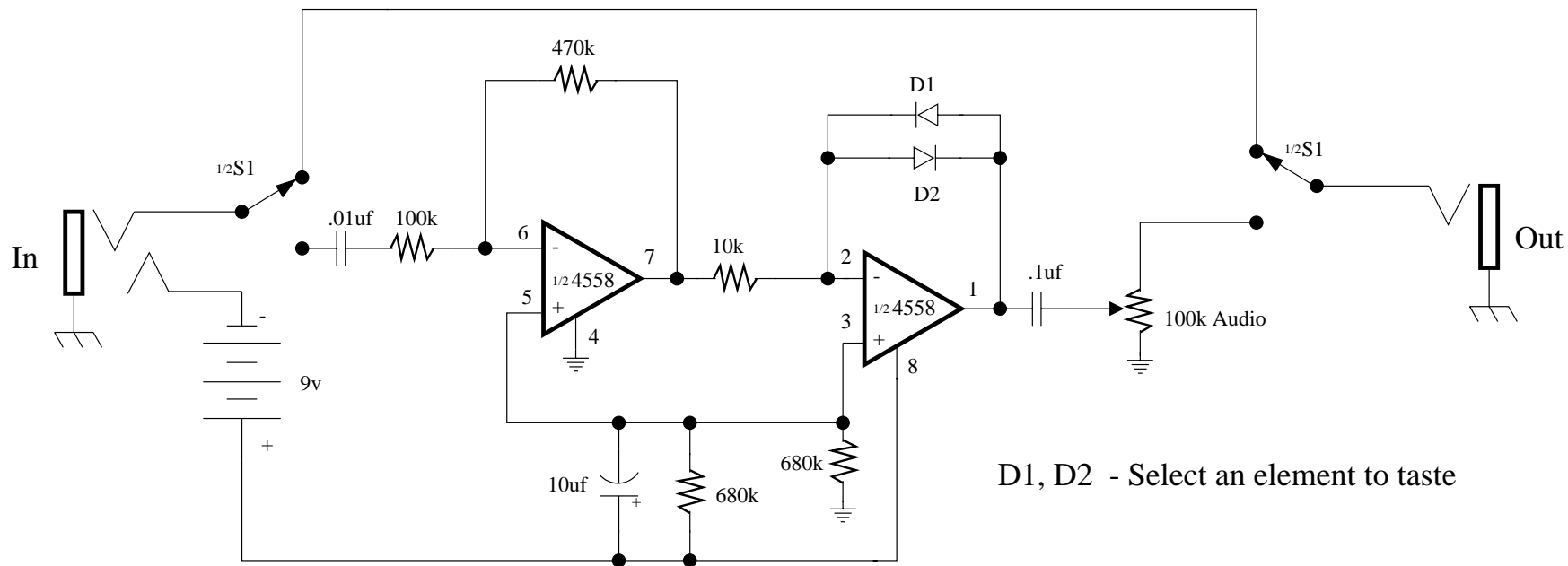
by M. Hammer



This circuit is a spin off of Craig Andertons Tube Sound Fuzz from his book Electronic Projects for Musicians. This only uses 2 stages of a CD4049 hex inverter/buffer the rest were left out of the schematic to keep it simple. Components with a \* are suggested values, substitutions can be made freely within 30%.

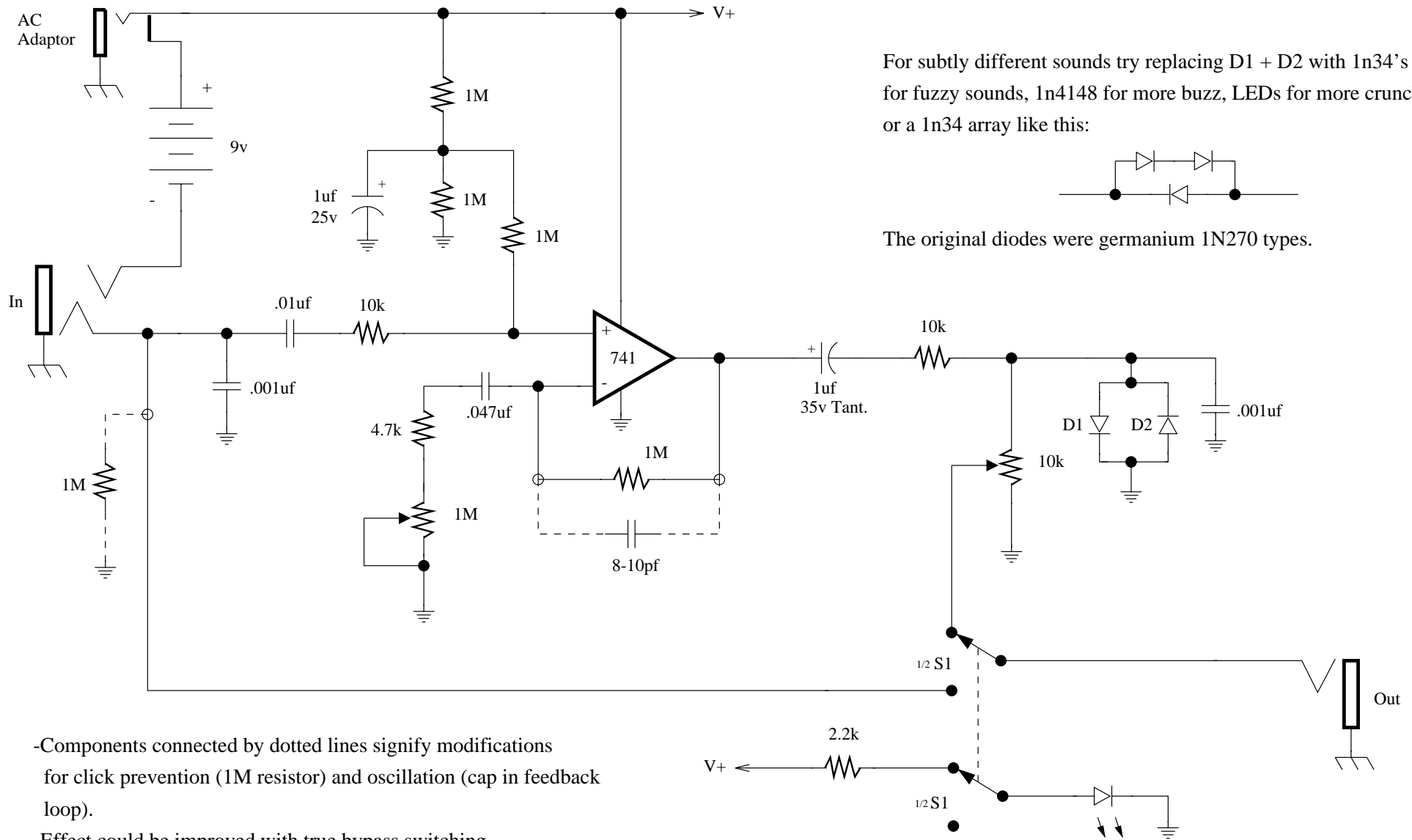
# Muff Fuzz

Electro Harmonix



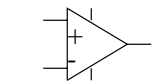
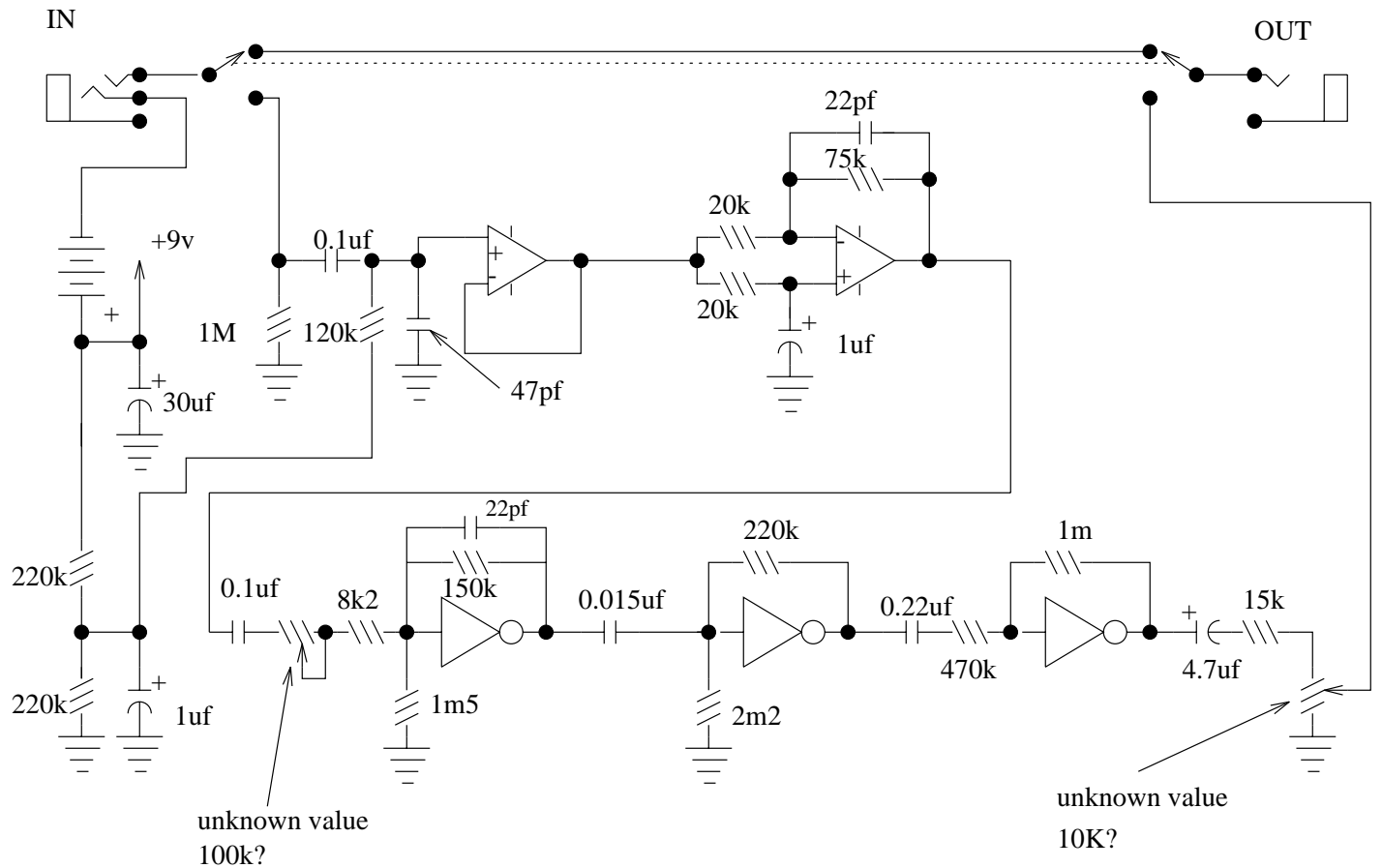
D1, D2 - Select an element to taste

# MXR Distortion +

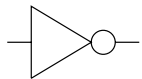


- Components connected by dotted lines signify modifications for click prevention (1M resistor) and oscillation (cap in feedback loop).
- Effect could be improved with true bypass switching.

## MXR Hot Tubes Distortion

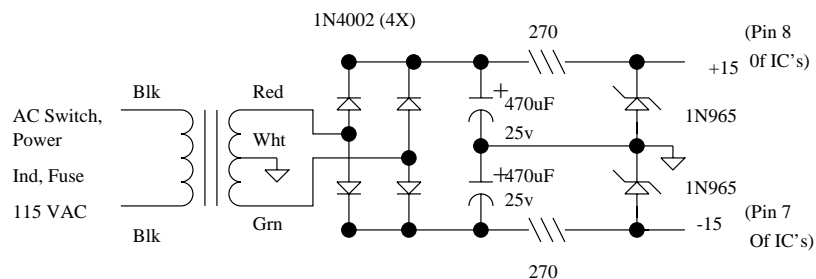
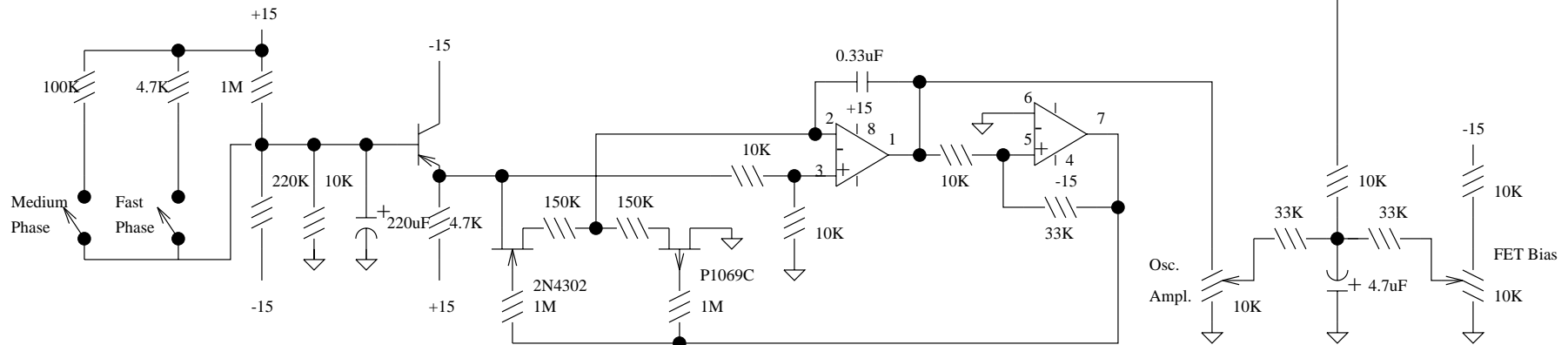
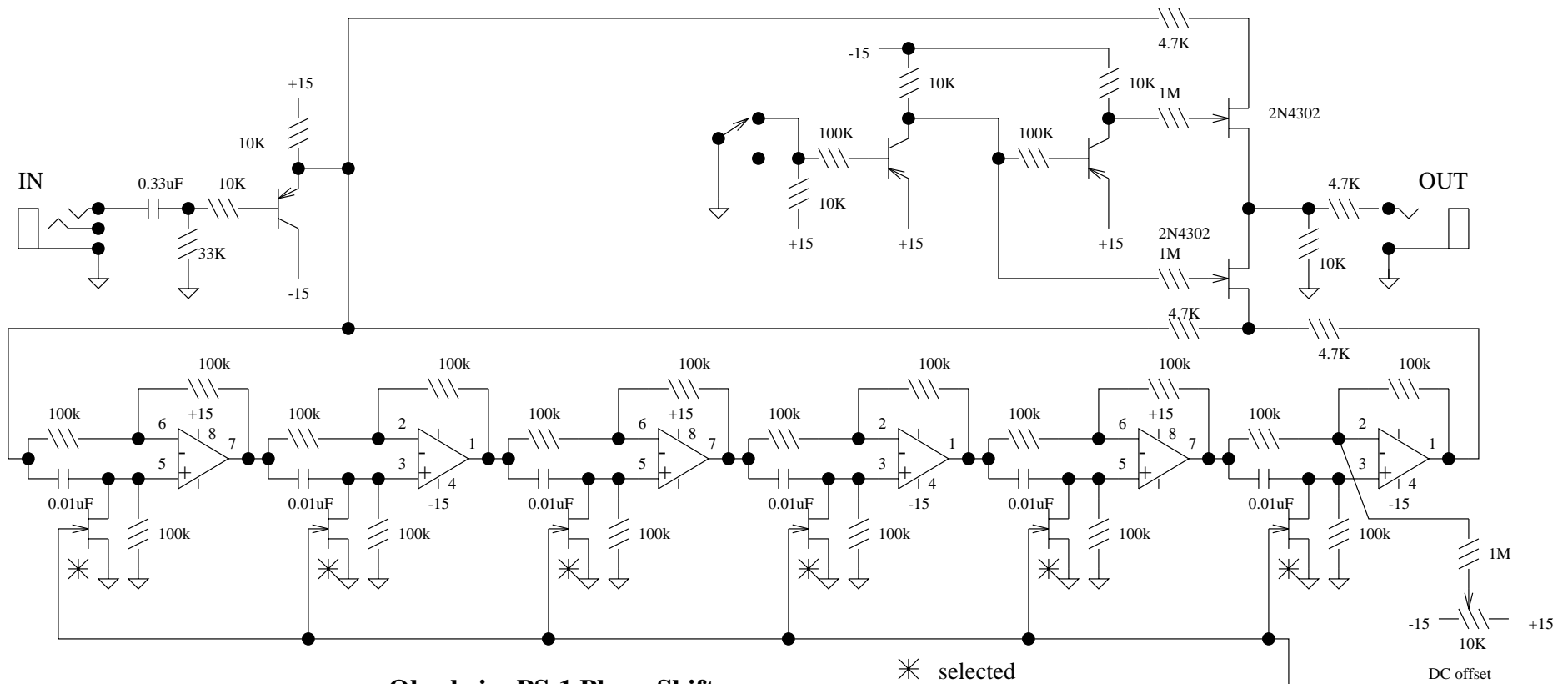


