Tweed mod	
Location	**Change to**
C22	.15uF
C100	.1uF
D1	1N34A GERMANIUM
D3	1N34A GERMANIUM
D7	1N34A GERMANIUM IN SERIES WITH 1N4001
D8	1N34A GERMANIUM
D10	1N34A GERMANIUM
C10	.1uF
C35	.047uF
C34	.1uF
C27	.0022uF
C10	1uF
C7	1uF

The midrange problem some folks hear can probably be best changed by swapping out different values for C9 and C16. These set the resonant frequency for the simulated inductor and C9.

If you need more gain: Try changing R30 and R36 to a 1k. You can also lower the values of R34 and R31. Also, connect a 10-47uf cap in parallel with r30, and another at r36. This should give you a ton of distortion, possibly too much, so do one change at a time. **NOTE:** Make sure that the electrolytic caps have their negative side going to ground there (one side of each of those resistors goes to ground). Find ground with your multimeter.

About the circuit:
The Boss blues driver is one of those pedals that everybody has owned or at least played through once. I'd venture to say it's nearly as popular as the beloved tubescreamer.

While many players like the sound of the stock pedal just fine, many other guitarists like the basic tone but just want it better – more organic, responsive, and dynamic. Some feel that there are just way too many high frequencies in the pedal, making it sound brittle… especially with a single coil guitar into a clean fenderish type of amp.

Let's discuss some modifications we can do to this pedal to make it much better.

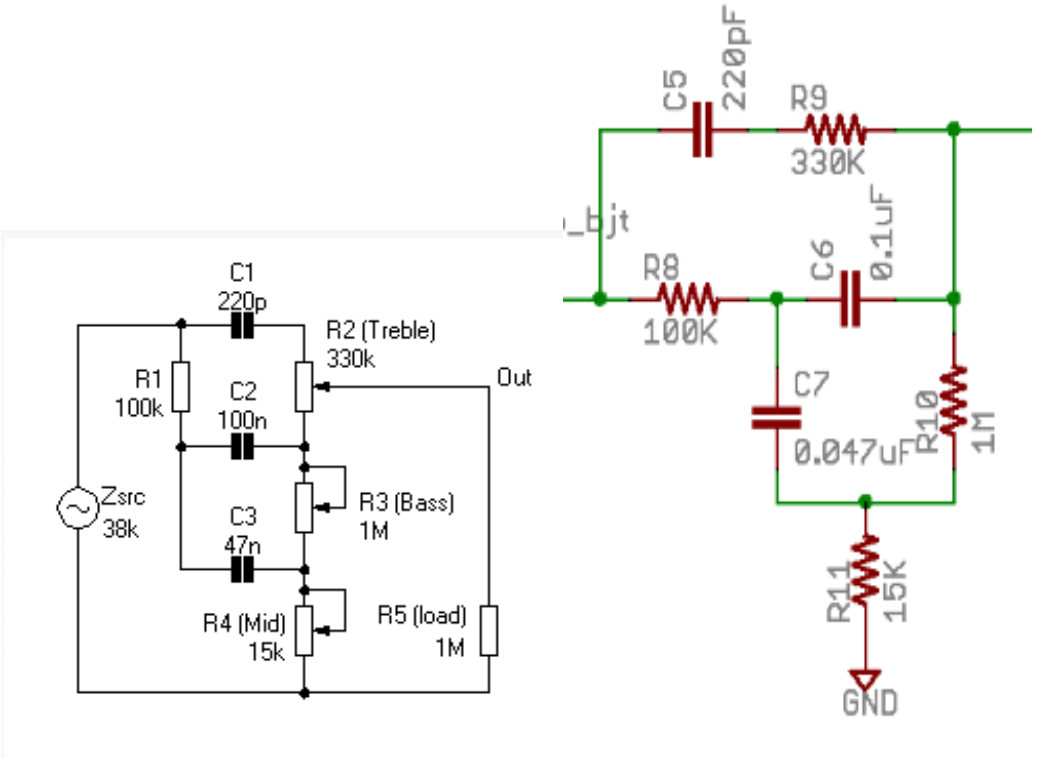
First though, let's break down the circuit a bit and see what is going on. Looking at the schematic we see that it is essentially two cascaded discrete op-amps which is then followed by a standard op-amp for gain recovery, bass boosting, and buffering of the signal. This is after it goes through a discrete buffer of course.

In laymens terms, a discrete opamp is similar to the IC chip version except that it does the same thing in a simpler fashion and in a way that some feel is more responsive and less 'sterile' feeling and sounding. It uses two FETs facing each other followed by a bipolar transistor. There are two of these type of gain stages in the bd-2, controlled by a dual gang 250k pot wired as a variable resistor. Just like the IC opamp circuits, there is a resistor/capacitor pair going to ground that will also help set a frequency to clip. This pair will also help set the gain, though they are fixed values in the bd-2. R31 and C22 are the pair for the first stage, while R15 and C9 are the pair for the second stage.

We know that eq before clipping determines the clipping feel, tonality, and response (distortion/overdrive) quite dramatically. For example, if we want a fuzzier type of distortion, we want to increase the bass before it is clipped. Then, we clip the signal as much as possible without creating a lot of noise or oscillations.

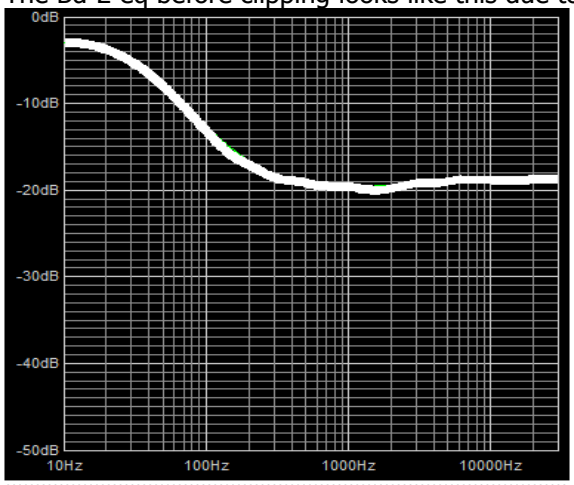
R31 and C22 in this first gain stage set a frequency of just a hair over 700hz. This is a normal frequency for most overdrives and distortion. If you want more fuzziness, increase this cap to . 22uf (microfarad) or larger. If you want a tighter crunchier type of tone, make the cap smaller. If you plug in these values to my calculator at http://www.indyguitarist.com/filter.htm you will see the frequencies you can affect.

After this first gain stage we go through what first looks like an odd tone filtering stage. Upon closer look, it is actually a fender type of 3 band tonestack with fixed values(with the treble on 0 and the bass and mid on 10)! This is a really cool thing to mess with because if you want to go hog wild, you can add trim pots in place of R37 (use a 250k trim pot for treble), R50 (use a 1M trim pot for bass), and R51 (use a 25k trim pot for mids). In addition, you can change the 'slope' resistor, R36, to a 33k, C34 and C35 to a .022uf, and change C26 to a 470pf in order to get more of a 'Marshall' type of tonality before the signal is clipped. When you are replacing these resistors with trim pots, just connect one hole to pin 1 on the trim pot, and the remaining resistor hole to pin 2 on the trim pot. Leave the 3rd lug untouched.



traditional fender tonestack bd-2 tonestack

The Bd-2 eq before clipping looks like this due to this filter:



Notice how there is a TON of bass present? That is before the majority of the clipping is happening, so it's no wonder that the pedal sounds fuzzy when the gain is turned up!

A good mod at this location is to make R50 a 100 ohm, and change R36 to a 47k. That will give you a much flatter eq response.

After that the signal is clipped by diodes connecting to ground (D7, D8, D9, D10) with two diodes on each side and fed into another discrete opamp. This opamp is nearly identical except the frequency response is a little different. There is more gain in the bass (set by R34 and C24, frequency is about 72hz) but it works the exact same. Notice that since the bass is boosted yet again here, it's really no surprise that the bd-2 would be so fuzzy with the gain turned up.

C17, R25, and C19 from both a high pass and low pass filter, which will get rid of some high harmonics about 5k or so, as well as try to get rid of some of the bass content that was created by boosting the lows so much previously.

From here, the signal goes through a fairly standard tone control very similar to that of an old Fender tweed Princeton. It acts as a hi pass filter with the tone knob turned up and a low pass filter with the tone knob turned down. So, as you turn up the tone, you increase the highs and lose some bottom end once you are past about halfway or so. Changing C100 will change what frequencies of highs you have with the tone control up, and changing C101 will change what frequencies are filtered with the tone control turned down. The volume control is next before going into the next stage – the eq stage.

The next stage is a simulated inductor which is boosting the bass content at about 120hz or so by 6db. Even though there are diodes in this stage (D1 and D3), they aren't really clipping much at all like diodes usually are in an overdrive or distorton circuit – it is actually more to protect this opamp from being slammed with a loud and hard signal. It also does a little bit of filtering as well as help to output a low impedance signal. Changing these diodes to a different type WILL give a little bit different 'feel' however – it becomes a little less compressed if you use LED's, and becomes a bit more compressed and filters out a little bit of highs if you use germanium type diodes. My inclination is that this is probably due to varying degrees of harmonics being just *ever so slightly* clipped.

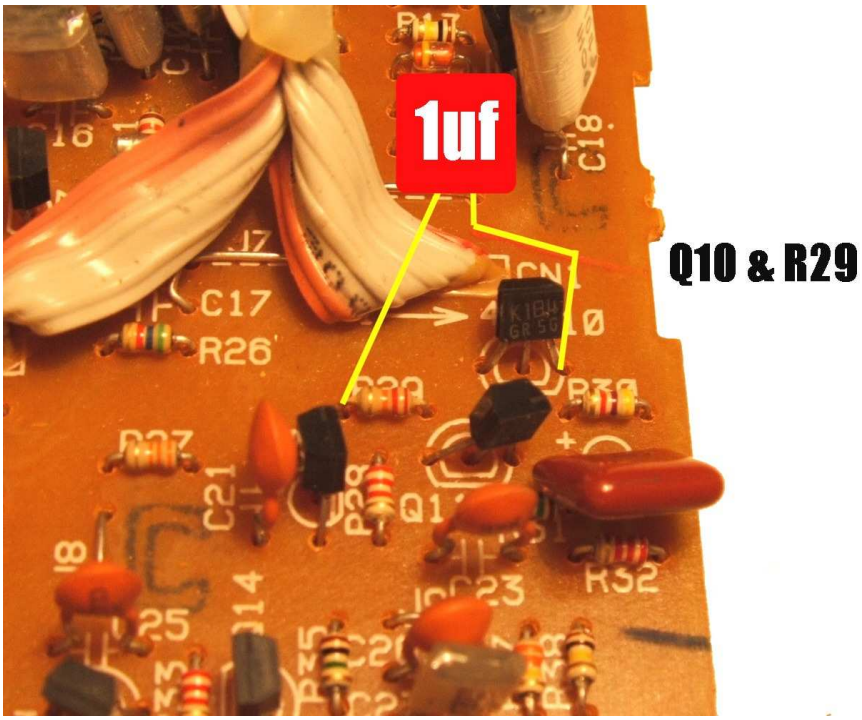
If you want to mess with the eq, there are several ways to do it. You can mess with changing the cap sizes of C9 and C16, or changing R21. Changing the caps can get you much more frequency options, just by subbing in various values. Increasing the resistance lowers the frequency and decreasing it raises the frequency to a point as well. You might even try subbing a 5k trim pot here just for fun! ☺

From here it goes into the switching circuit and then to an output buffer. Even when in bypass the pedal is going through three discrete buffers.

Note:
To make the pedal tailored towards low to mid gain applications, change r29 and r27 to 4.7k resistors.

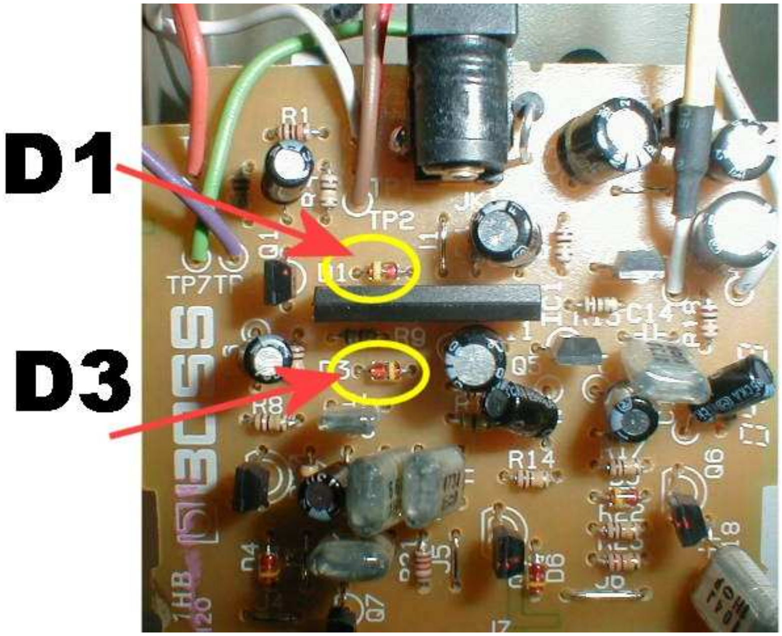
bd-2 Fuzz Mod

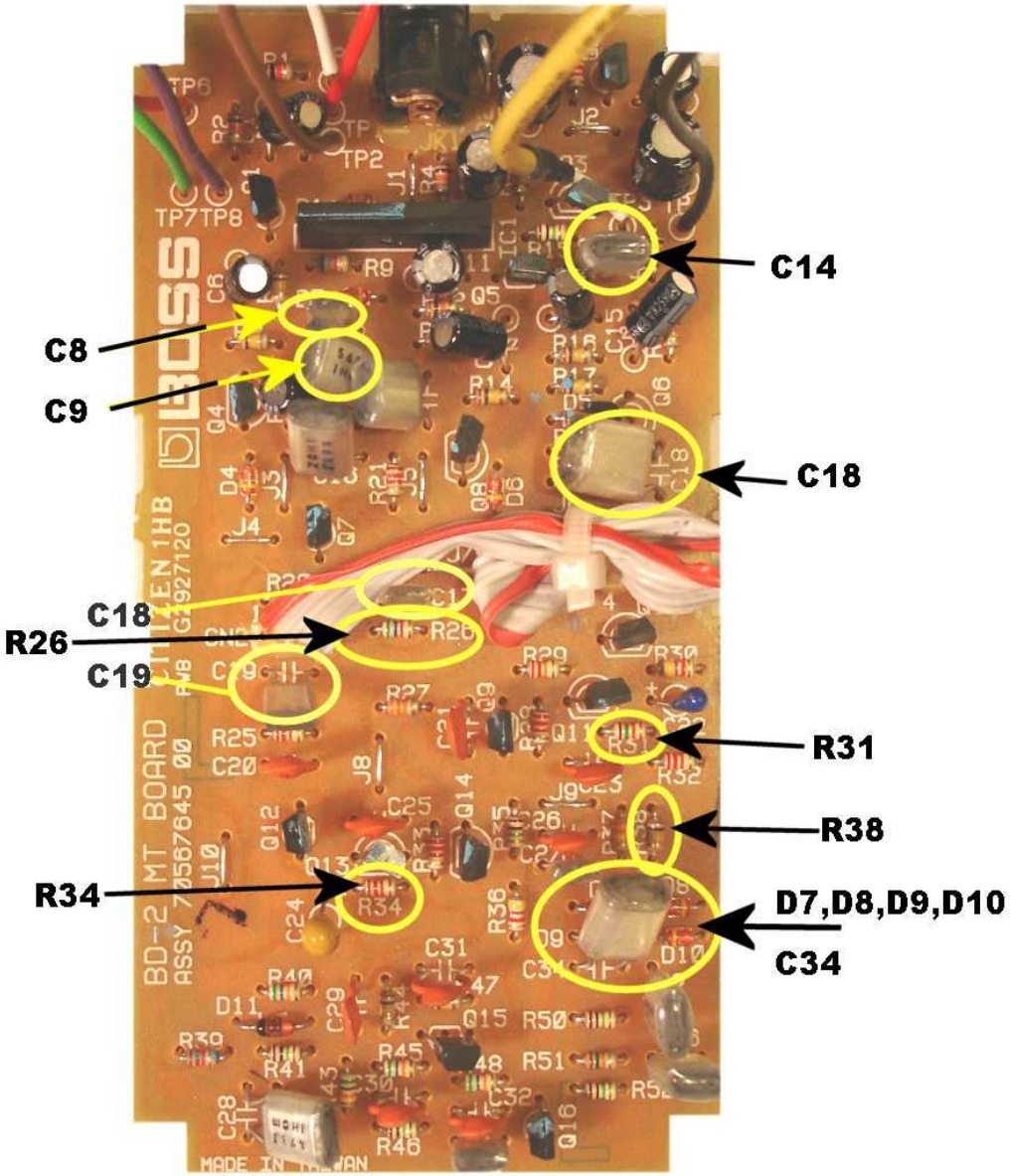
location	Stock Value	mod value	What it does
Q10 & R29		ADD 1UF CAP AS SHOWN	Adds a hint of octave, extreme fluttering fuzz
Tone control cap C100, directly under tone pot		.047	will add bass and better tone control



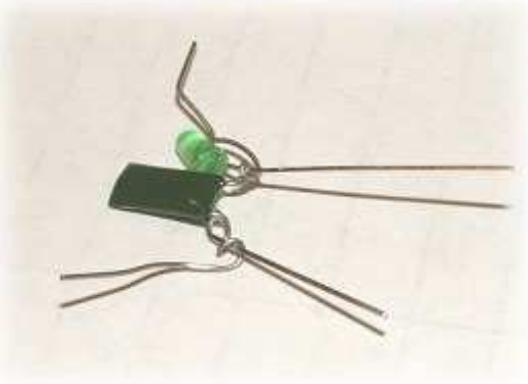
Tweed Mod

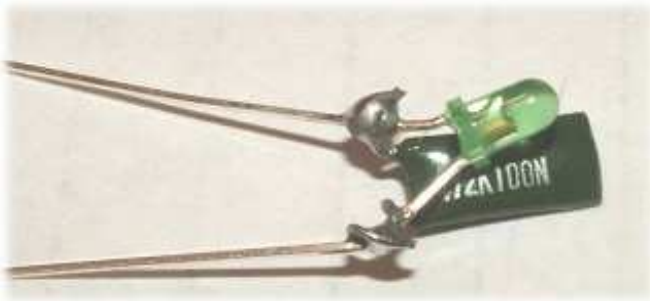
location		mod value	What it does
C22		.15 uf metal film cap	Cleaner bottom end – for more bass, make this cap a .22uf
Tone control cap C100, directly under tone pot		.1 uf	will add bass and better tone control
D1		1n270 germanium diode	These changes will make a big difference in the response, dynamics, and flavor of overdrive/distortion
D3		1n270 germanium and 1n4001 in series (germanium first)	
D7		1n270 germanium and 1n4001 in series (germanium first)	
D8		1n270 germanium	
D9		1n4148	
D10		1n270 germanium	
* 1n34a diodes can be used instead of 1n270 germanium diodes			


D1
D3

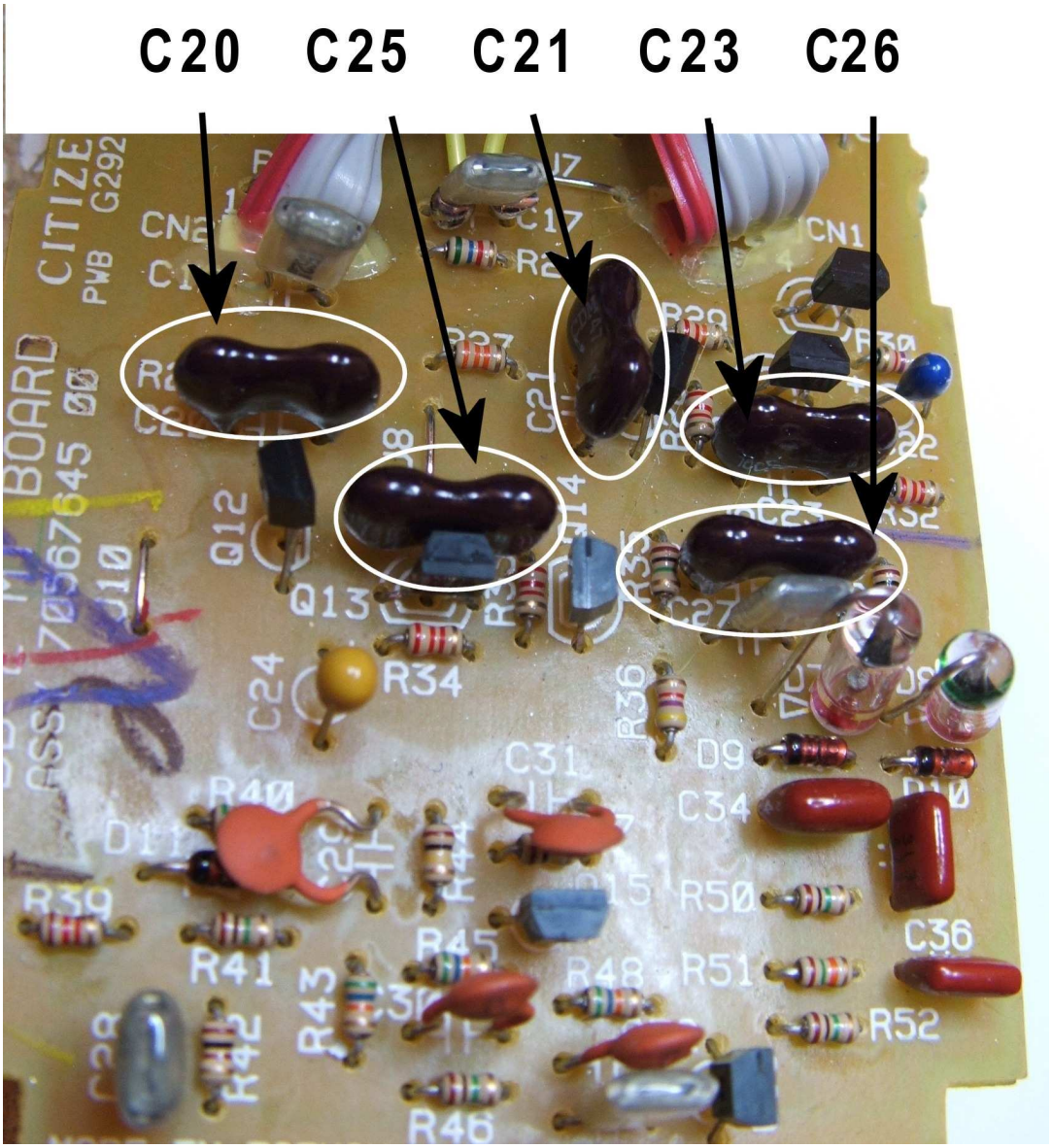

C14
C8
C9
C18
C18
R26
C19
R31
R38
R34
D7,D8,D9,D10
C34
BOSS
BD-2 MT BOARD
ASSY 7056764500
MADE IN TAIWAN

D9, (Led & .001 to
.0047 cap in parallel)- this is what it will look like before you solder it together