= 1/2 of dual 741 or 4558 opamp; +v on pin 8, -v on pin 4



= 1/6 of CD 4049 CMOS inverter. Vdd on pin 1, Vss on pin 8

The MXR Hot Tubes is a commercial cousin of Craig Anderton's "Tube Sound Fuzz". It differs in that it uses a dual opamp input buffer, more stages, and more filtering. Also, there appears to be a DC offset in the bias points of two of the inverter/distortion stages.

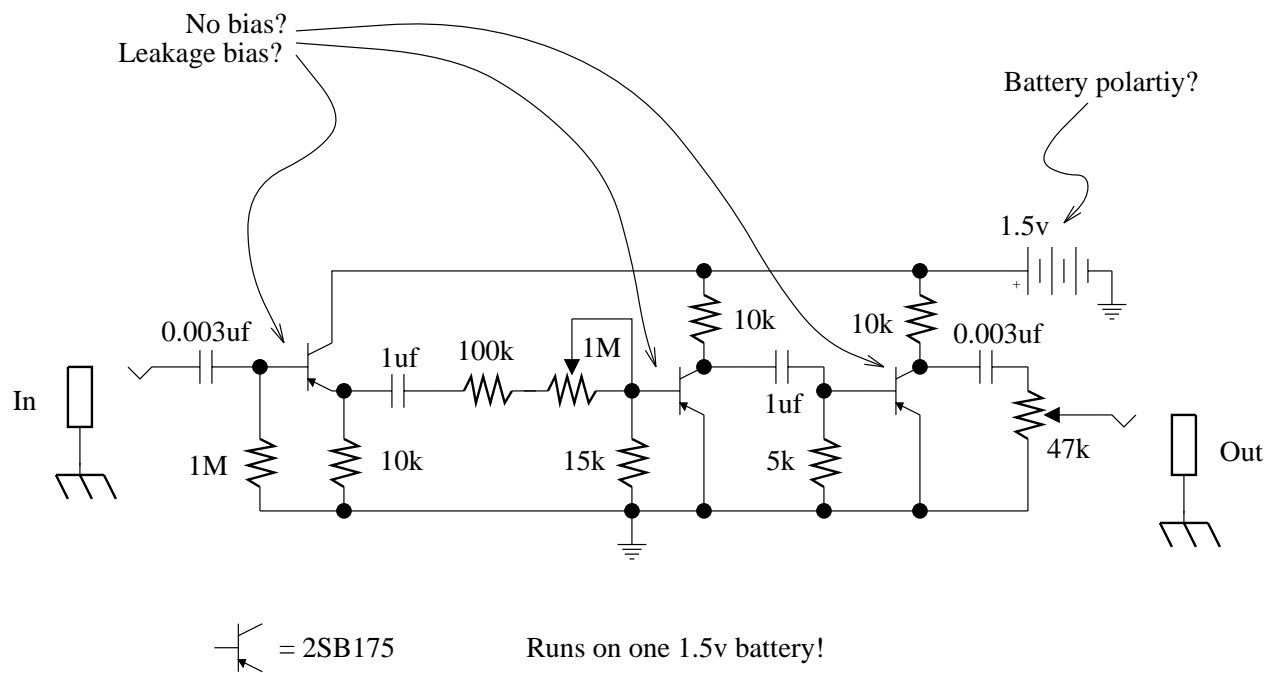


Adjustment procedure:

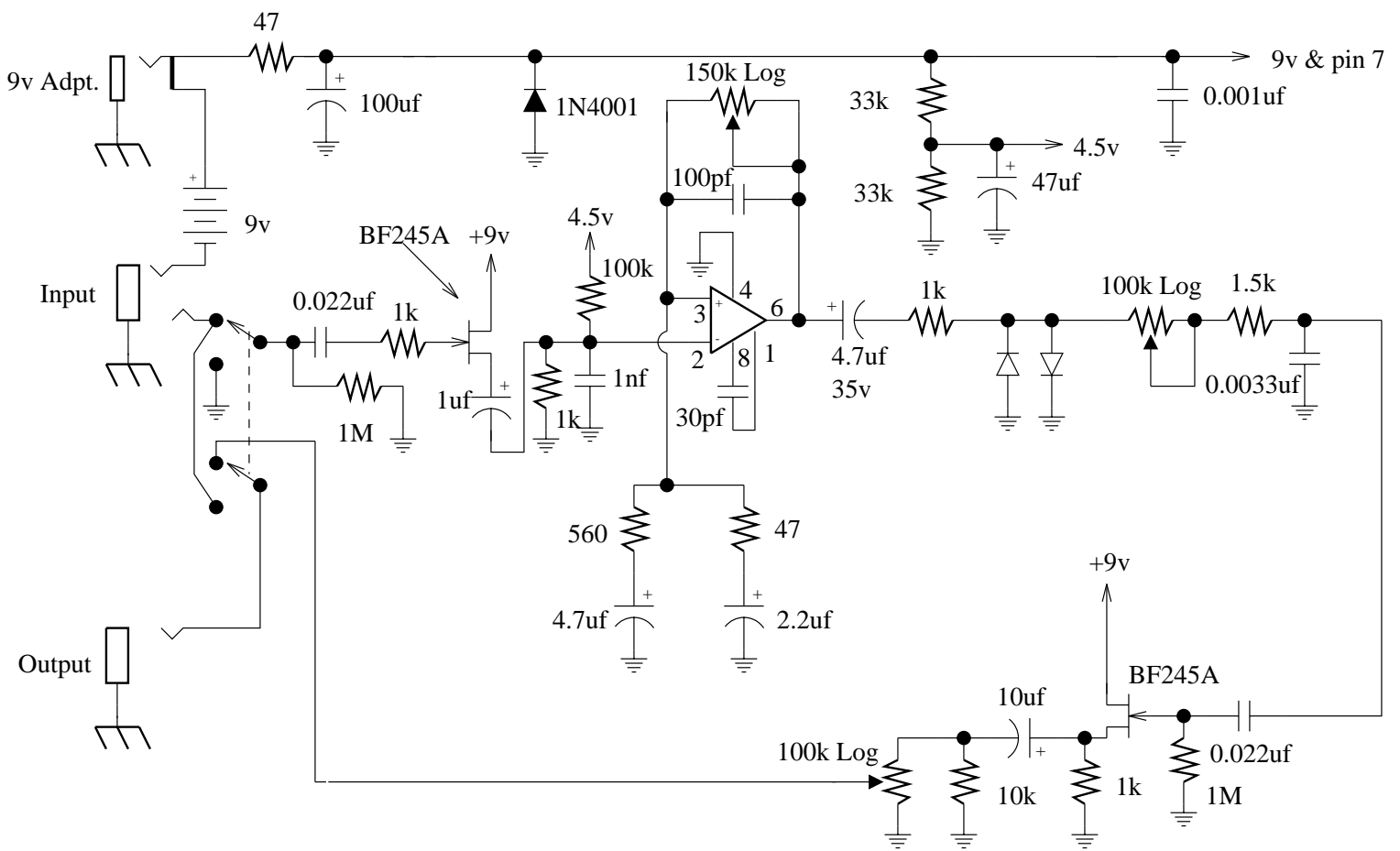
1. FET Bias: With Osc.Ampl. trimmer fully counterclockwise, adjust FET Bias so that audible phasing sound is in the middle of its range.
2. Osc. Ampl.: Adjust for desired depth of phasing sound.
3. Output Offset: adjust for minimum "click" when Off/Slow Phase switch is operated.