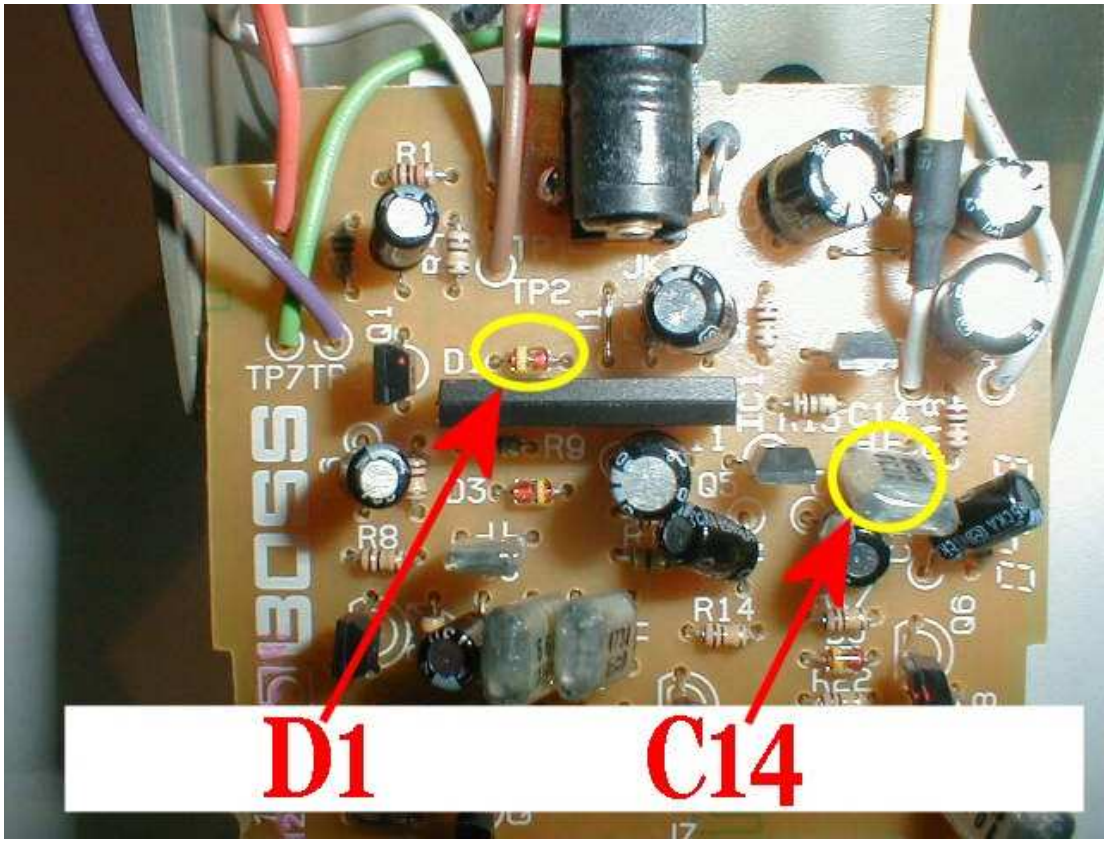




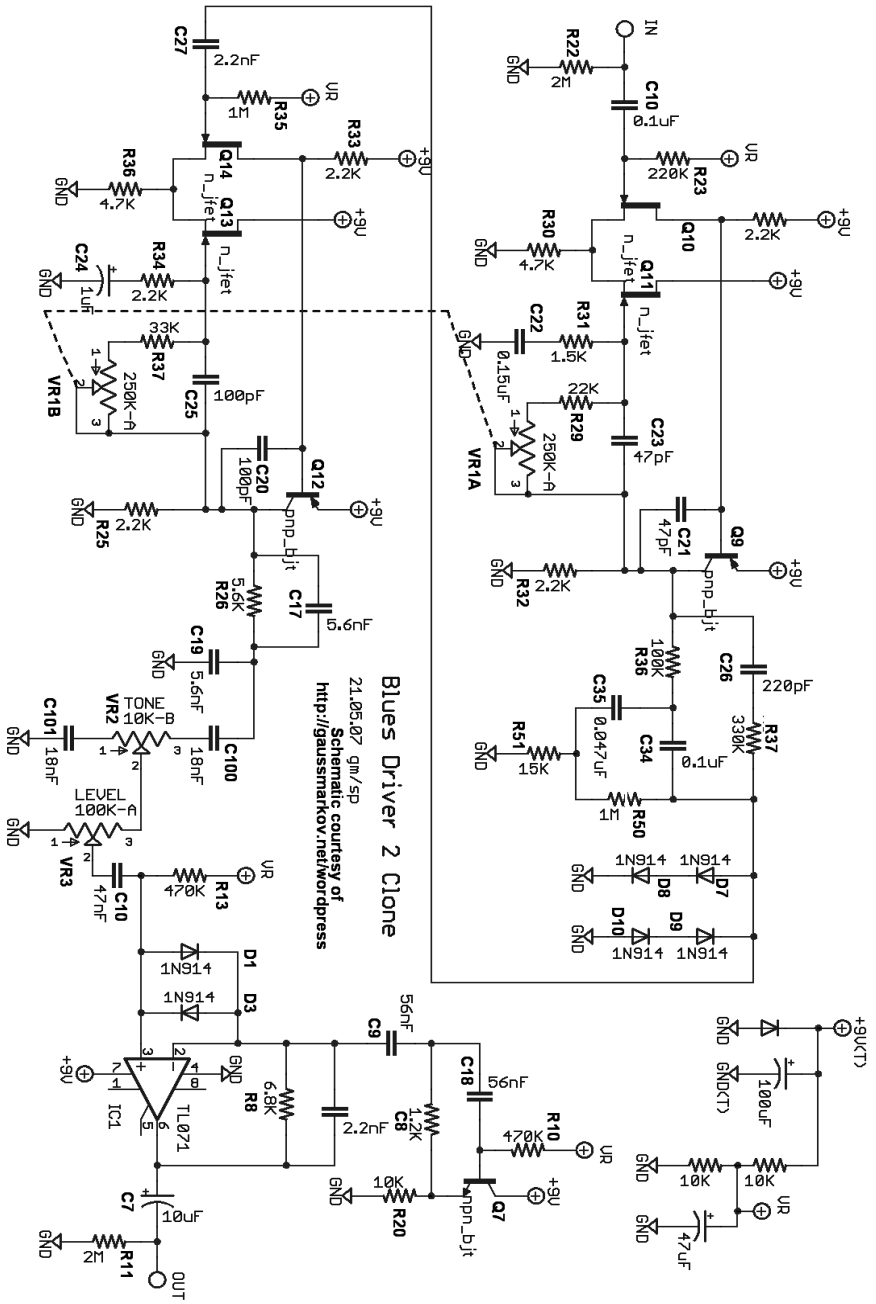
After you solder them together, cut the excess legs off of the capacitor


C20
C25
C21
C23
C26
CITIZE
PWB G292
BOARD
CN1
CN2
C17
R28
R30
R32
C22
C27
Q12
Q13
R34
C24
R36
C31
D9
D10
C34
D11
R40
R39
R41
R45
R48
R50
R51
C36
R52
R43
R42
R46


D7, D8 - change to 1n60a
or 1n48a Germanium diodes
c34, c35, c36
change to metal film