# Olson New Sound



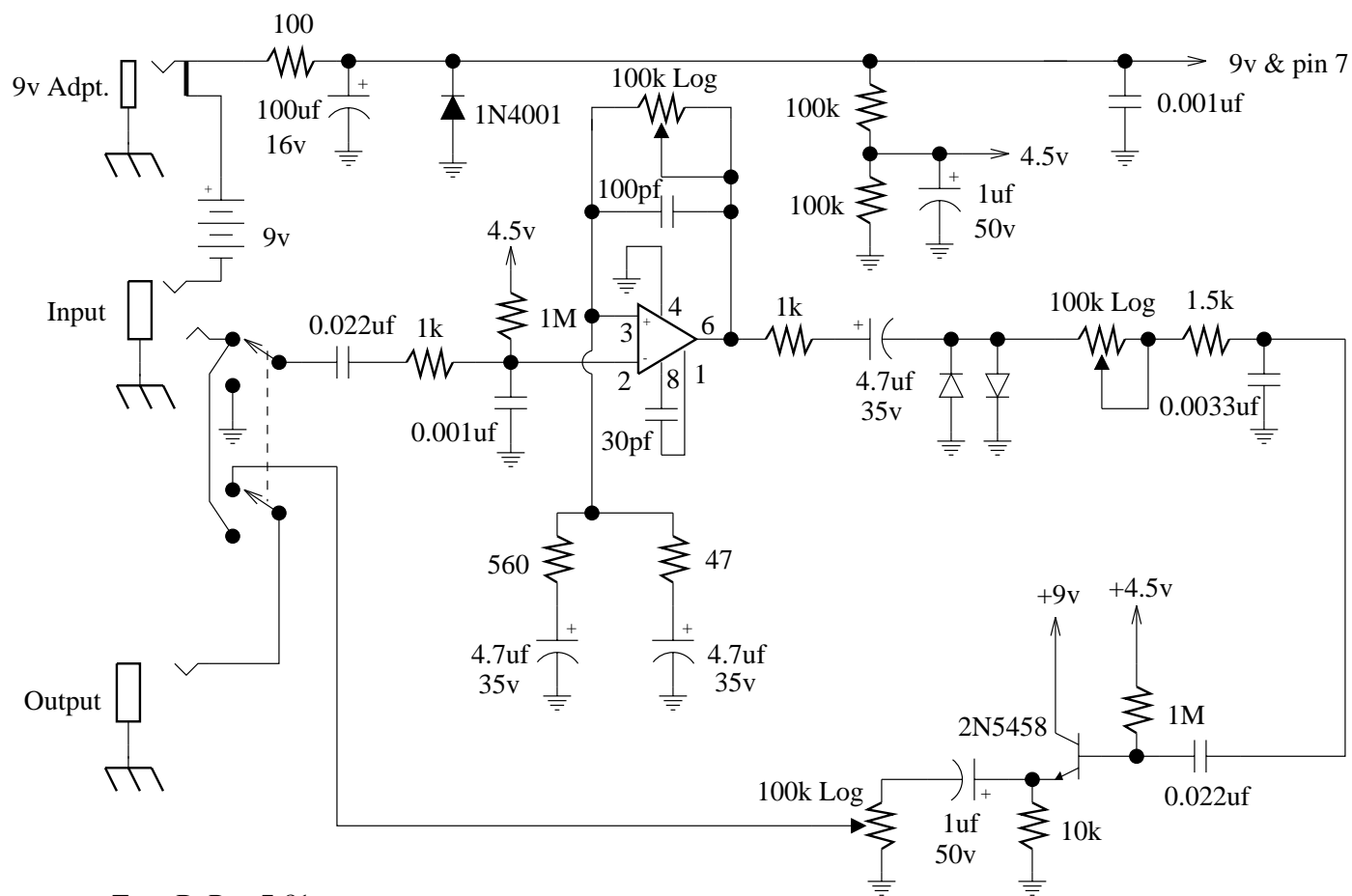
# ProCo Rat Distortion



IC = LM308

Diodes = 1N4148

# ProCo Rat Distortion



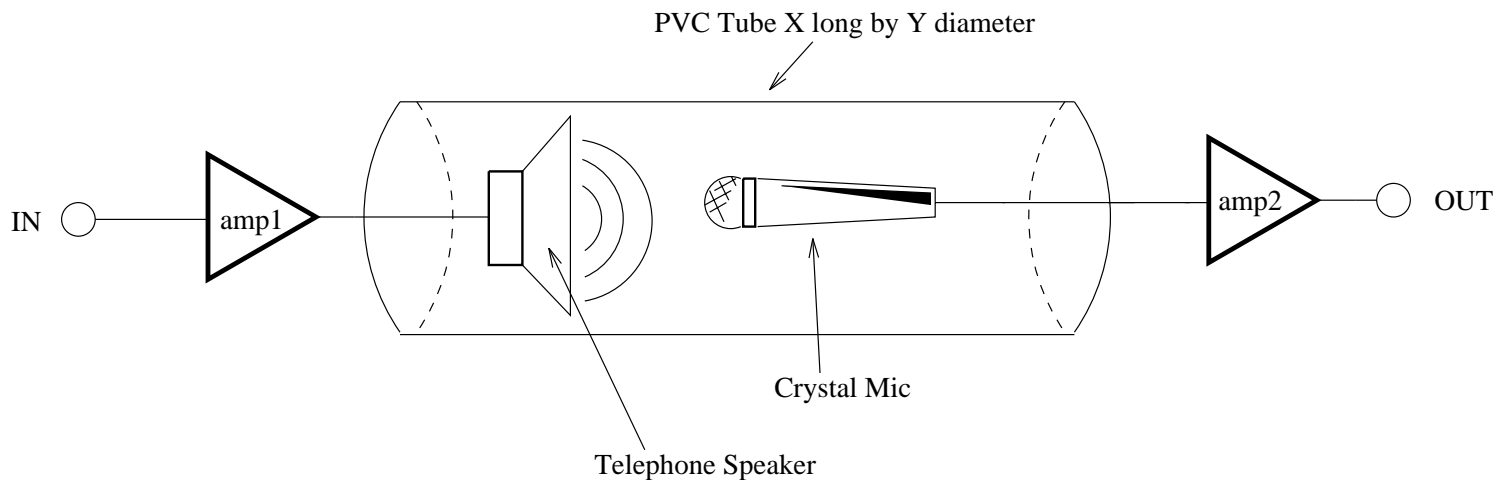
Type B Rev 7-81

Current Drain @ 9v  
 ~ .6ma, no Input (idle)  
 ~ 1.6ma, full output

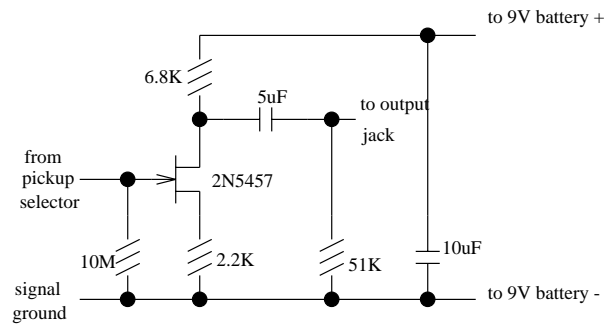
IC = LM308  
 Diodes = 1N4148

THE

# PIPE BOMB

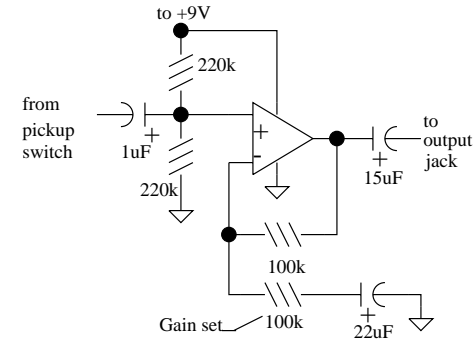


My dimensions for my prototype are X= 36cm, Y= 5.5cm. This imparted a pretty high pitch tone but I like it. The X and Y dimensions should be played with to create the exact tone your looking for, also I chose a telephone speaker and a crystal mic so I got the funkiest tone I could think of. A dynamic mic would limit the trebel somewhat probably make it sound less harsh. I'd be interested in any mods made to this design (ie. stories, ideas, etc.) so feel free to email me. The amps can be any old simple op-amp configuration that can drive a speaker or take a mic input. I just used some surplus stuff I had lying around to make mine. The end product had all the circuitry inside the tube and the battery on the outside, with one control for the gain of the speaker (mic was at fixed gain). Note, if you place this infront of your amp and turn every thing up, without adding any dampening to the tube it will feedback like you wont believe! You will probably wish to avoid this as it tends to hurt your ears. I put a bit of foam rubber in one end of the tube and an old sock in the other to dampen feedback. I like to leave my options open though, so I also didn't make this a permanent addition. My prototype is basically a fuzz, as my guitar will overload the speaker quite easily and the tube just adds a bit of strange overtone and what I swear is the tiniest hint of reverb. Sounds great though! Clean tones through a similar set up would sound good too, but I haven't built one of those yet. Perhaps a larger speaker (4-5") and an old carpet tube would add better characteristics for clean tones. Try changing the tube material also for a different tone, I almost used a bit of gutter piping when I first built this, now I wonder what it would've sounded like.

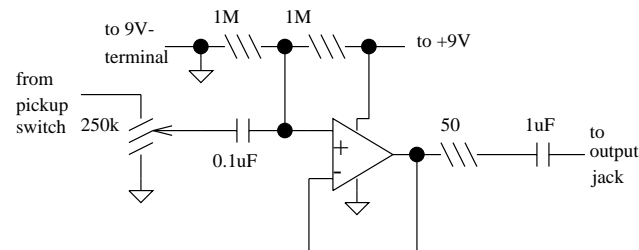


For people who don't like op amps, here is a discrete JFET preamp design. It has low distortion, low noise, low feedback, overloads gracefully, is small, etc, etc. Overall gain is 3db (2X) or so. It uses about 1/2 ma, so a 9V battery will last a long time. You can add a high boost switch if you like by having it shunt the 2.2k resistor with a 0.05uF cap (or other value; smaller cap = boosts only higher frequencies, and the reverse). You can just put in a 10uF cap across the 2.2k resistor to up the gain.

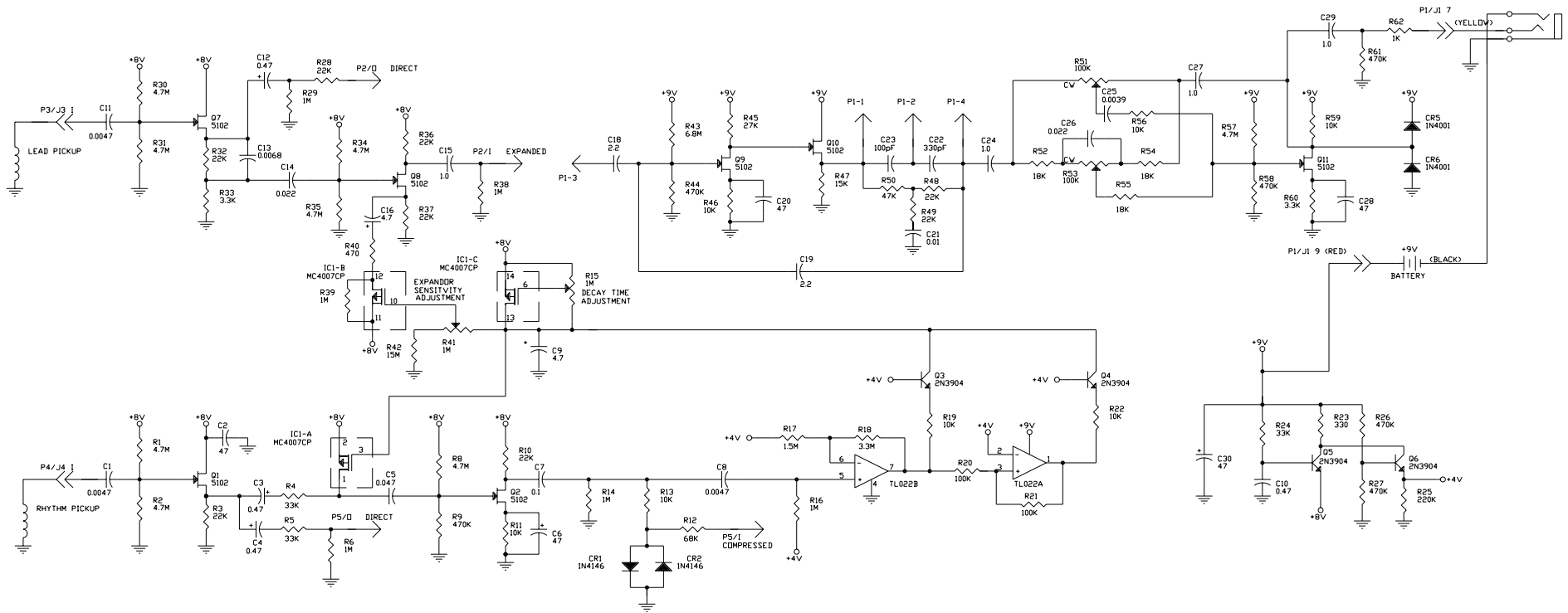
Circuit by Don Tillman. don@till.com



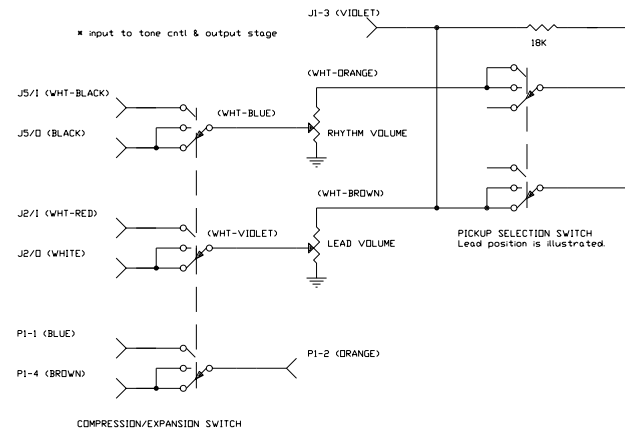
A preamp from a TL071 op amp. The gain set resistor lets you customize the gain. As shown, it is 2. Lowering the Gain Set resistor lets you raise the gain. You get distortion at high gains.



The opamp is a LT1012 micro power opamp, could be other low noise low power op amp. Use a stereo jack on the guitar to turn power on when a cable is plugged in. The circuit produces no noticeable noise or distortion and a 9 volt battery lasts a couple of years. This is intended to buffer the guitar pickups and controls from the cable capacitance. It is possible to add gain to this circuit by modifying the



RD Artist switch wiring description:



NOTE:  
 (1) Both compression and expansion effects are determined by the lead pickup output only.  
 (2) P and J designations refer to plugs and jacks respectively.  
 (3) I and O designations refer to inner and outer connections for the specific plug/jack.  
 (4) Two green wires connecting P1-(5/6) are signal grounds. P1-8 is used for plug polarity sensing.

GIBSON RD-Artist			
Schematic drawn by: Fabian P. Hortery			
RD Artist Active Electronics (Assy. Rev. C)			
Size	Document Number	REV	
C	996-042368-001 (MODG 980-042367A)	C	
Date:	November 20, 1994	Sheet	1 of 1

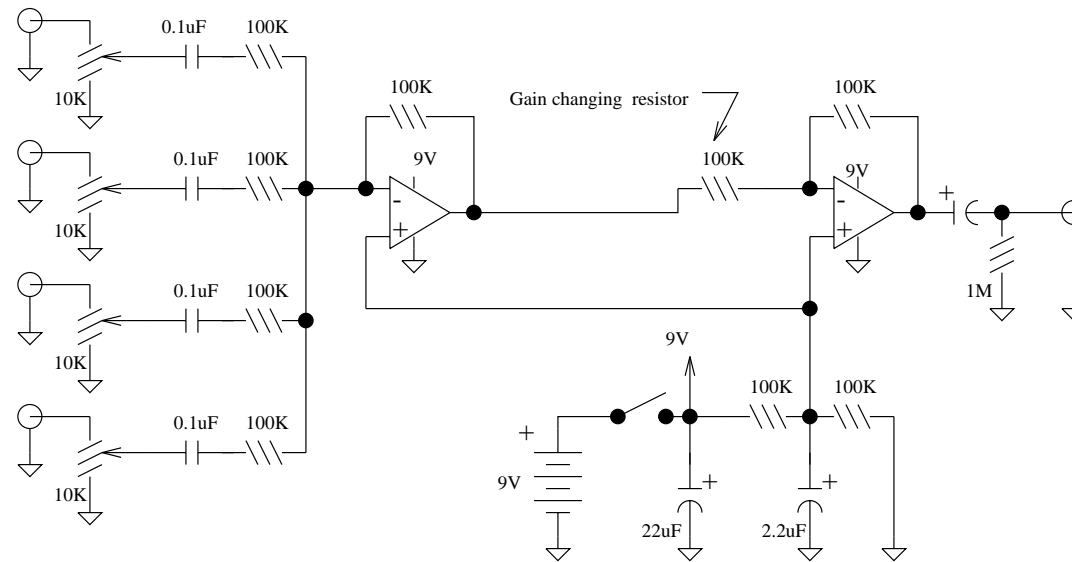
from Guitar Player 1976 by Craig Anderton

This simple spring reverb can be built cheaply and requires a minimal amount of space for the circuit it self. The op-amp is a quad type, the pinout for a 4136 is shown, but others may be substituted. The bypass caps C1 and C2 can be from 10 to 100 uf. The resistor marked with a \* may need to be lessened if you experience distortion in your reverb, lower this to achive maximum signal with no distortion. Many spring reverb units may be used with this circuit, the original article suggested an accutronics model. Many reverb units also use RCA style jacks for in's and out's, be prepared for this. The cancel switch will shut off the reverb effect without any clicks or pops. All resistors are 1/4 or 1/2 watt, 5% tolerance, and all caps are rated at 10 or more volts.