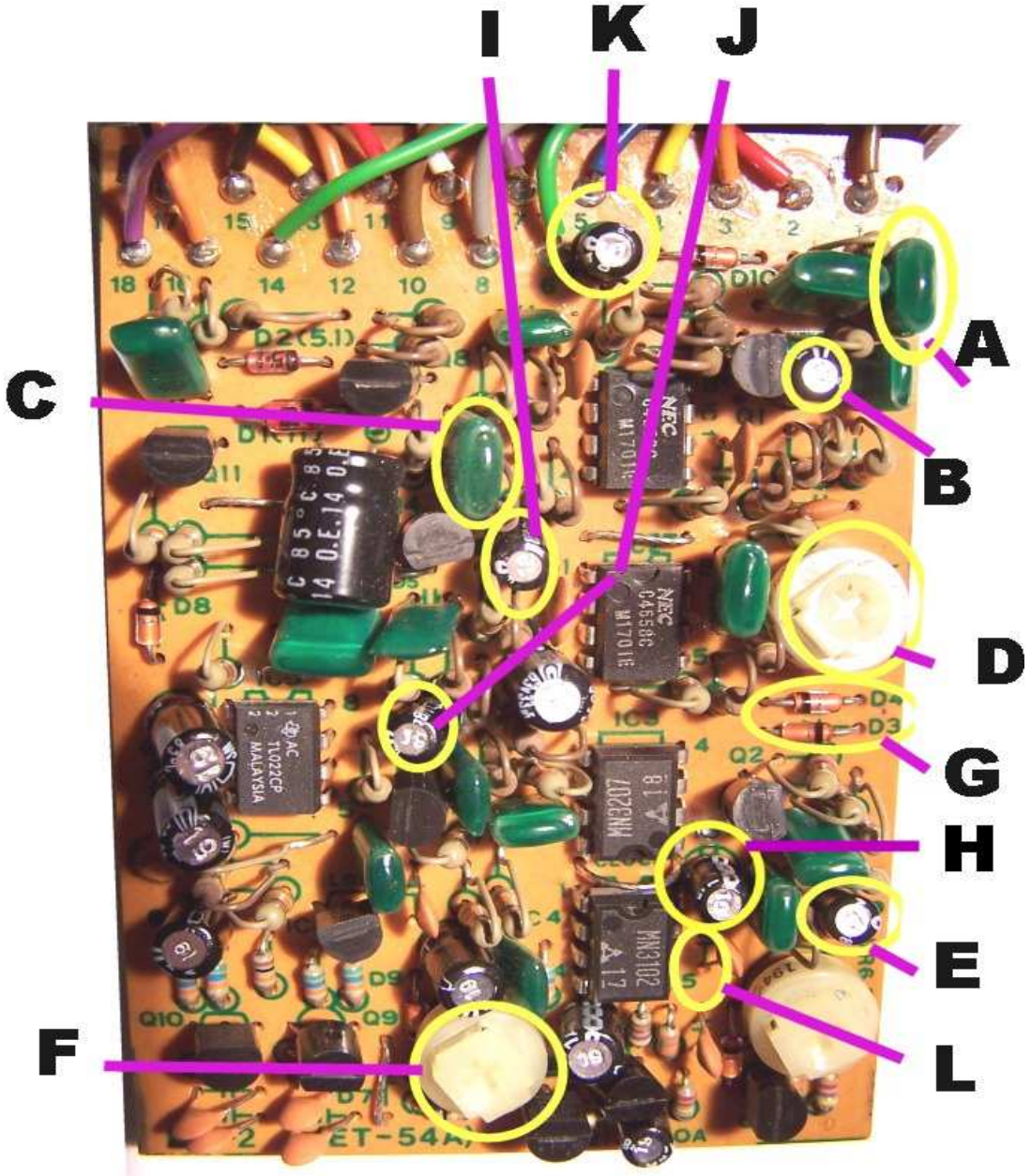

R1
TP2
TP7TP
D1
R9
D3
R8
R14
C14
Q6
D1
C14

BD-2 Schematic without switching

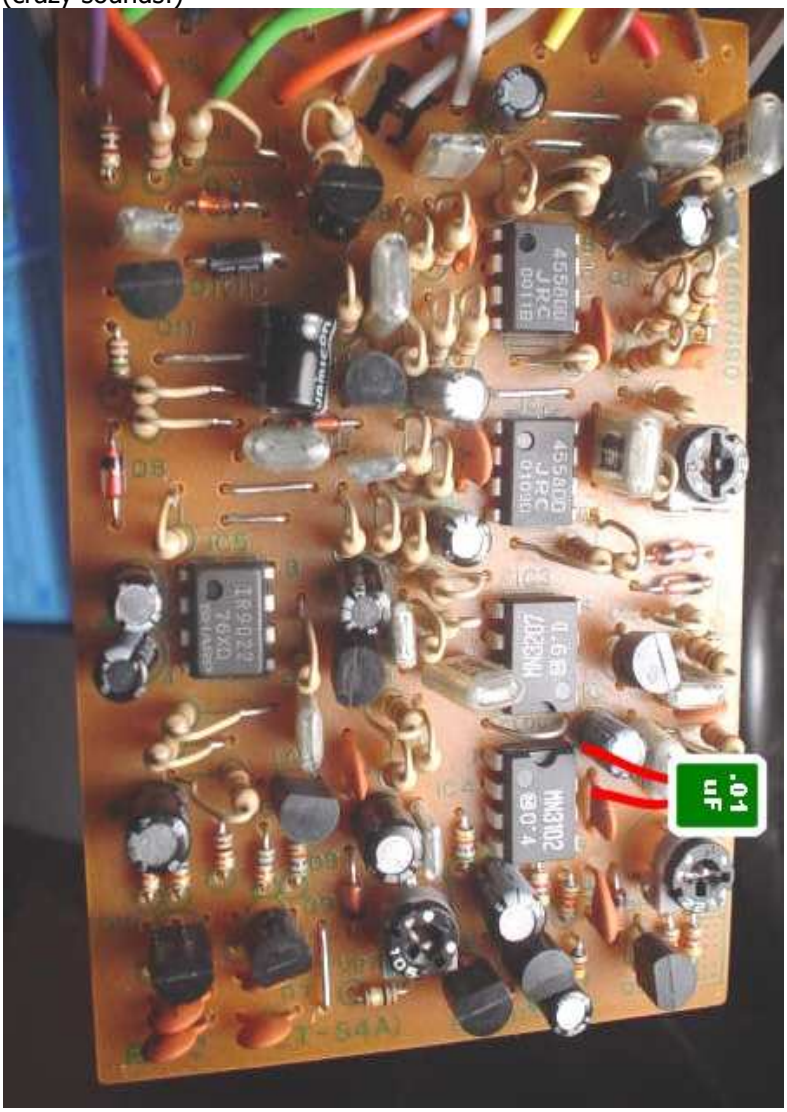


Boss BF-2 flanger mod

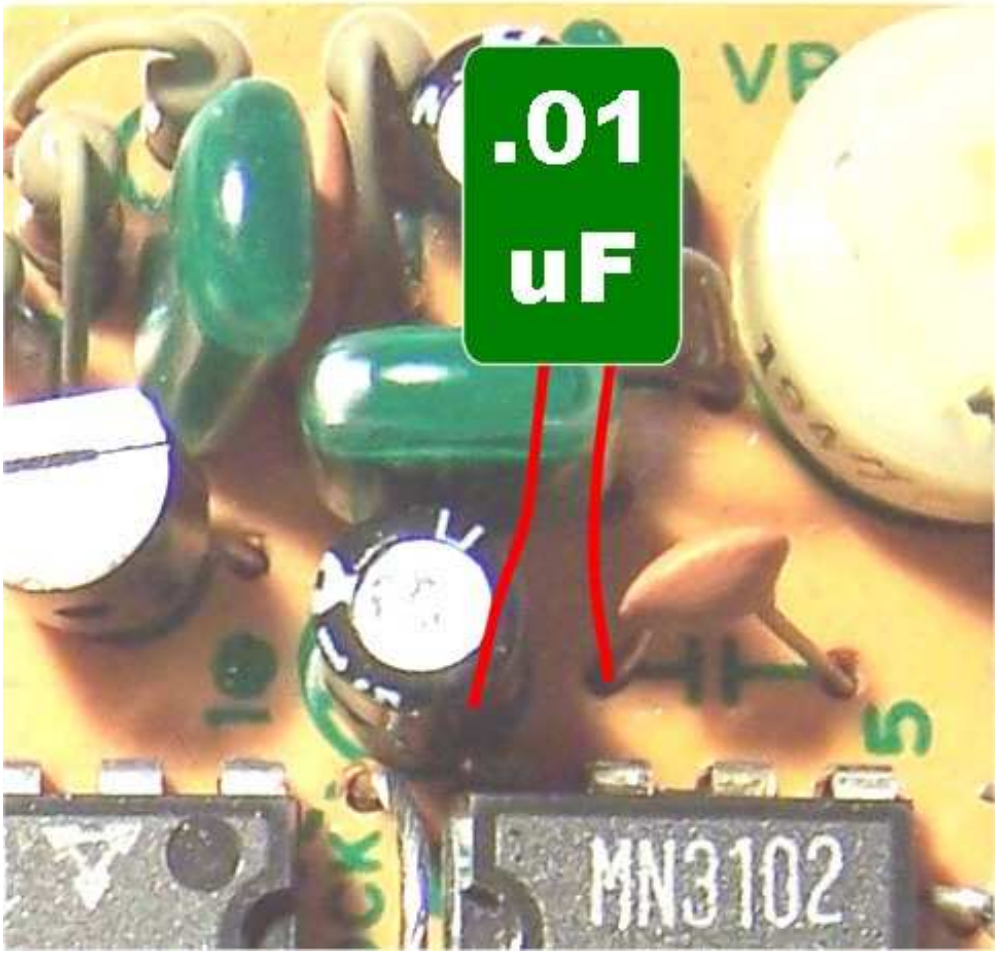
Location	Mod value	What it effects
A - cap	.01 uf cap	Helps get rid of 'boxy sound'
B – cap	1 uf metal film cap	Helps quiet background hiss
C – cap	.01 uf cap	Helps get rid of 'boxy sound'
D - trim pot (optional)	Experiment with position!	Will change the sound of flanger drastically.
E - cap	1 uf metal film cap	Helps quiet background hiss
F – trim pot (optional)	Experiment with position!	Will change the sound of flanger drastically.
H -cap	1 uf metal film cap	Helps quiet background hiss
I – cap	.22 uf metal film cap	Helps quiet background hiss
J – cap	.22 uf metal film cap	Helps quiet background hiss
K – cap	1 uf metal film cap	Helps quiet background hiss
L – cap	100pf	Adds more depth to flanger

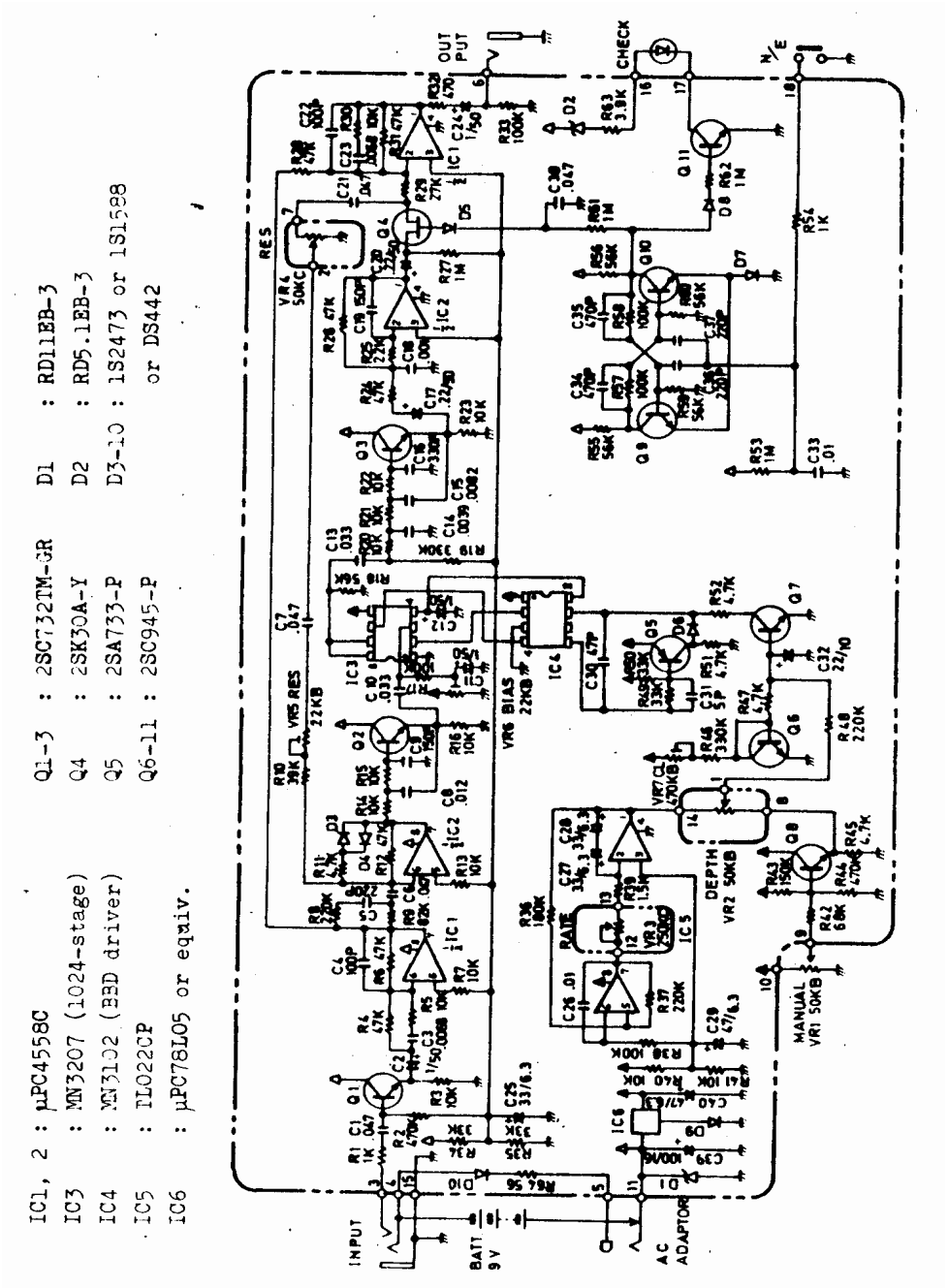

I
K
J
A
C
B
D
G
H
E
F
L

For Noise fans:
Spaceship Mod (crazy sounds!)



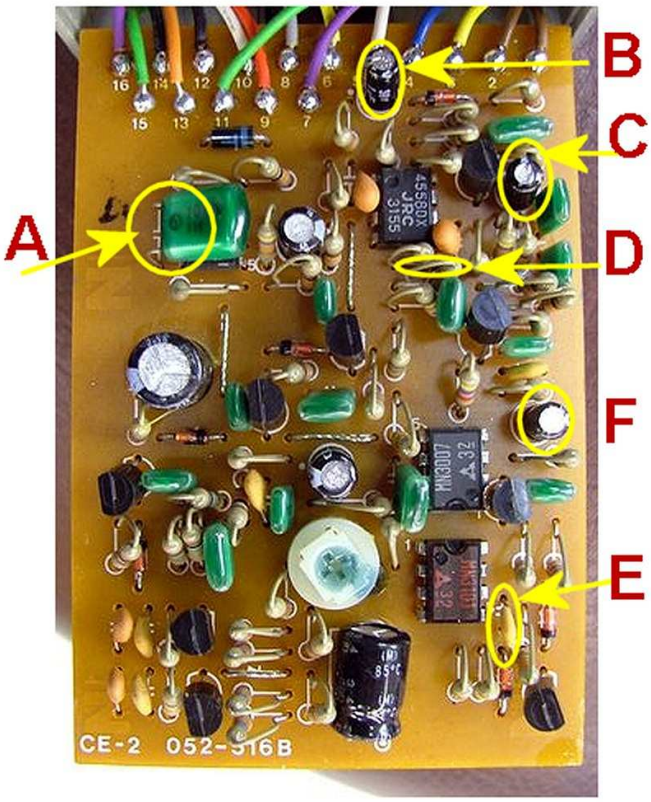
Connect a .01uf capacitor between the ceramic and electrolytic cap pictured.