## Simple Mixer

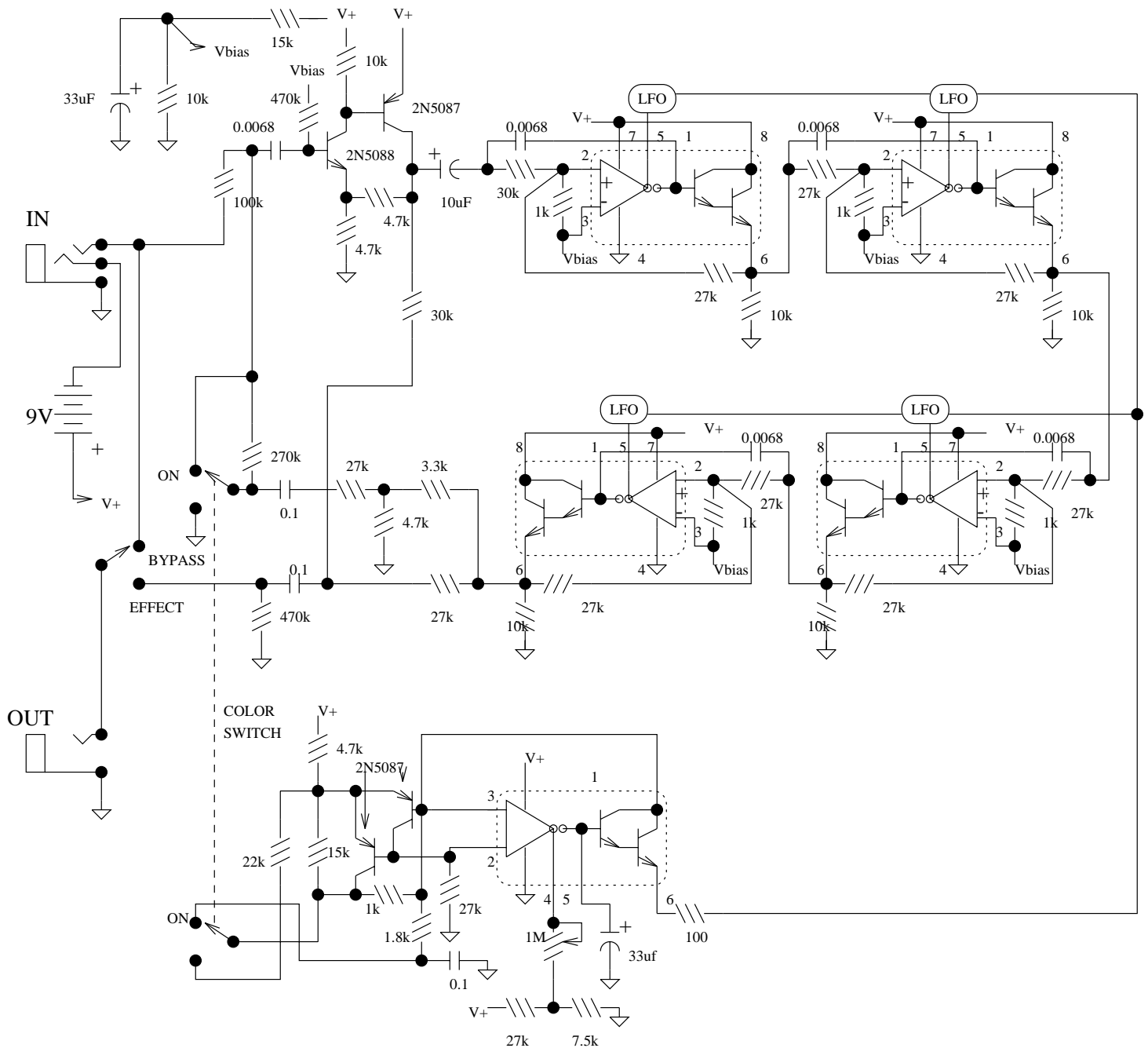


A simple mixer suitable for mixing microphones or effects outputs. The overall gain from input to output is one if the pot corresponding to the input is full up. You can make this a net gain of ten (or any other reasonable gain) by reducing the input resistor to the second op amp. 10K in this position gives a gain of ten, or 20db. If you are mixing effects outputs which have an output level control built into them, you can dispense with the input level controls, or make some have level controls, some not. Audio taper pots are probably better, but linear will work.

For the opamps, choose a jfet input dual or singles, like from the National Semi LF3xx series, or something like the TL072 or TL082.

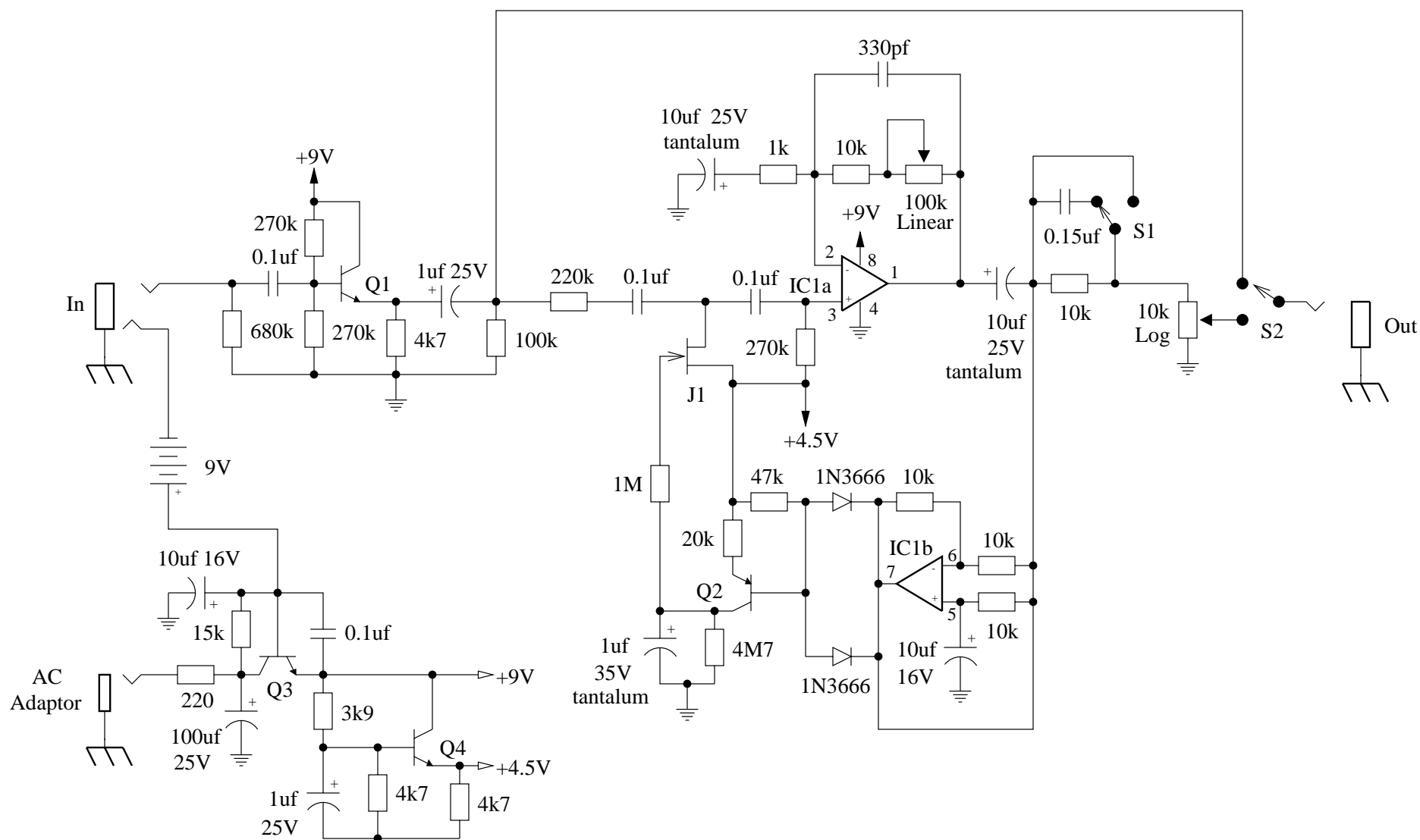
# EH Small Stone Phaser

## Issue J



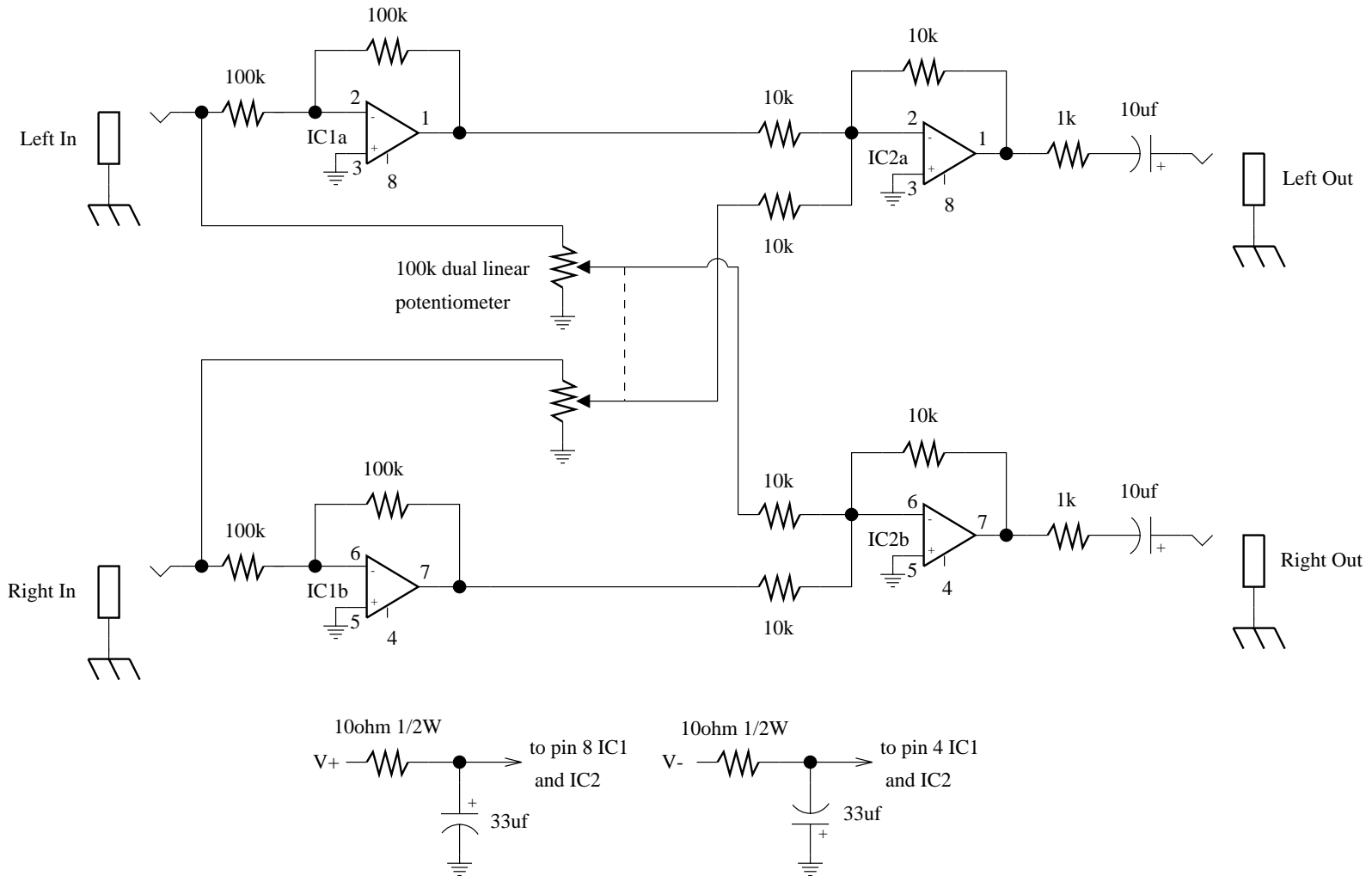
The Small Stone is somewhat unique in using Operational Transconductance Amplifiers (OTA's) for phase shift stages instead of opamps with variable resistors. All of the IC's are house marked EH1048, but can be replaced with CA3094 which is a combination of an OTA equal to the CA3080 and a darlington emitter follower. Later Small Stones used slightly different circuits, but all used the OTA.

Name:	Soul Preacher	Manufacturer / Designer:	Electro-Harmonix	Revision:	10/13/95	Model #
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- All resistors are carbon film, 1/4W, 5%, unless otherwise noted
- All non-polarized capacitors are mylar, 50V, 10%, unless otherwise noted
- Transistors Q1-4 and FET J1 are unknown
- IC1 is a 4558

# ***EM Stereo Spreader***



IC1 & IC2 are 5532 Dual Op amps for low noise. All resistors are 1% metal film 1/4W unless otherwise noted. Requires bipolar power supply from 9 to 15 volts.

# For that different sound, Music a la Theremin

By Louis E. Garner, Jr.

Published November 1967, Popular Electronics

For about the price of an inexpensive guitar, plus a few hours assembly time, you can own and enjoy what is perhaps one of the most versatile of all musical instruments: the unique and amazing theremin. Named after its Russian-born inventor, Leon Theremin, its frequency range exceeds that of all other instruments, including theater pipe organs, while its dynamic range is limited only by the power capabilities of the amplifier and speaker system with which it is used. Above all, it is a true electronic instrument, not just an "electronic version" of a familiar string, reed, or percussion instrument. Its tone is unlike that of any conventional instrument.

A musician playing a theremin seems almost like a magician, for he can play a musical selection without actually touching the instrument itself! As he moves his hands back and forth near two metal plates, he seems to "conjure up" individual notes at any desired volume; he can "slide" from one musical note to another with ease, can produce tremolo and vibrato effects at will, and can even sound notes which fall outside the standard musical scale. He can play tunes or melodies, produce unusual sound effects, or can accompany a singer or another instrument—all by means of simple hand movements.\*

The theremin is ideal for amateur as well as professional musicians and can be used for "fun" sound effects as well as for serious music. It makes a wonderful addition to the home recreation room, and can be used equally well by rock'n' roll groups or larger bands. Theatrical groups find it just the thing for producing eerie and spine-tingling background effects to accompany mystery or horror plays, and for the budding scientist or engineer, it is an excellent Science Fair project.

The typical theremin has two r.f. oscillators, one having a fixed, the other a variable, frequency, with their output signals combined in a mixer/amplifier stage. At "tune-up," the oscillators are preset to "zero beat" at the same frequency. The frequency of the variable oscillator is controlled by an external tuning capacity--the "antenna"—which is a "whip" or simple metallic plate.

As the musician's hand is moved near this antenna, the variable oscillator shifts frequency and a beat note is set up between the two oscillators. The pitch is proportional to the difference in frequency between the two oscillators. This beat note, amplified, is the theremin's output signal. The more advanced theremin designs—such as the version presented here—use a third oscillator to control output volume and two antennas. This theremin also uses a unique FET volume, and a FET output stage. See Fig. 1.

## Construction

Except for the two control antennas, power switch S1, and battery B1, all components are assembled on a printed circuit board as shown full-size in Fig. 2(B). An insulated jumper is required between C15 and R20 as shown in Fig. 2(B) and Fig. 3. Mount the PC board in a suitable cabinet with four spacers (see Fig. 3), making sure that suitable holes are drilled in the cabinet or through a dialplate to accept the tuning-slug screws of L2 and L4. Coils L1 and L3 are mounted on small L-brackets; initially, these brackets should be adjusted so that L1 is at right angles to L2 and L3 at right angles to L4. Switch S1 is also mounted on the cabinet or

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\* Nearly everyone who has ever watched television or attended a motion picture has heard music and background effects produced by a theremin, yet relatively few could recognize the instrument, and fewer still have had the chance to own or play one. With its astounding tonal and dynamic ranges, it has been used to produce background music and special effects in scores of science-fiction, fantasy, horror, and mystery shows.

dialplate, in the area of the L2 and L4 slug screws, while the battery is secured to the cabinet wall.

Ordinary copper-clad circuit board can be used to make up the pitch and volume control antennas. Although the author's units are equilateral triangles approximately 9" on a side—almost any other design will do—shape is not critical. If desired, the upper surface of the antennas may be covered with a colorful material (see cover photo).

The antennas are mechanically mounted on an electrically conducting support. The ones used by the author, (see Fig. 4) were six-inch lengths of 3/4" aluminum pipe with appropriate mounting flanges. The antennas were attached to the pipe with conduit plug buttons soldered to the bottom of each antenna. The flanges of the buttons should make a good friction fit to the pipe. A solder lug for connection to the PC board is placed under one of the pipe support mounting screws as shown in Fig. 3.