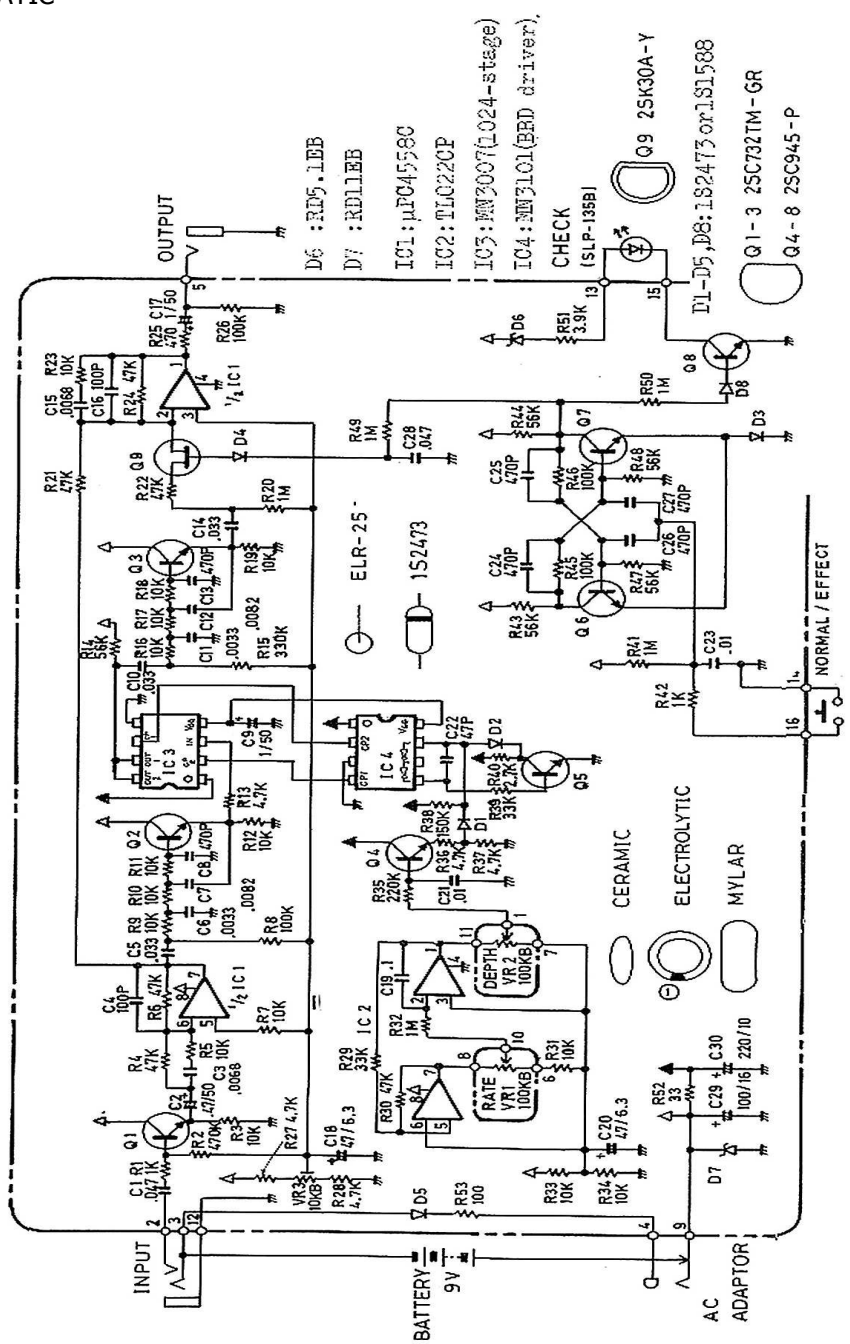

IC1, 2 : μPC4558C
IC3 : MN3207 (1024-stage)
IC4 : MN3102 (BBD driver)
IC5 : TL022CP
IC6 : μPC78L05 or equiv.
Q1-3 : 2SC732TM-GR
Q4 : 2SK30A-Y
Q5 : 2SA733-P
Q6-11 : 2SC945-P
D1 : RD11EB-3
D2 : RD5.1EB-3
D3-10 : 1S2473 or 1S1588 or DS442
INPUT
BATT 9V
AC ADAPTOR
OUTPUT
CHECK
M/E
RES
VR4 50KC
VR5 RES 22KB
VR6 BIAS 22KB
RATE
DEPTH
VR2 50KB
MANUAL
VR1 50KB

Boss CE-2 chorus

Location	Stock value	Mod value	What it effects
A	.1 UF	.068 UF or for modulation filter sounds, try a . 022uf or a . 047uf	Make a lower value if you want faster speed,
B	1 UF ELEC CAP	1 UF FILM CAP	Closer tolerance part for better tone
C	1 UF ELEC CAP	1 UF FILM CAP	Closer tolerance part for better tone
D	REMOVE ONE END OF RESISTOR		WILL TURN PEDAL INTO VIBRATO INSTEAD OF CHORUS NOTE: This must be connected to a spdt or spst switch as removing one end of this will not allow you to bypass the pedal properly. (see pic below)
E	47 pf	100 pf	Makes depth more – fuller, deeper chorus effect
F	1 UF ELEC CAP	1 UF FILM CAP	Closer tolerance part for better tone

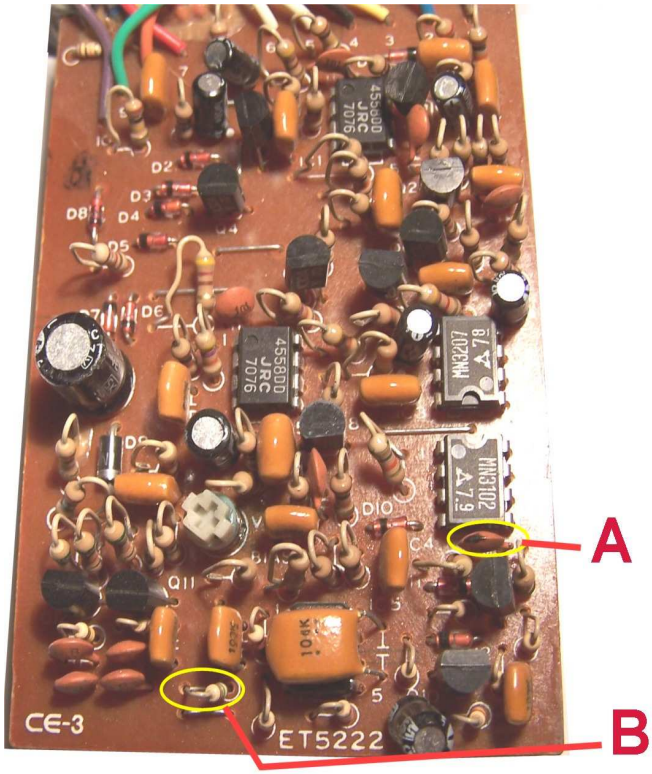

A
B
C
D
F
E
CE-2 052-316B

CE-2 SCHEMATIC



Boss CE-3 Chorus

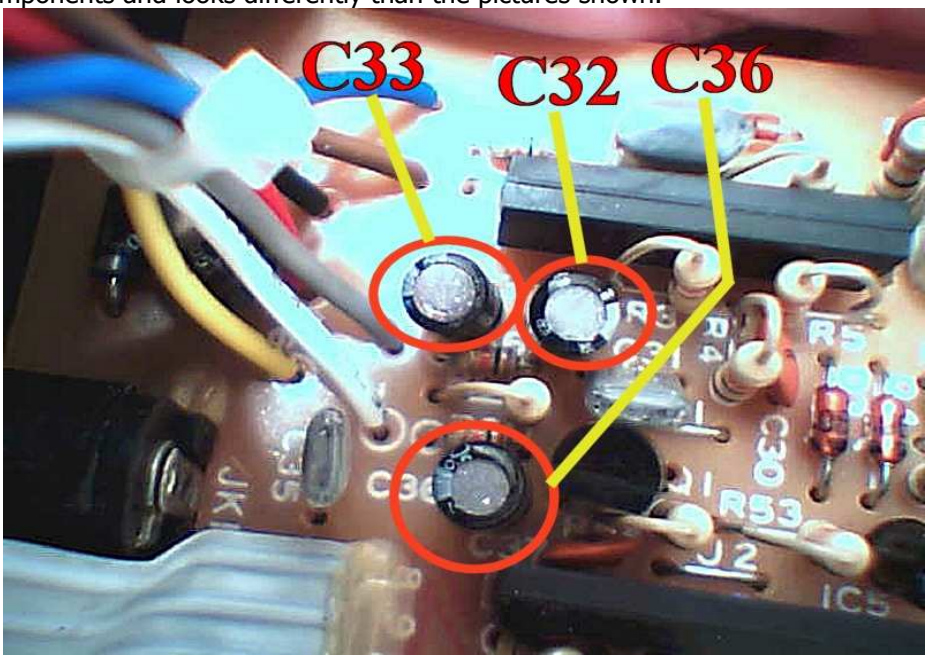
Location	Stock value	Mod value	What it effects
A - CAPACITOR	47 PF	100 PF	ALLOWS MORE CHORUS DEPTH
B - RESISTOR	1 M (1,000,000 ohms)	470k , or 220k ohms	The lower the ohms, the faster the rate.
Extra's			
Replace all .47 uF, and 1uF electrolytic caps with their film capacitor equivalents.			Changing from electrolytic to film capacitors will help quiet a noisey pedal as well as make the pedal sound better.

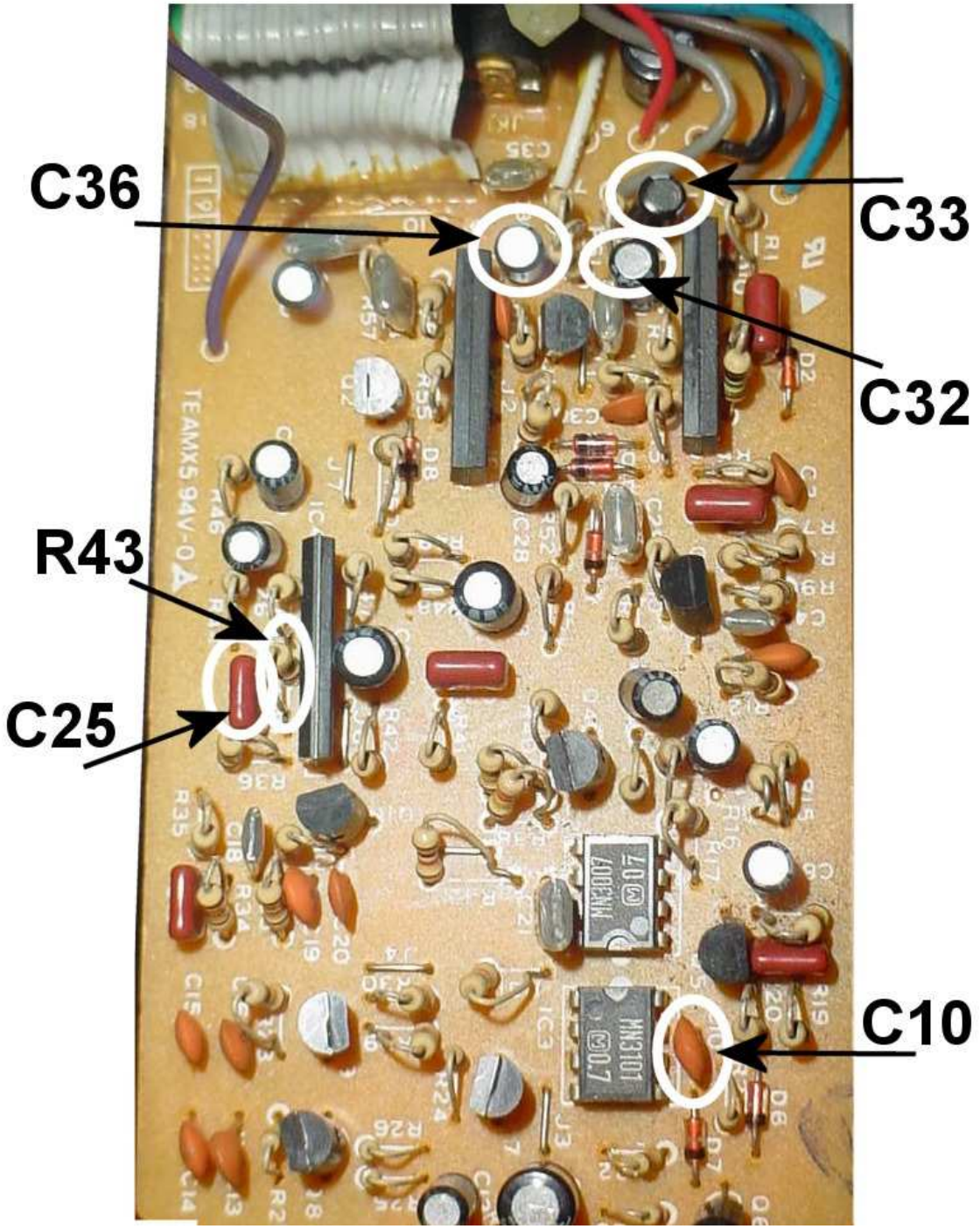


Boss CH-1 Chorus

Location	Stock value	Mod value	What it effects
C10 cap	47 pf	100 pf or 200 pf	Increases depth of chorus (the larger the value, the more depth)
R43 resistor	47k	100k	Increases available speed
C25 cap	.01 uf	.01 cap	Change to metal film to help cut down on noise and sound bigger and fuller
C8 cap	1uf	1uf	Change to metal film cap to help cut down on noise and sound bigger and fuller
C36 cap	1uf	1uf	Change to metal film cap to help cut down on noise and sound bigger and fuller
C33 cap	1uf	1uf	Change to metal film cap to help cut down on noise and sound bigger and fuller
C32 cap	.47uf	.47uf	Change to metal film cap to help cut down on noise and sound bigger and fuller

*note: this modification applies to the older style of ch-1 pedals. I'm not aware of any way to tell if it will work on your version without opening up the pedal. The newest versions use surface mount components and looks differently than the pictures shown.




C36
C33
C32
R43
C25
C10

NOTE: IF YOUR CIRCUIT BOARD LOOKS LIKE THIS , THE MOD WILL NOT WORK

A few notes about this mod

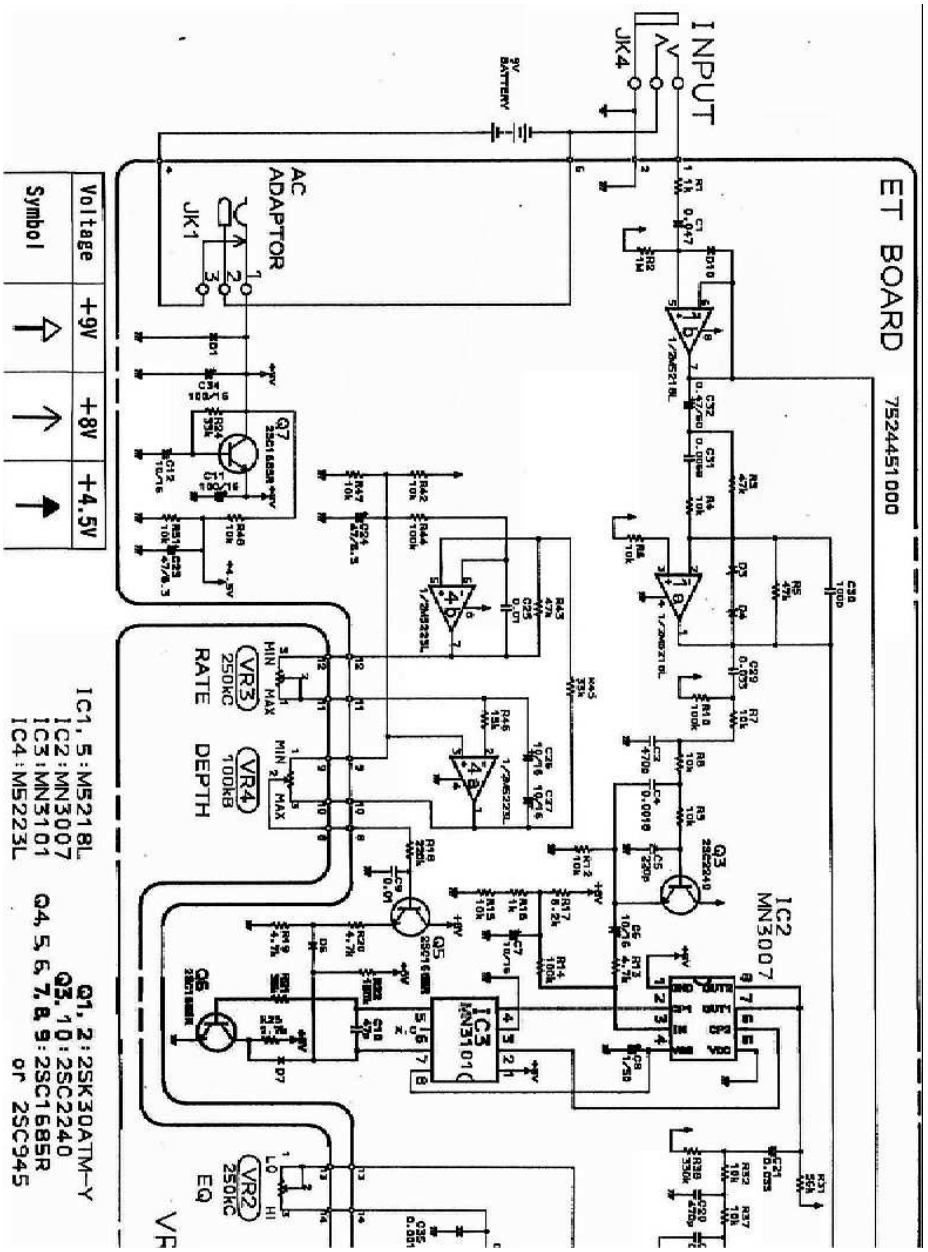
The CH-1 can be modded in just about all the "normal" ways that a CE-2 can be modded.

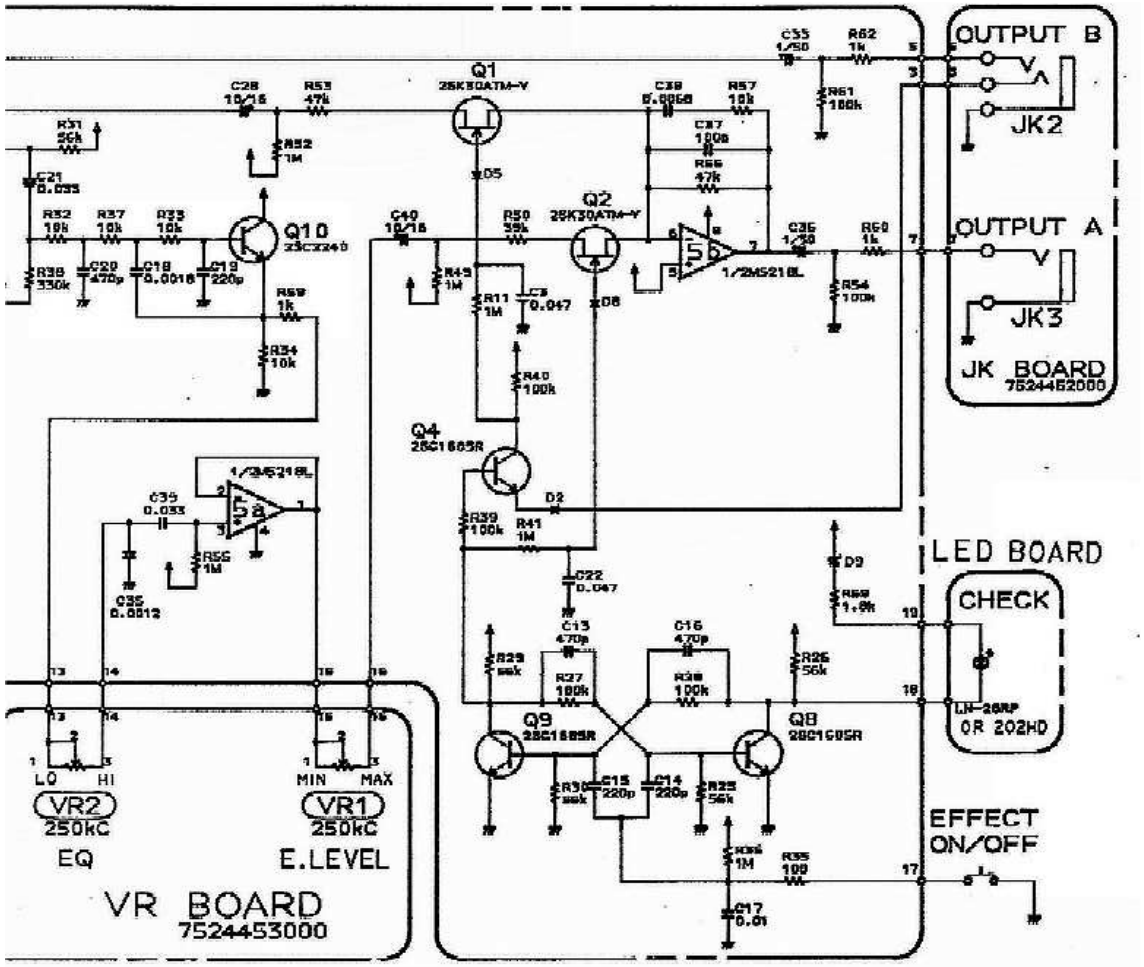
For example, you can change the delay range by changing the 47pf capacitor beside the MN3101 chip. Smaller values (e.g., 33pf) will shift the delay range closer towards flanging, and larger values (e.g., 68pf) will move the range towards spacier thicker sounds. Just be aware that longer delays will make the pitch "wobble" stronger, so you/he will need to turn the Depth control down.

To achieve ring-modulator type sounds, the two back-to-back 10uf capacitors (Labeled C36/C37, I think) in the low-frequency/modulation oscillator can be replaced with a 1uf nonpolarized cap. This will shift the speed range over by a factor of about x5, such that the fastest speed will give an elastic-like "boing" and the slowest speed will be closer to the what used to be the "bubbly"' speed.

If you break the kink between R53 (47k) and Q1, you will cancel the clean signal at output jack A, giving a vibrato-only effect. Please note that this unfortunately produces NO OUTPUT when you bypass the effect. The more problem-free way to accomplish the same effect is to stick a mono plug into jack B, without any wires attached to it. Doing this will feed a delay only signal to jack A in effect mode, and clean signal in bypass mode.

CH-1 SCHEMATIC



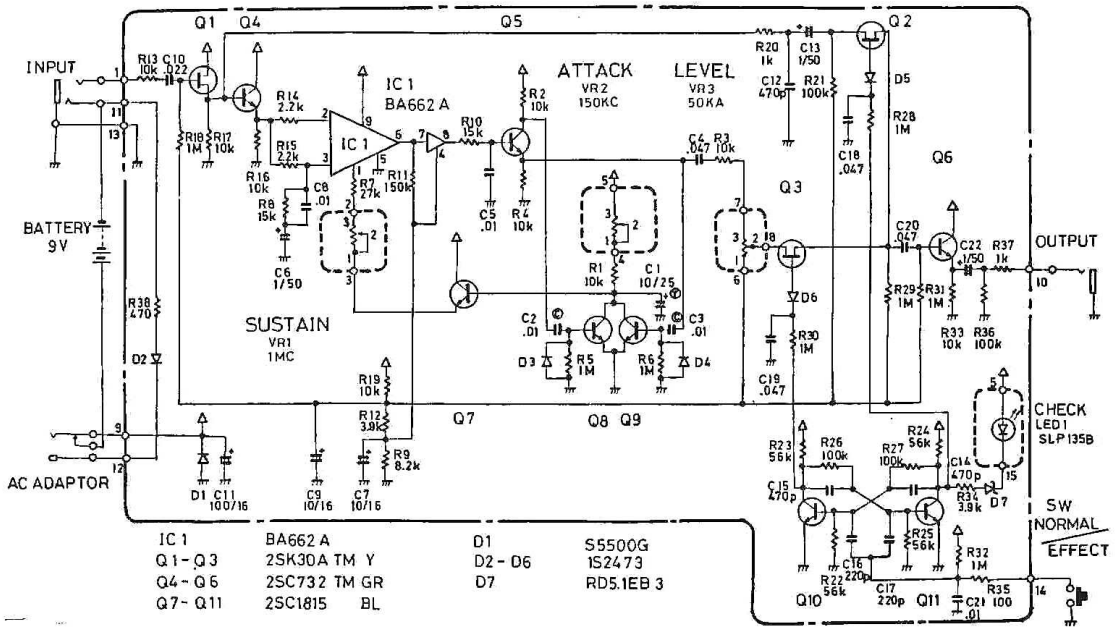


ATM-Y
40
35R
C945

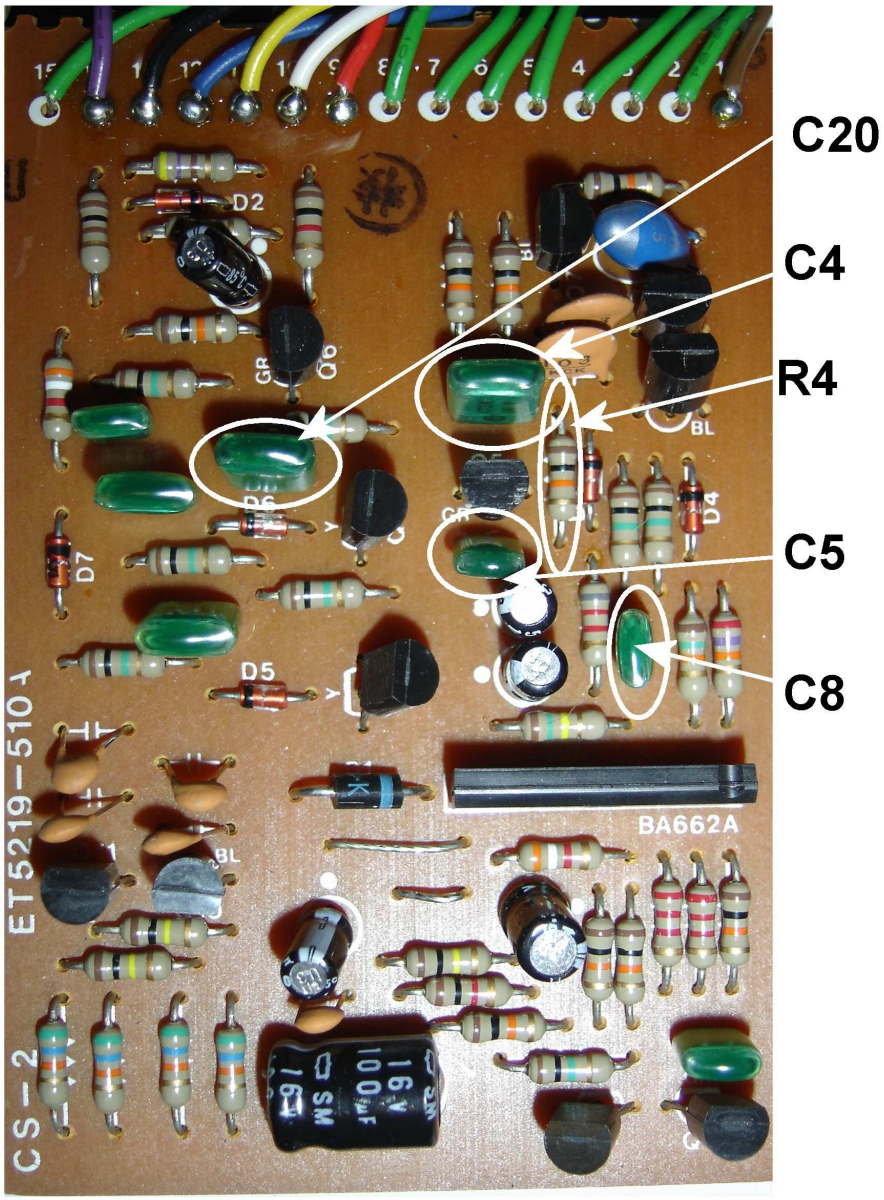
D1 : 1N4004 or S5500G
D 2, 5, 6, 7, 8, 10 : 1N4148 or 1S2473
D3, 4 : RD3.0EB1
D9 : RD5.6EB3