Connect the negative lead of the battery to terminal B on the PC Board; then connect the positive battery lead, via S1, to terminal A. The center lead of the audio output coaxial cable is connected to terminal C on the PC board, while the associated braid is soldered to the ground foil. Connect the volume control lead and one lead from L3 to the proper hole on the PC board (see Fig. 3), then connect the pitch control lead and one lead of L1 together and solder to the hole on the PC board. The other ends of both coils are soldered to the ground foil of the PC board.

## Tuning

Although the theremin is used with an external audio amplifier and speaker, no special test equipment is needed for the tuning adjustments. The procedure is as follows.

1. Temporarily short Q6's gate and source electrodes together, using either a short clip lead, or a short length of hookup wire, tack-soldered in place.
2. Preset the coil (L1, L2, L3, and L4) cores to their mid-position.
3. Connect the theremin's output cable to the input jack of an audio amplifier (with speaker)-a guitar amplifier is ideal. Turn the amplifier on, volume up to nearly full.
4. Turn the theremin on by closing S1 and adjust L2's slug (keep hands or other parts of the body away from the pitch antenna) until a low frequency growl is heard from the speaker.
5. Turn the theremin off and remove the short from Q6.
6. Turn the theremin back on and adjust L4's slug until a point is found where the growl is heard from the speaker. Then adjust L3's stud until the sound is reduced to near zero. This setting, although somewhat critical, will be stable once obtained.
7. Finally, adjust L2's slug until the growl becomes lower and lower in pitch, finally disappearing as "zero beat" is reached.

With the coils properly adjusted, no output signal will be obtained unless the operator's hands are moved near the *pitch* and *volume* control plates *simultaneously*. As the operator approaches the *pitch* control plate, a low-frequency note should be heard increasing in pitch as the hand moves nearer and, finally, going higher and higher and beyond audibility as the hand almost touches the plate. As the operator puts his hand near the *volume* control, a low level signal should be heard, increasing in amplitude until maximum volume is attained just before the plate is touched.

After the initial adjustments, L2 and L4 can be readjusted from time to time (using the front panel knobs) as needed to correct for minor frequency drift. In any case, a preliminary check of adjustment is always desirable whenever the theremin is to be used for a performance.

One further adjustment is optional. Coil L1's positioning with respect to L2 will determine, to some extent, the shape of the output waveform and, hence, its harmonic content. The mounting bracket supporting L1 can be adjusted to reduce the mutual coil orientation to less

than 90 degrees if a greater harmonic content is desired. However, as the angle is reduced, low-frequency notes may tend to become pulse-like in character.

## Installation

A guitar or instrument amplifier is an ideal companion unit for the theremin; either one allows bass or treble boost, as desired, and fuzz (distortion) or reverberation (if these features are incorporated in the amplifier's circuit). Simply provide a suitable cable plug and connect the theremin's output cable to the amplifier's input jack.

It is not necessary to purchase a special amplifier. The theremin's output signal level is sufficient to drive most power amplifiers to full output without additional preamp stages. The instrument can be used, for example, with a monaural version of the "Brute-70" amplifier described in the February, 1967 issue (of *Popular Electronics*).

If the theremin is used in conjunction with a power amplifier which does not have a built-in gain (or volume) control, a "volume level" control should be added to its basic circuit to prevent accidental overdrive. This can be accomplished quite easily by replacing source load resistor R16 (Fig. 1) with a 10,000-ohm potentiometer.

## Operation

The results obtained depend more on the ability of the operator than on built-in limitations within the unit itself. A good "ear" for music is a must, of course, but, in addition, a moderate amount of skill is required, particularly in finger or hand dexterity and movement. The latter is learned only through practice. For a start, here are the basic techniques.

*To sound an individual note*, first move the "pitch" control hand to the proper position near the *pitch* antenna (as determined by practice) to sound the desired pitch. Next move the "volume" control hand *quickly* to the proper position near the *volume* antenna to sound the note at the desired level, then away after the proper interval to sound an eighth, quarter, half or full note.

*To sustain a note*, hold both hands in position. The note volume may be increased slowly by moving the "volume control" hand *slowly* nearer the *volume* antenna, reduced by moving it slowly away.

*To "slide" from one note to another*, hold the "volume hand" fixed in position and move the "pitch hand" nearer (or away from) the pitch antenna plate.

*To produce a vibrato effect*, hold the "volume hand" fixed in position and shake—or tremble—the "pitch hand" at the desired rate.

*To create a tremolo effect*, hold the "pitch hand" fixed in position and vibrate—or tremble—the "volume control" hand.

*Tremolo and vibrato effects* can be produced by simultaneously rapidly moving both hands back and forth.

If you've used triangularly shaped control plates in your instrument (as in the model shown), you'll find that a given hand movement has less effect on operation near the narrow (pointed) end of the triangle than near its broad base.

Practice is important!

===== [30] =====

## How It Works

Transistors Q1 and Q2 are the variable and fixed “pitch” oscillators respectively, while Q4 serves as the “volume” oscillator. Essentially similar circuits are used in all three oscillators, so only one (Q1) will be described here. Base bias is established by resistor voltage divider R1 and R2, with the former bypassed for r.f. by C3. Resistor R3 serves as the emitter (output) load. The basic operating frequency is determined by the tuned circuit of L1 and the combination of C1 and C2.

In the case of Q1 and Q4, their tuned circuits are also connected to external “antennas.” When these antennas are “loaded” due to body capacitance (the presence of a hand near the antenna), this “load” is reflected to the tuned circuits as a capacitive change which, in turn, alters the frequency of oscillation. Because Q2’s circuit uses no “antenna,” its frequency remains constant at all times.

In operation, Q1’s r.f. output signal is coupled to mixer/amplifier Q3 via coupling capacitor C5—while Q2’s signal is coupled to Q3 via C10. If these two oscillators (Q1 and Q2) are at the same frequency, then there will be no resultant “beat” present at the collector of Q3. However, since Q1’s frequency is determined by how close the operator’s hand is to the “pitch” antenna, the resultant beat frequency will vary as the distance between the hand and antenna varies. Because the mixing action of Q3 produces both r.f. and audio beats, capacitor C12 is used to bypass the r.f. components and prevent them from appearing at the collector of Q3. The resultant audio beat is passed, via the volume control circuit, to the FET output stage, Q7.

Oscillator Q4 (the “volume” oscillator), like “pitch” oscillator Q1, has its frequency of oscillation determined by the amount of hand capacitance near its “antenna.” The r.f. signal at the collector is coupled via C20 to another tuned circuit consisting of L4 and C22. The r.f. signal across this second tuned circuit is rectified by diode D1 and applied to the base of d.c. amplifier Q5. Thus, the d.c. voltage level present at the collector of Q5 is a function of the amount of r.f. present on L4-C22. This level is at its maximum when the L4-C22 tuned circuit is at the *same* frequency as the Q4 collector tuned circuit.

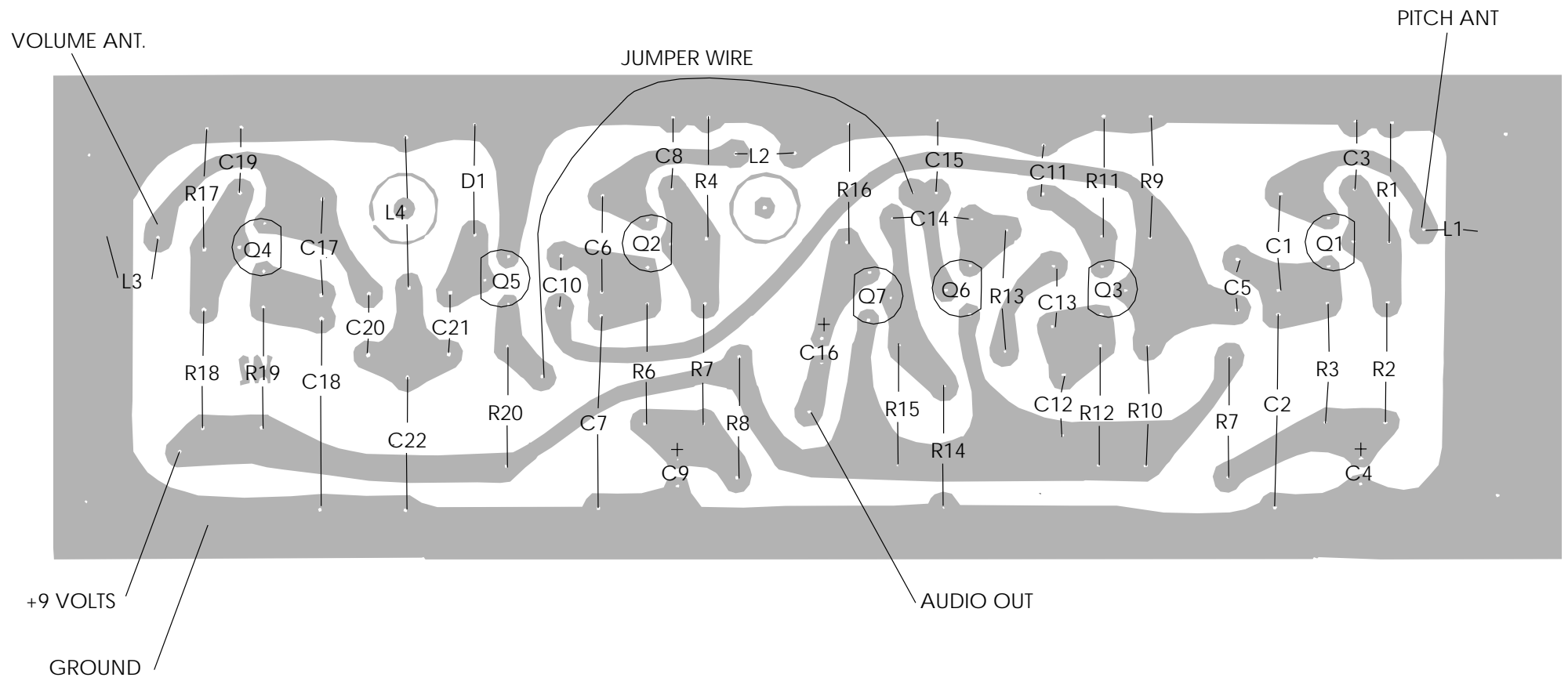
In practice, however, the frequency of Q4’s tuned circuit is made to be *slightly higher* than the L4-C22 frequency. As a result, very little d.c. signal is passed to the base of Q5. This means that the voltage at the collector of Q5 is at a maximum. If the frequency of Q4’s tuned circuit is reduced, when a hand is placed near the “volume” antenna, the base current applied to Q5 increases, causing the collector voltage to drop.

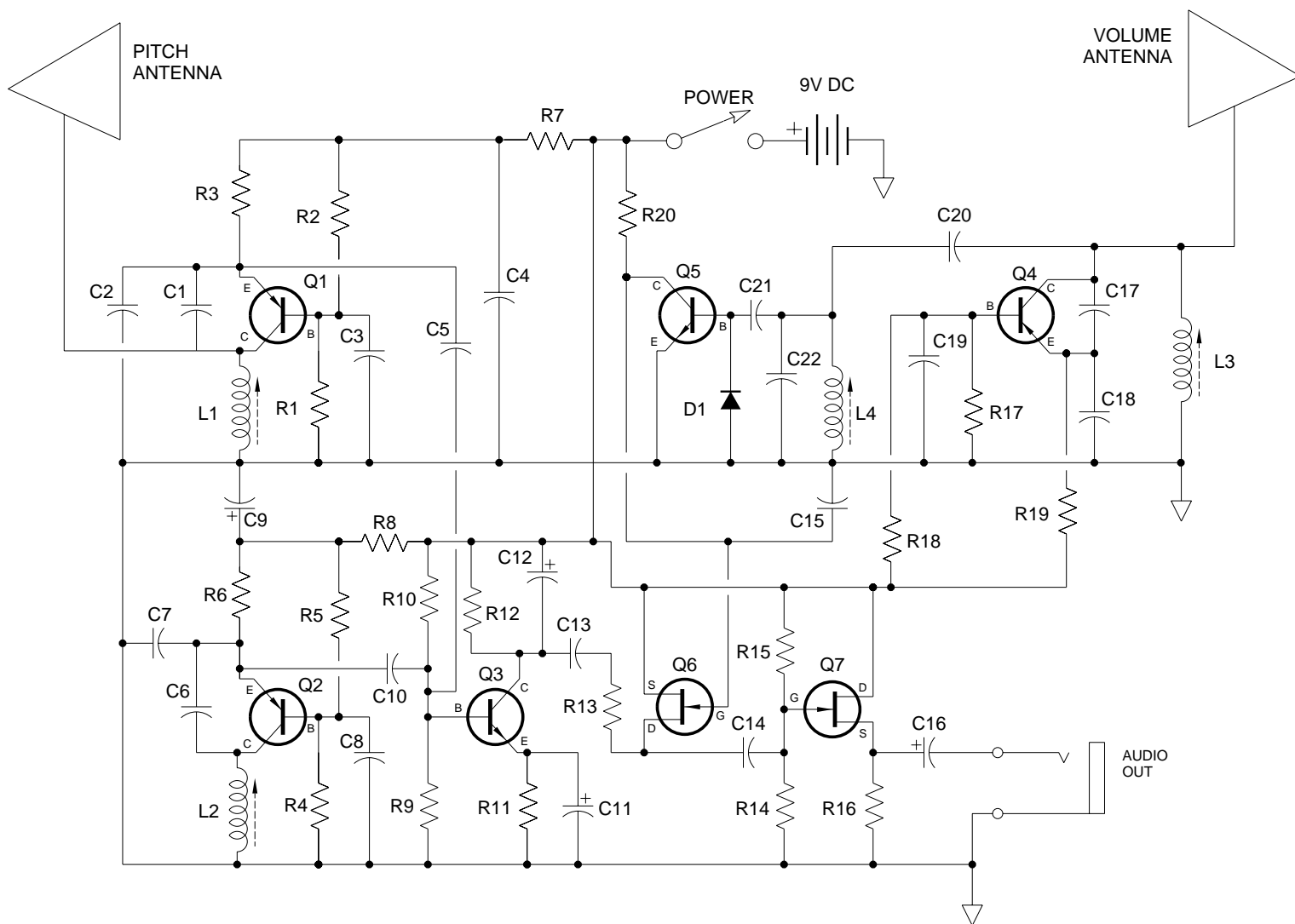
The unique volume control consists of FET Q6, connected in shunt with the audio signal flow. The audio signal at the collector of Q3 passes through d.c. blocking capacitor C13 and is also isolated (for d.c.) from Q7 by C14. Resistor R13 and FET Q6 are arranged as a voltage divider. If the gate voltage of Q6 is highly positive, then the FET acts as a low resistance between R13 and ground, greatly reducing the signal level allowed to pass to Q7. As the gate of Q6 goes less positive, the effective resistance of Q6 increases and the level of audio signal to Q7 increases.