Boss CS-2 Compressor Modification

Location	Change to	What does it do?
Volume pot	Connect a .001uf cap to lugs 3 and 2	This forms a high pass filter – more highs will get through. Lower cap value if it is too bright, or raise cap value for more clarity.
R3	100 ohm	More clarity, a bit more fullness as well
C20, C13	1uf	Makes the pedal fuller and quieter by changing a coupling cap with a larger, higher quality one
C4, C22	1uf	Makes the pedal fuller and quieter by changing a coupling cap with a larger, higher quality one



BOSS CS2



Boss CS-3 compressor mods

"Fat Body mod" – will sound much fuller, warmer, and not so 'splatty'!

Location	Mod value	What it effects
R36	100 ohm	Adds richness and depth
C2	.1 uf	Allows more bass to come through
C1 (under attack pot)	.1 uf	Adds a lot of fullness to the sound – it changes the tone control in a way that will add mids as well as highs into the signal.
C13	2.2uf electrolytic cap (use bipolar cap)	Increases bass
R5	470 ohm	Adds more 'body' to tone
R32	Remove and jumper	Lower value to make the led brighter, will add clean headroom
D10 (right above R32)	Remove and jumper	will add clean headroom

*note: on some versions, r32 and d10 are already jumpered.

Modification for Bass Guitar use:

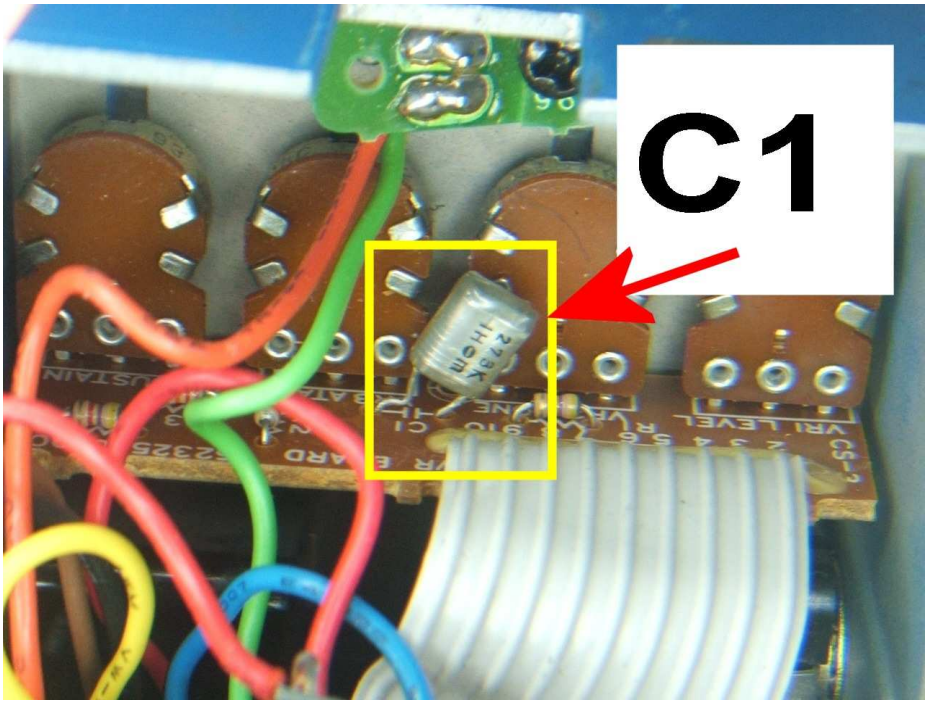
Location	Mod value
C2	1uf
C4	10uf (non-polarized)
C6	10uf (nonpolarized)
R5	1k
R36	100 ohm
C13	10uf (nonpolarized)
C1	1uf
C5	500pf silver mica capacitor
C15	.1uf

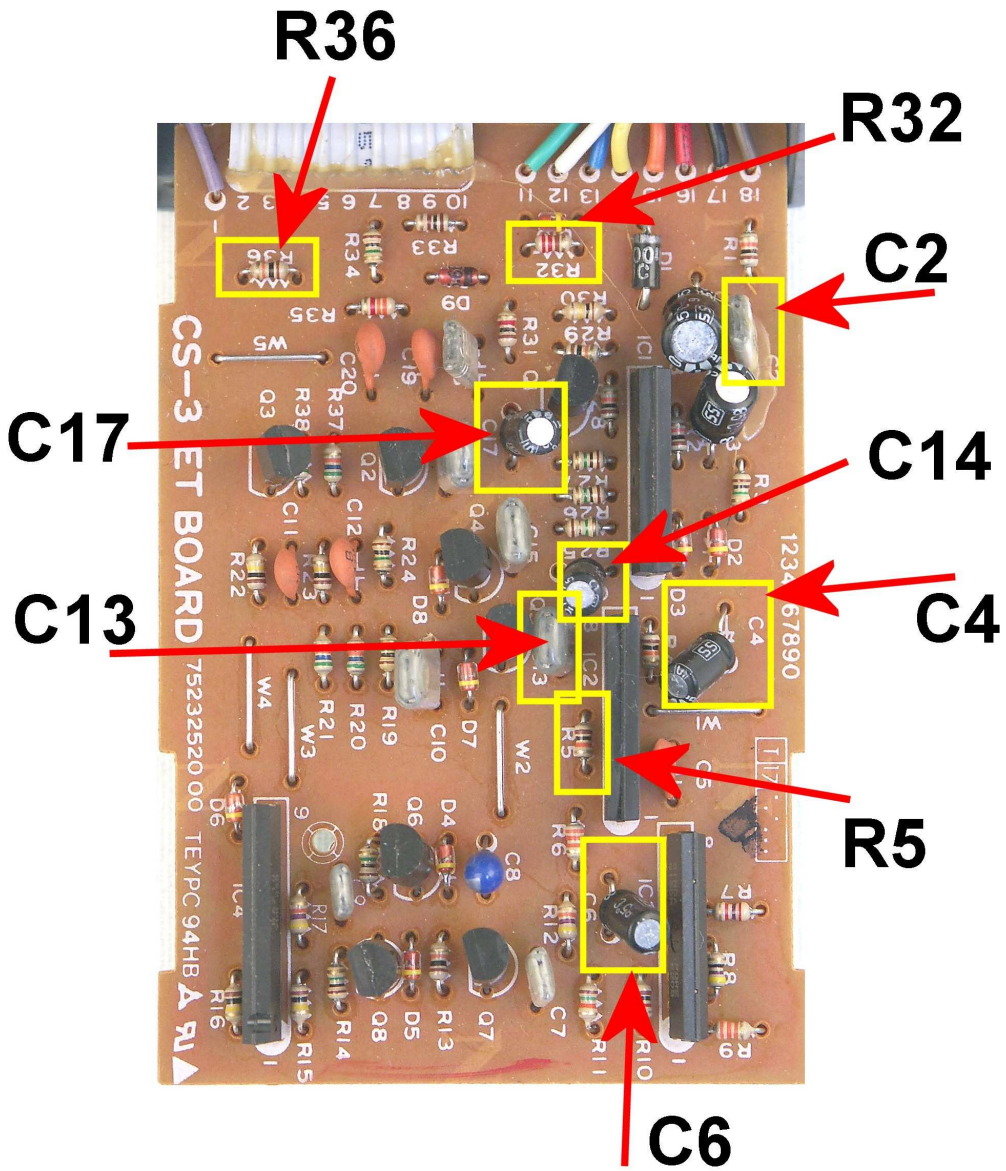
How to control the background noise

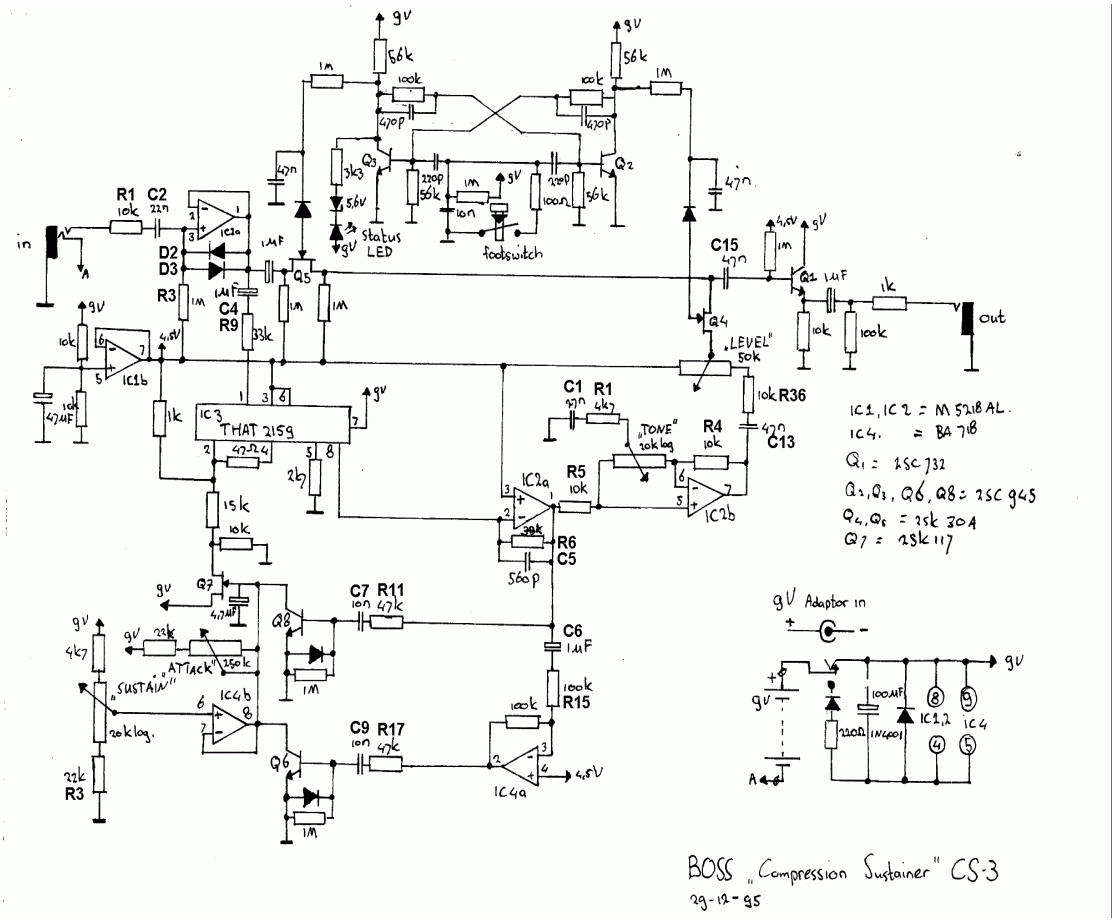
Location	Stock value	Mod value	What it effects
C4	1uf elec	1 uf film	Quiets some of the noise (hiss)
C14	1uf elec	1 uf film	
C17	1uf elec	1 uf film	
C6	1uf elec	1 uf film	

For the ultimate quietness, change c4, c14, c17, and c6 1uf electrolytic caps in the pedal to 1uf metal film, or just regular 1uf film caps. This should help a bit, though the real problem is the fact that compressors by nature tend to be a bit noisy. The last stage actually boosts the higher frequencies which means that the noise gets boosted as well. You can connect a small cap in parallel with the 10k resistor at R4 – start with 100pf and go larger as needed. Too large, though, and you will start to lose highs.