The voltage at the collector of d.c. amplifier Q5 is connected to the gate of Q6. As this voltage level is determined by the frequency of Q4, the operator can readily adjust the output volume by changing his hand capacitance to the “volume” antenna. The variable pitch variable-volume audio signal is coupled to an external audio amplifier via FET Q7. A FET is used for Q7 because its very high input-impedance (a couple of megohms) will not affect operation of FET Q6. If desired, the source resistor of Q7 can be changed to a similar valued potentiometer.

-[30]-





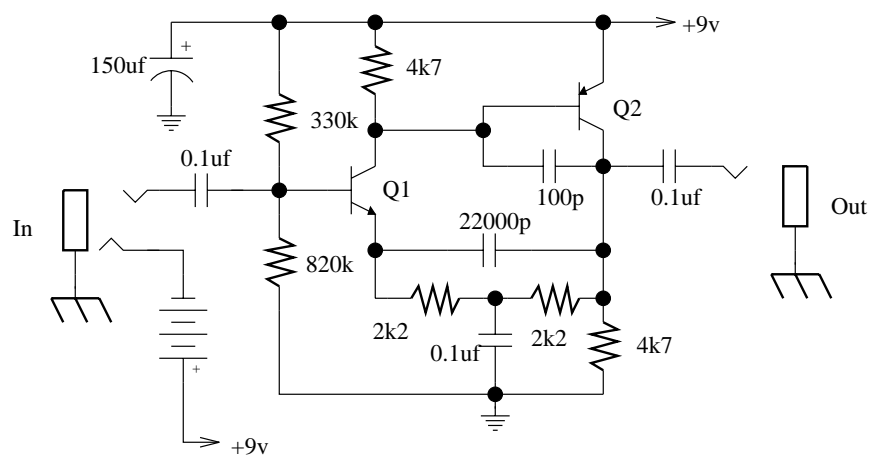


B1	9-VOLT BATTERY
C1,C6	390pF POLYSTYRENE CAPACITOR
C2,C7,C17,C22	0.001uF POLYSTYRENE CAPACITOR
C3,C8,C19	0.1uF DISC CERAMIC CAPACITOR
C4,C9	10uF, 15V ELECTROLYTIC CAPACITOR
C5,C10	60pF POLYSTYRENE CAPACITOR
C11	200uF, 15V ELECTROLYTIC CAPACITOR
C12,C14,C15	0.001uF DISC CERAMIC CAPACITOR
C13	0.01uF DISC CERAMIC CAPACITOR
C16	5uF, 15V ELECTROLYTIC CAPACITOR
C18	0.01uF POLYSTYRENE CAPACITOR
C20,C21	4.7pF POLYSTYRENE CAPACITOR
D1	1N34A DIODE
L1,L2,L3,L4	50-300uH ADJUSTABLE COIL
Q1,Q2,Q4	MPS3638 TRANSISTOR (MOTOROLA)
Q3,Q5	MPS3708 TRANSISTOR (MOTOROLA)
Q6,Q7	TIS-59 N-CHANNEL FET (TEXAS INST)
R1,R4,R17	47K 1/2W 10% RESISTOR
R2,R5,R18	33K 1/2W 10% RESISTOR
R3,R6,R7,R8, AND R11,R19	1K 1/2W 10% RESISTOR
R9,R12,R16,R20	10K 1/2W 10% RESISTOR
R10,R13	100K 1/2W 10% RESISTOR
R14,R15	4.7MEG 1/2W 10% RESISTOR

# *Tone Booster*

from Everyday Electronics Sept. 1978

peaks frequencies at 5000 Hz for a "cleaner and more penetrating" sound



Q1 - ztx384

Q2 - BC415p

IN

20uF

39k

10k

0.0015uF

250k

Treble

709

+V

0.005uF

39k

1M

Bass

20uF

600 ohms

OUT

Preamp w/  
Bass & Treble  
Control

IN

500k

4.7uF

100k

100k

220 ohms

1.0uF

22k

6800pF

250k

6800pF

22k

6800pF

0.5uF

470k

56k

20uF

10k

47k

20uF

20uF

10k

2k2

220 ohms

470k

3k3

1N914

1N914

OUT

1k

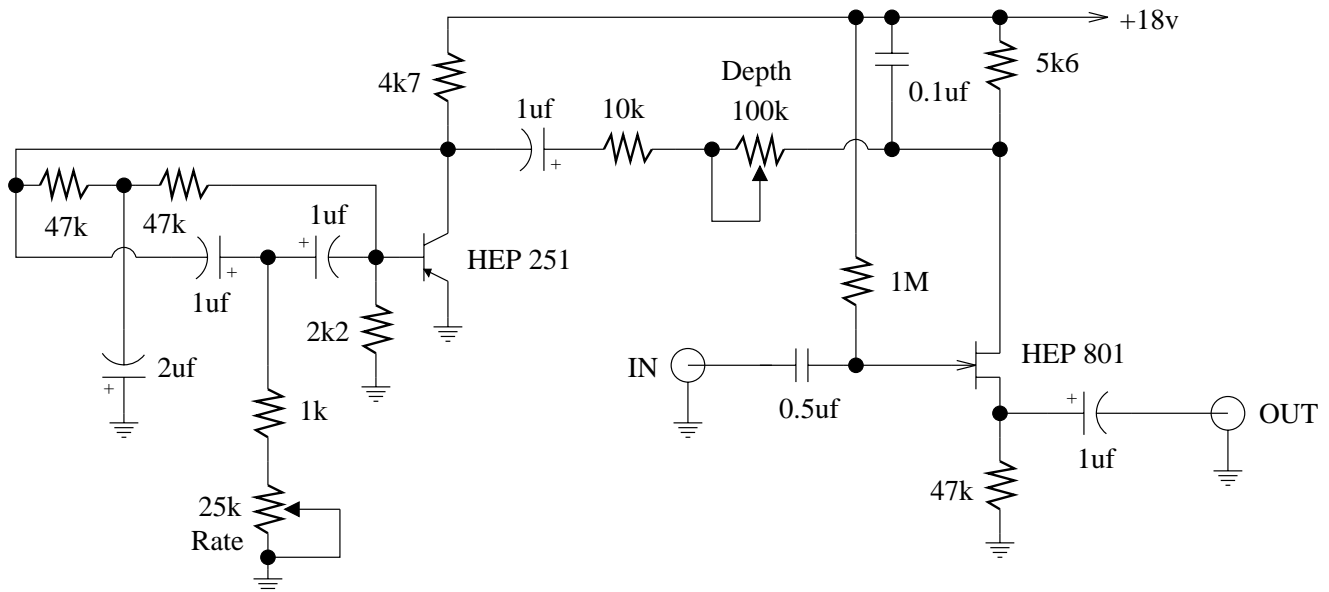
+15v

Unlabeled ???

HEP 50

Tone Control circuit with signal isolation and impedance-matching stages.

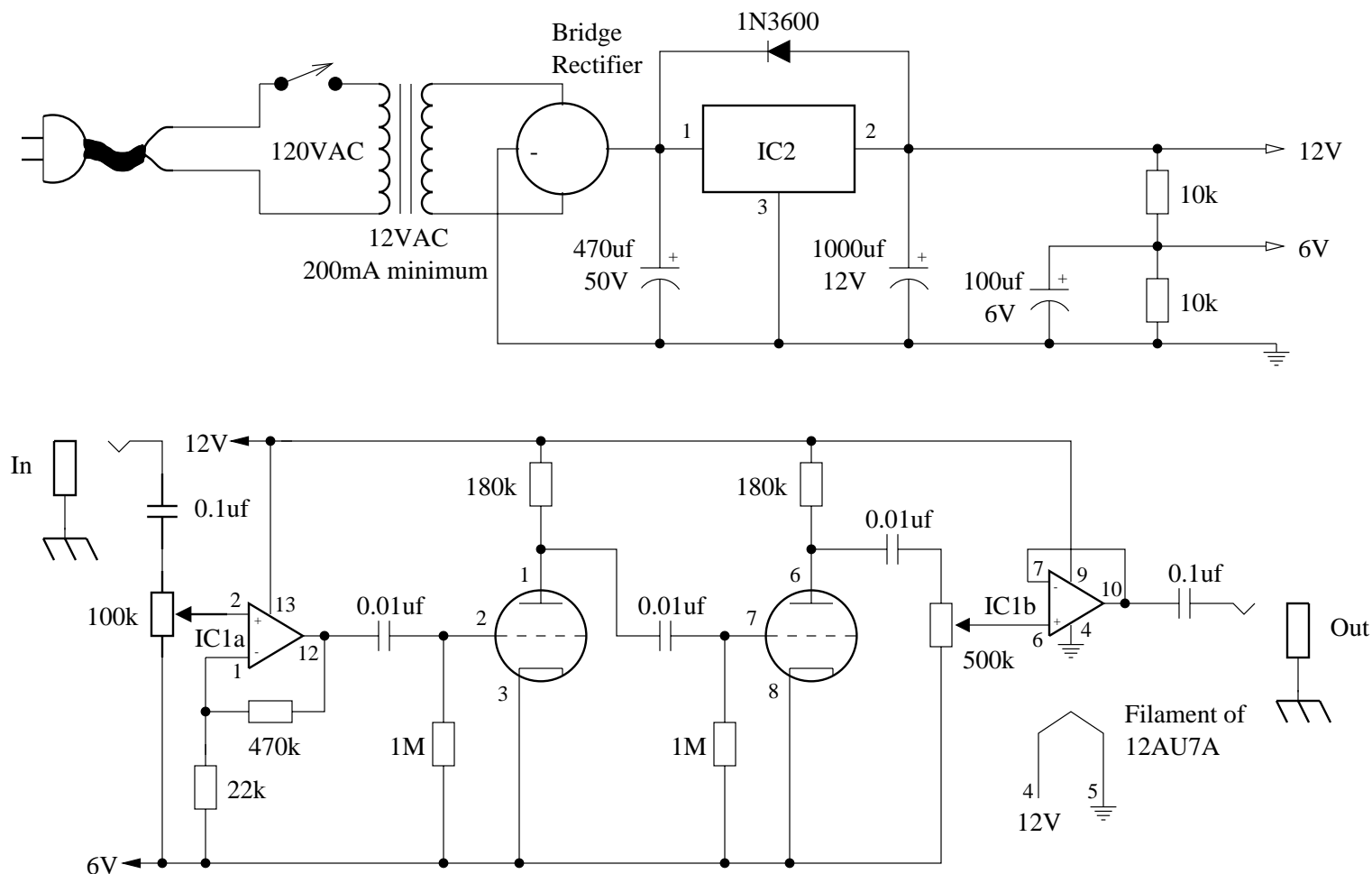
## Controllable Tremolo Circuit



This tremolo circuit is not a "plug and play" ready guitar effect, however it could be converted to one with relative ease. It just needs some buffering on the input and output and perhaps some bypass switching.

Name: Tube Distortion	Manufacturer / Designer: Ron Black	Revision: 10/13/95	Model #
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Circuit from Guitar Player : October 1981



IC1 - 747 dual op-amp, others may be substituted but pinout will differ

IC2 - LM340K-12V Voltage Regulator

Bridge Rectifier - Full wave bridge rectifier, 50 Volts, 500 mA minimum

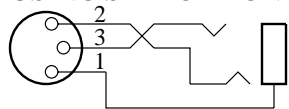
All resistors 1/2 W, 10% preferred







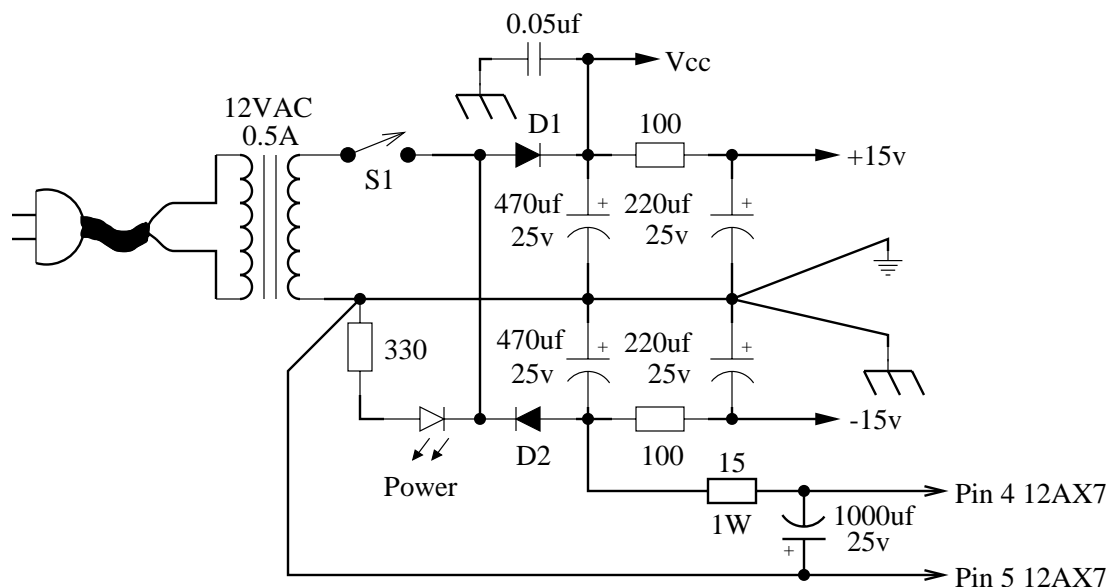
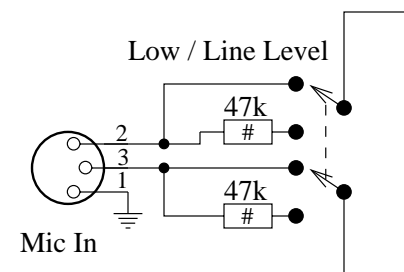
### USING STEREO PHONE JACKS FOR INPUT



This mod converts the XLR jacks to 1/4" balanced stereo jacks. However, when a mono plug is used with this new jack the inverting input of the differential amp is grounded, this single-ends the balanced input so standard phone plugs on dynamic mics can be plugged in directly. Additionally the polarity switch still works, even for unbalanced inputs. If phantom power is not turned off while using a single ended input the performance of the TMP will not be up to par but it won't damage the TMP either.

### USING THE TMP WITH LINE LEVEL SIGNALS

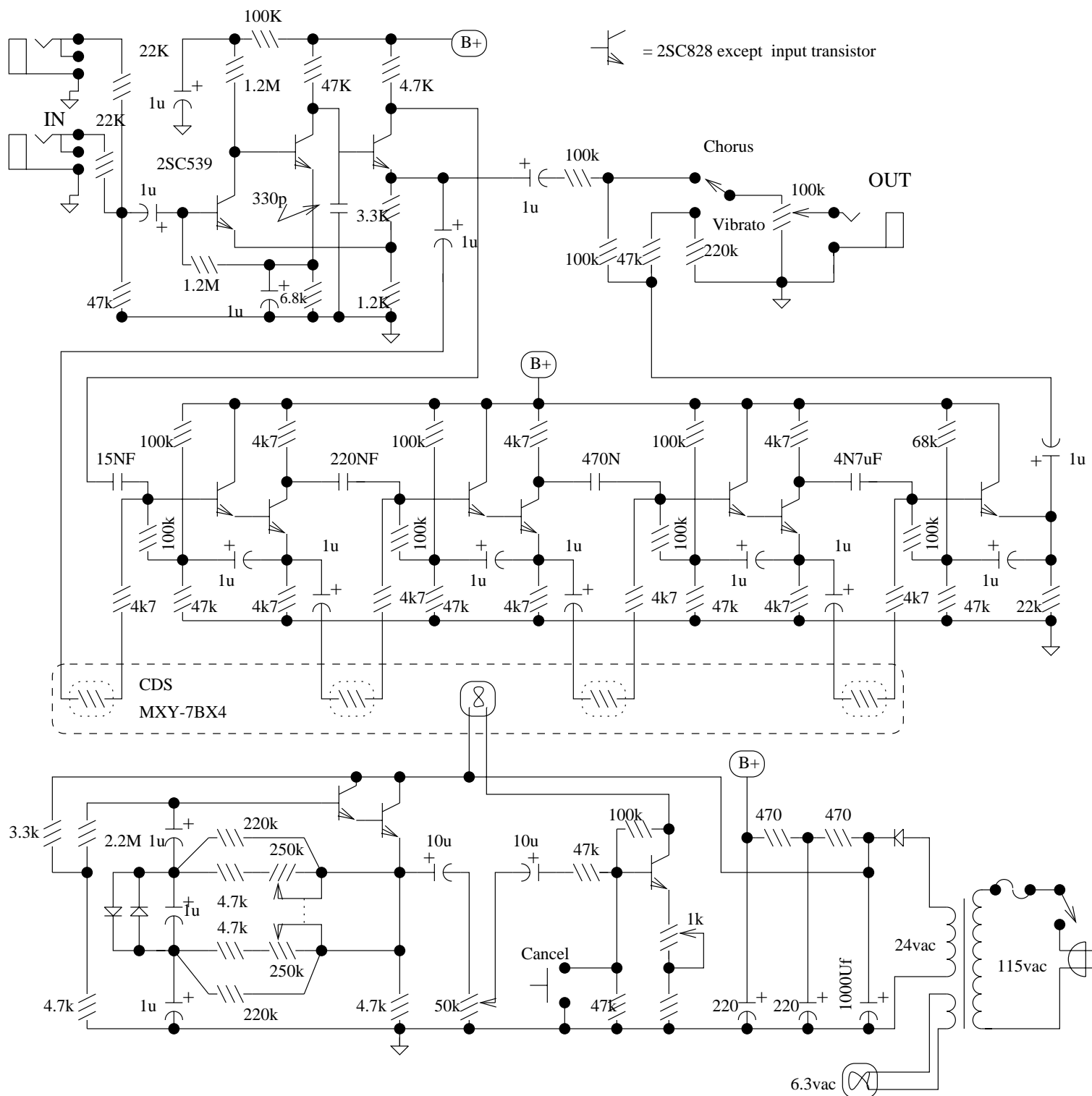
There are two options for line level signals. First if you know that you'll be using line level signals all the time with the TMP then you can change the two 33k 1% resistors to 1k 1% types and you're done. Alternatively if you want the option of line level or low level signals then you can sacrifice the polarity switch and rewire it here as shown. Notice that the 47k resistors are again of the 1% variety.



### USING DC TO POWER THE HEATER FILAMENTS

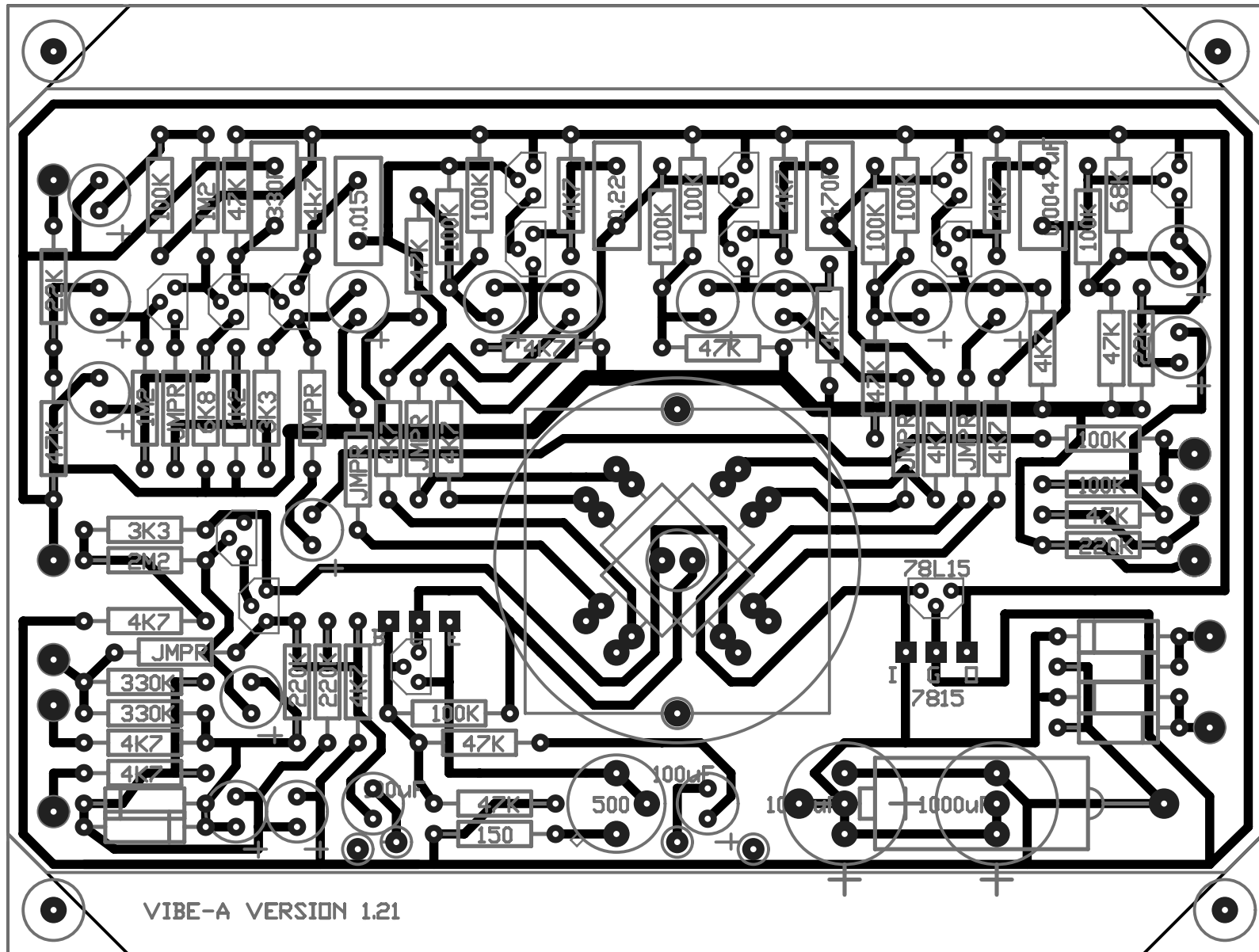
This mod can make the TMP quieter. Instead of using the 12VAC to power the heater filaments rectified and filtered DC can be used. This is accomplished as shown. The new resistor added is a 15 ohm 1W type, the new cap is a 1000uf 25v as shown. It is critical that pin 5 of the 12AX7 connects to the ground point shown.

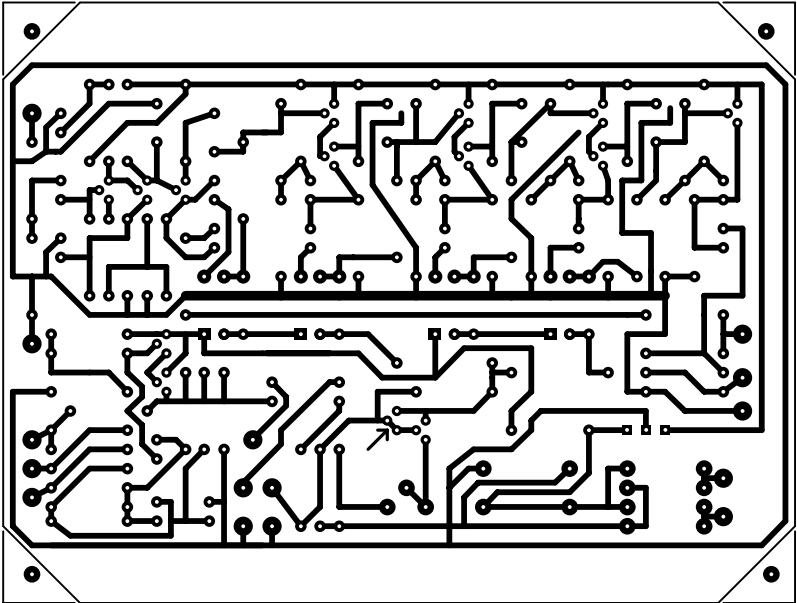
## UniVibe (model 905, by Unicord, circa 1968)

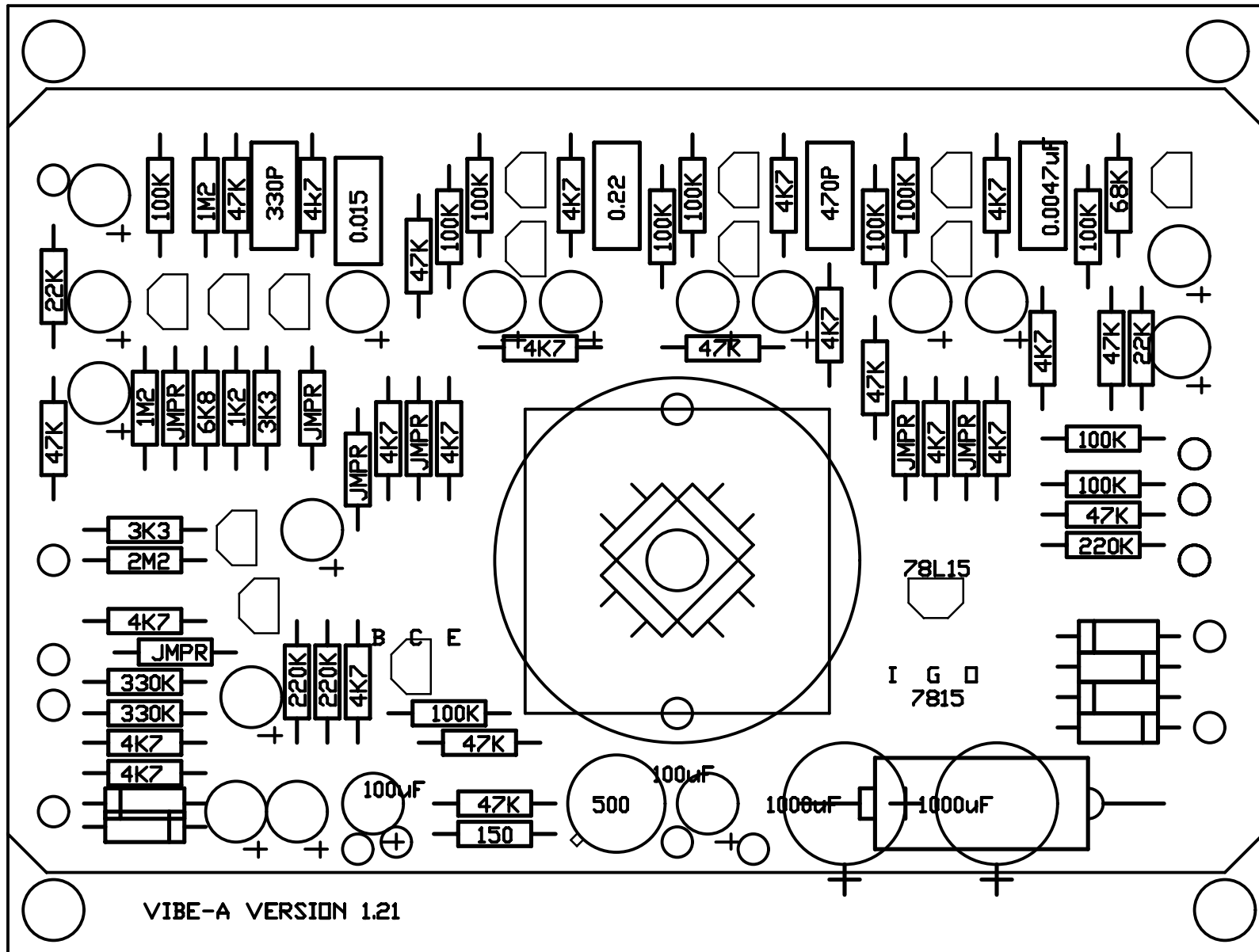


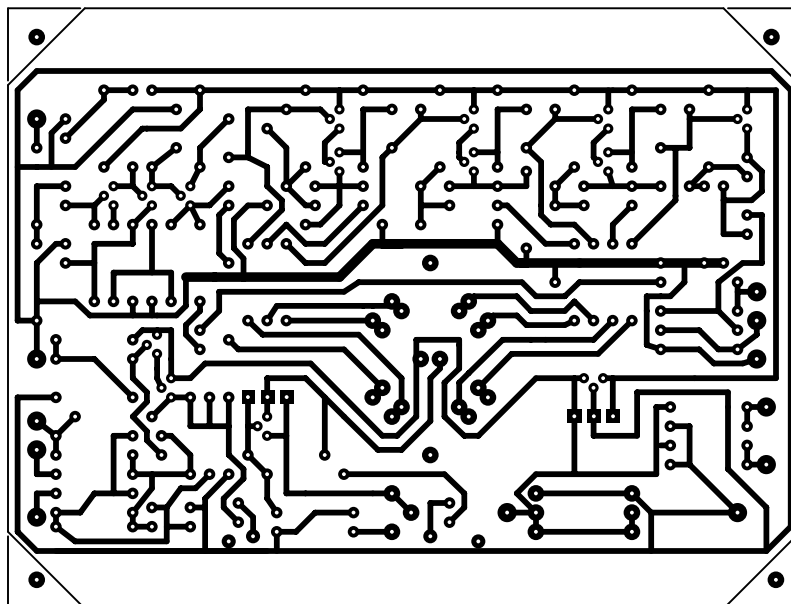
The UniVibe is famous from Jimi's use of it. The LFO is a phase shift oscillator, with the dual 250K pots in the pedal assembly to control speed. A modern version would substitute an LED/photocell optocoupler for the four LDR's and the incandescent light bulb that makes the shifting work. This IS just a four stage phaser, perhaps with some distortion from the signal path thrown in.

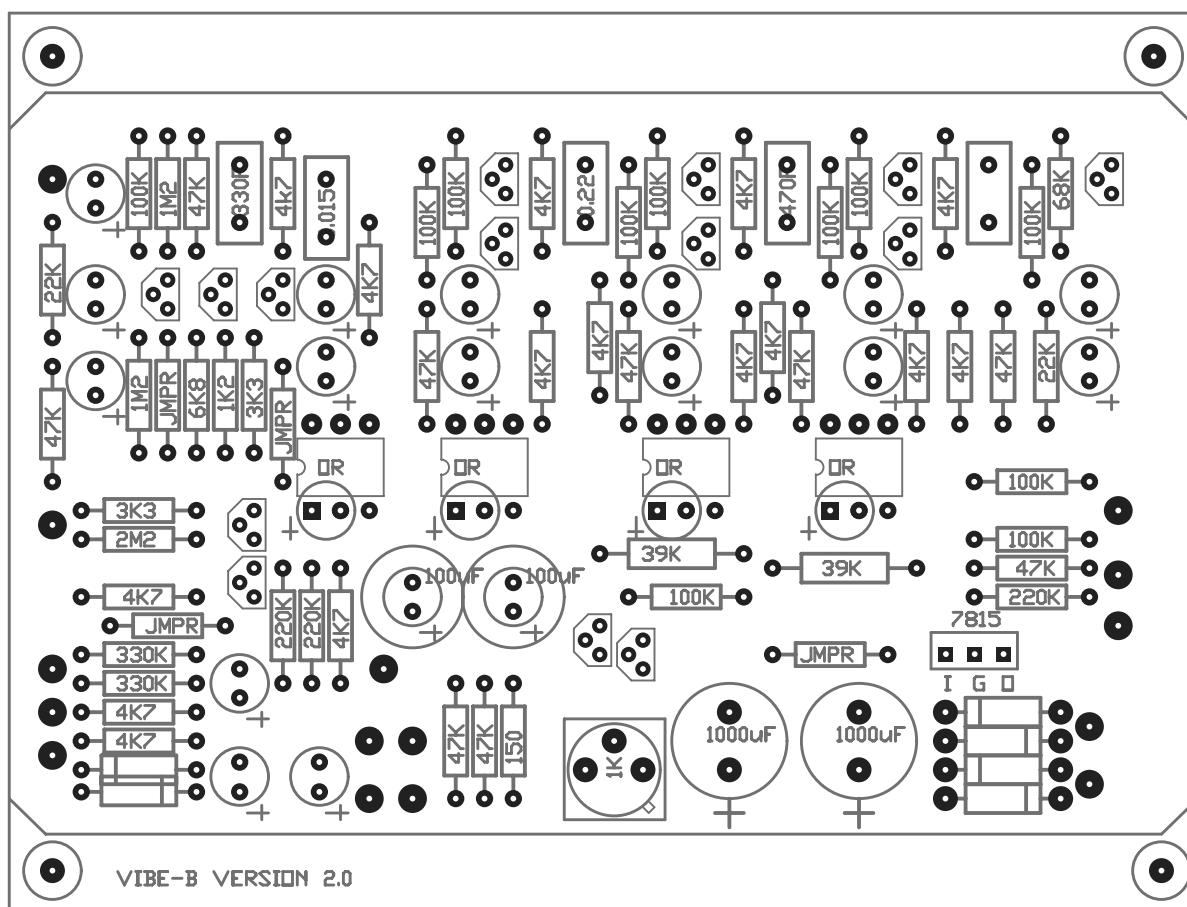
Since the Univibe (r) is being reissued by Dunlop, Dunlop probably owns the "Univibe" trademark these days. This schematic bears no resemblance, except accidental, to the reissue that Dunlop or anyone else may be making.



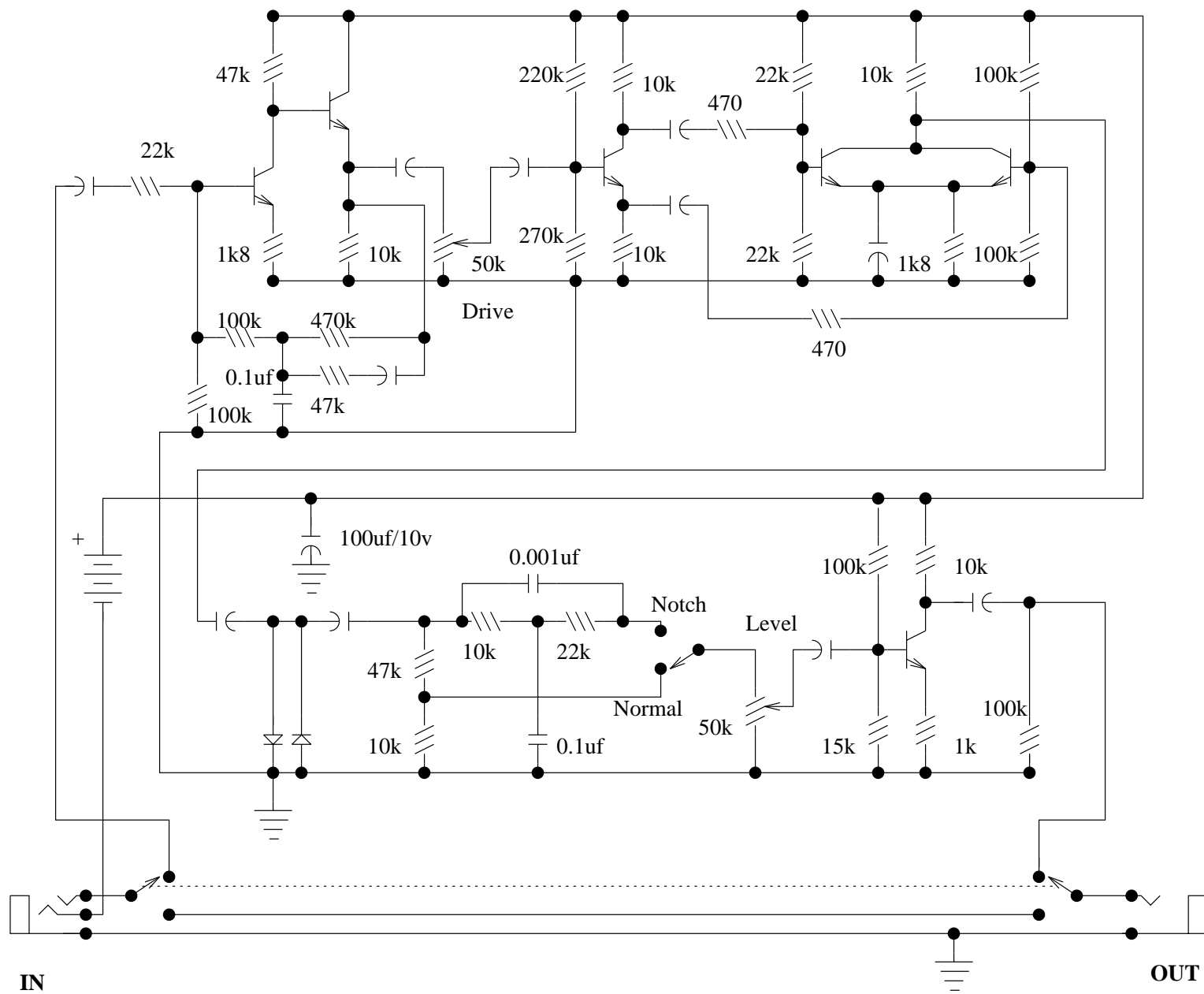









# Univox Super-Fuzz

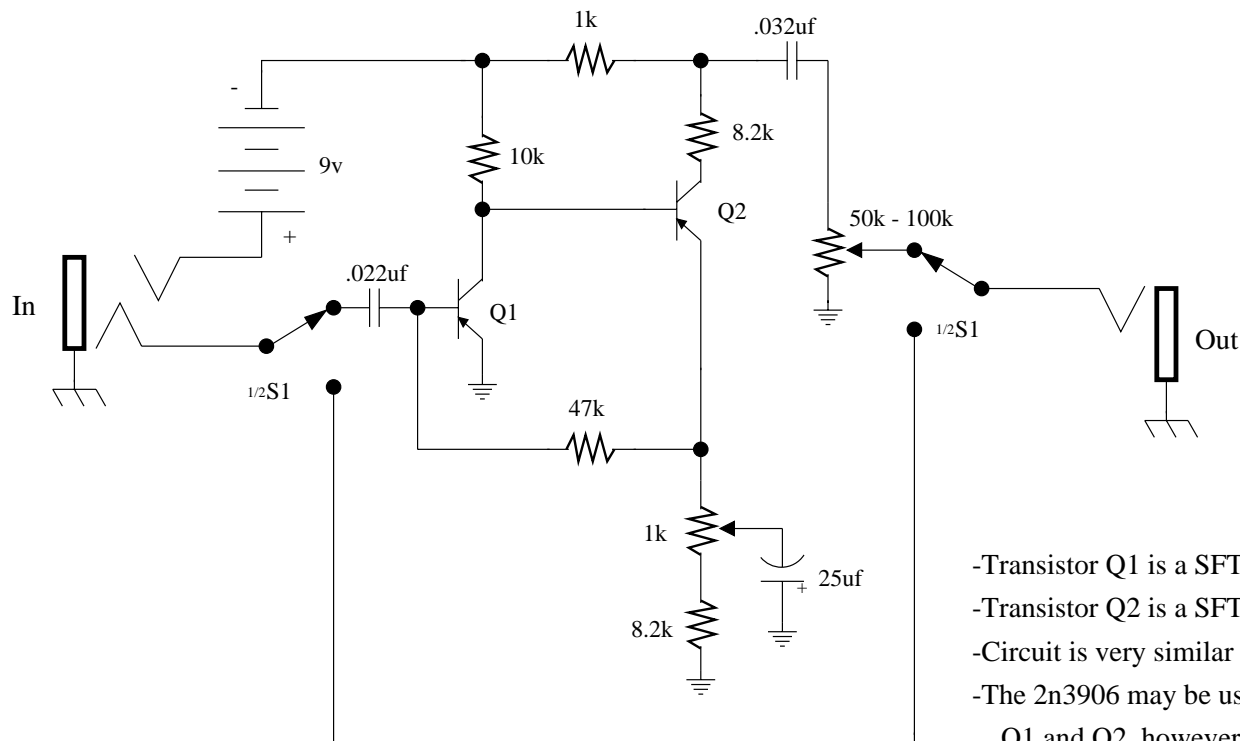
 = high gain NPN; 2N2222, 2N3391

 = 10 uF electrolytic cap, positive at straight bar

The Univox Super-Fuzz is a 69-to-early 70's design that includes two unique features. These are the octave generation effect from the differential-pair-with-collectors -tied-together and the choice of just a clipping amp or a 1kHz notch for different sounds. The odd-diffamp is actually a full wave rectifier as used here. The clipping is all done with the pair of back-to-back diodes just before the normal/notch filter section. These were originally germanium, although silicon works. You can use LED's here for a different sound, but you need a lot of gain in the input to get enough signal to them to break them over.

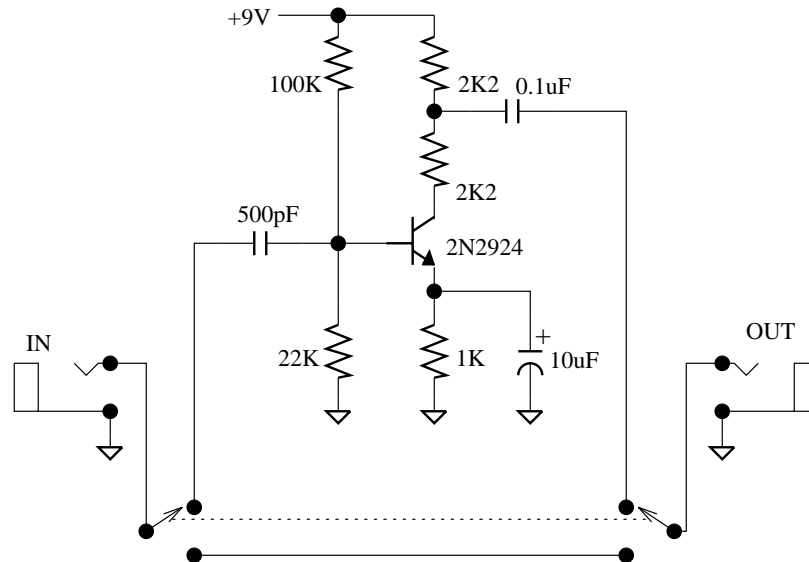


# Vox Tone Bender

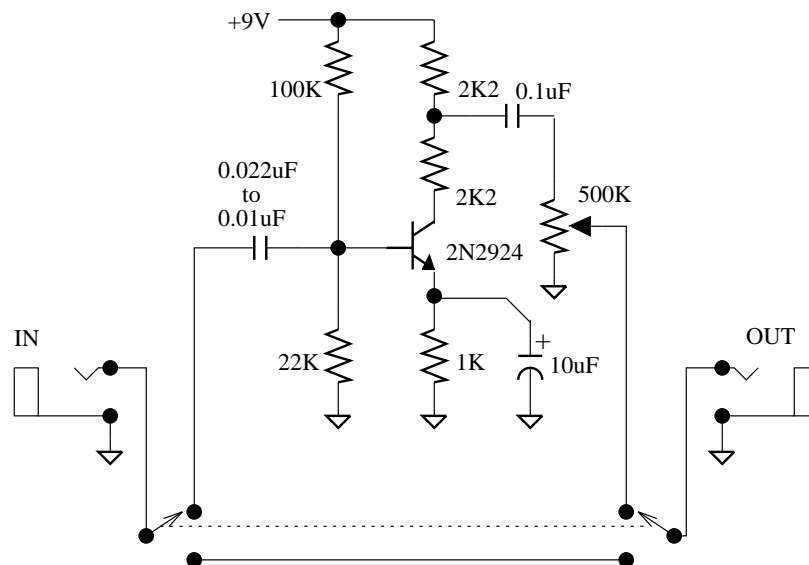


- Transistor Q1 is a SFT 363
- Transistor Q2 is a SFT 337
- Circuit is very similar to "Fuzz Face"
- The 2n3906 may be used as a replacement for Q1 and Q2, however originals were probably germanium.

## VOX Treble Booster



Original Circuit



Modified to be used as an overdrive/distortion unit

The input cap is changed from 500pF to 0.01 uF (1000pF) or 0.022 uF (2200 pF) to allow more bass in. This usually overloads the booster and causes crunchy distortion.