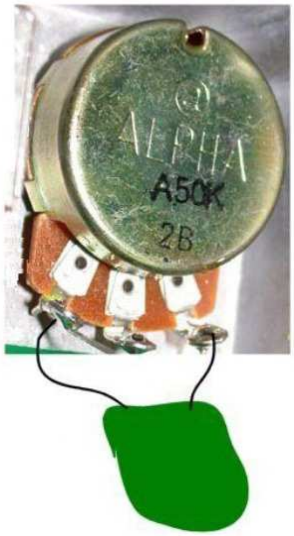
You might try to place the compressor before your dirt pedals and after your dirt pedals, and see which way works best for your needs. Notice: You'll need to find 1uf caps that are physically small – I've found the smallest ones at digikey.com, the parts numbers are located elsewhere in this book.


C1


R36
R32
C2
C17
C14
C13
C4
R5
C6
CS-3 ET BOARD
75232520 00 TEYPC 94HB A


9V
56k
100k
1M
470P
Q3
Q2
3k3
220P
56k
100n
47n
5V
5.6V
Status LED
footswitch
R1 10k
C2 22n
IC1a
D2
D3
R3 1M
1uF
C4
R9 33k
Q5
in
A
IC1b
4,5V
10k
4,7uF
1k
IC3 THAT 2159
4,7n
2k7
15k
R36 10k
C1 47n
R1 4k7
"TONE" 20k log
R4 10k
C13 47n
IC2a
IC2b
R5 10k
39k
R6
C5 560p
Q7
4,7uF
C7 10n
R11 47k
Q8
C6 1uF
100k
R15
"SUSTAIN"
"ATTACK" 250k
IC4b
20k log.
4k7
22k
R3
C9 10n
R17 47k
Q6
IC4a
4,5V
C15 47n
Q1 1uF
"LEVEL" 50k
out
IC1, IC2 = M 5218 AL.
IC4. = BA 718
Q1 = 2SC 732
Q2, Q3, Q6, Q8 = 2SC 945
Q4, Q5 = 2SK 30A
Q7 = 2SK 117
9V Adaptor in
100uF
220R
1N4001
IC1,2
IC4
BOSS "Compression Sustainer" CS-3
29-12-95

Delay pedal modifications



cap connected to outside lugs of potentiometer

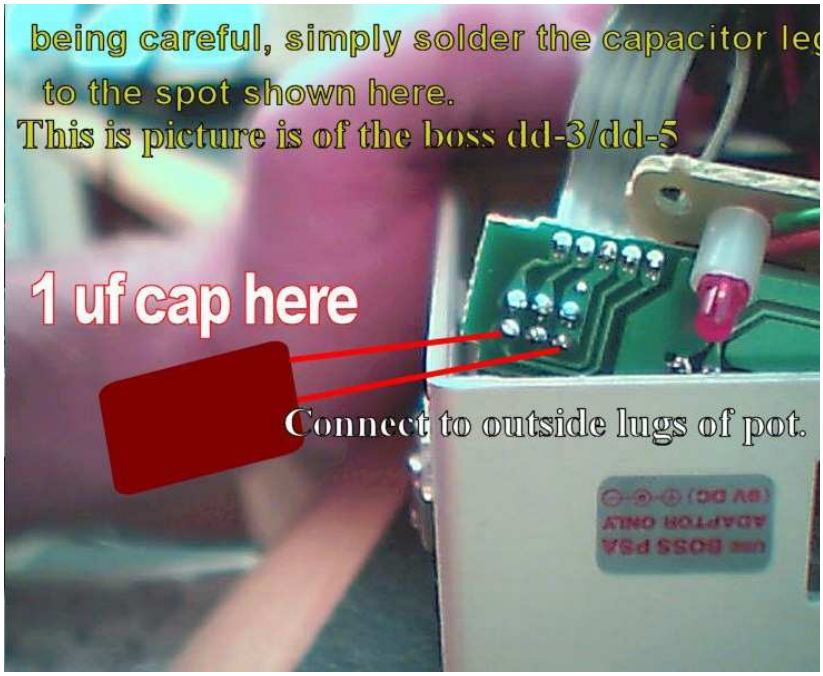
"Analog emulation" (High Cut) modification for most delay pedals

Simply connect as shown below to the 'feedback' pot or the volume pot/effect level pot.
This modification will work on most delay pedals, but will not work on reverb pedals or the Boss DD-6.

Capacitor can be anywhere from .022uf to .47uf. The higher the value, the more highs are taken out.

Boss DD-3

Note that the capacitor should be smaller than 1uf value for best tone (even though this image says "1uf")



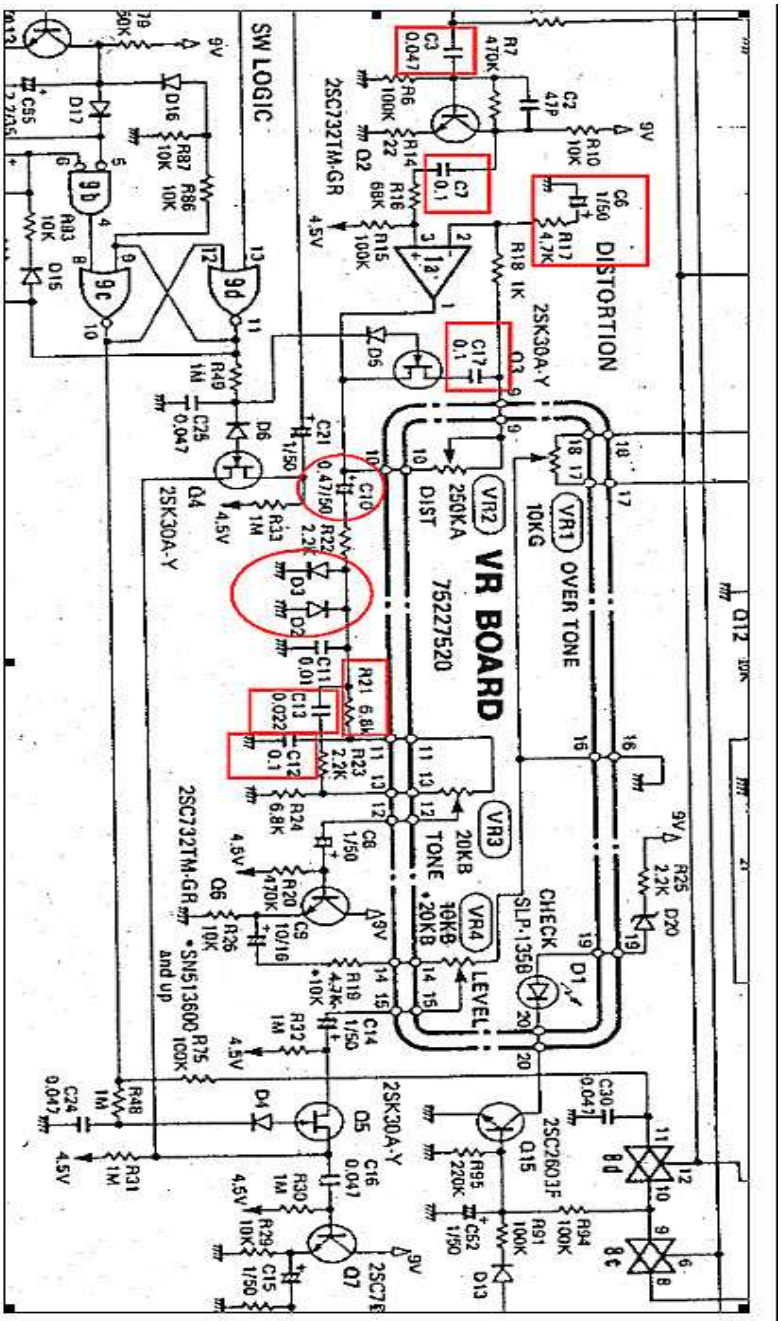
Boss DF-2 super feedbacker & distortion

NOTE This is a tweaker's dream – I'm simply outlining some key areas that would work well being modified. I don't have pictures of the circuit board for this, but the more experienced DIY'ers will have a ton of fun experimenting with this.

Location	Stock value	Mod value	What it affects
C3	.047UF	.068uf, .1uf, .15uf, .22uf, .47uf, 1uf	Raise value for more of the guitar signal getting going through clipping, resulting in a fuller or fuzzier sound depending on how big you make it.
C7	.1UF	.15uf, .22uf, .33uf, .47uf, .68uf, 1uf	Raise value for more of the guitar signal getting going through clipping, resulting in a fuller or fuzzier sound depending on how big you make it.
C17	.1UF		Changing this capacitor will affect the eq of the pedal slightly
C10	.47UF		Raise the value to give the pedal more bass, or reduce the value to make it smoother and rounder.
C13/R21	.022UF/6.8K		This combination is a filter – experiment with different values to see what you like.
C12	.1UF		Raise the value to give the tone knob more of an effect and it will also sound like more lows are added.
C6/R17	1UF/4.7K		Experiment with the values here of this filter. Make the resistor smaller for more bass, for more distortion, raise the capacitor to 2uf and change the resistor to 2.2k. For more bass and distortion, keep the 2.2k resistor and make the capacitor larger than 2uf, possibly 2.5uf or 3.3 uf
D2, D3	1n4148		Clipping diodes – experiment, Leds sound great here instead of the silicon diodes

Note:
The Distortion circuit on the Df-2 is nearly identical to the Ds-1 circuitry.
The same mods apply as the DS-1, simply swap the pcb locations in the ds-1 mods to the df-2 pcb locations.
Listed below is a table that shows what the identical part in the df-2 is compared to the ds-1:

DF-2	DS-1
C3	C3
R7	R7
C5	C5
C6	C8
R17	R13
C10	C9
R22	R14
D2,D3	D4,D5
C11	C10
R21	R16
C13	C11
R23	R15
C12	C12
R24	R17


VR BOARD
75227520
DISTORTION
OVER TONE
DIST
TONE
LEVEL
CHECK
SW LOGIC
2SK30A-Y
2SC732TM-GR
2SC2603F
VR1
VR2
VR3
VR4
10KG
250KA
20KB
10KB
SLP-135B
SN513600 and up

Boss DS-1 Distortion

Location	Change to:
"Evil" Modification	
D4	LED
D5	LED
C3	.068uF
C10	.047uF
C12	.047uF

Location	Change to:
"Classic Rock" Modification	
D4	LED
R14	10K
C12	.047uF
C10	.1uF

"Acid Blues" Modification	
C12	.047uF
C10	.1uF
R14	6.8K
D4	LED
D5	1N4001

Tube Emulator Modification	
C2	1 uf
C3	.1 uf
C12	.047 uf
D4	LED
D5	1n4001
R14	10k

"Vintage" Modification	
D5	Led
C3	.033uf
R16	1k resistor
C11	.01uf
C1, C5	.1uf

Classic JCM-type Marshall Tones:

LOCATION	CHANGE TO:
C3	.033
R17	15k
C2	1µF
D4	1N4148 Connected in Series to another 1N4148
D5	1N4001 Connected in Series to another 1N4001
C5, C9	1UF
R13	OPTIONAL - Change to 1k for tons of gain, if you do this, also change c8 to 1µF

Modern distortion tones

LOCATION	CHANGE TO:
R16	1k
R14	10k
C10	.001µF
R16	3.3k
D4	LED

Less shrill highs

LOCATION	CHANGE TO:	FREQUENCY ROLLOFF:
C10	.015µF	48kHz
C10	.022µF	3.2kHz
C10	.027µF	2.6kHz
C10	.033µF	2.1kHz
C10	.047µF	1.5kHz

The circuit is a buffered bypass circuit with electronic switching, as are all Boss pedals. The circuit comes in through R1, a 1K resistor, and then travels through C1, a .047 microfarad, or ìF, capacitor into the first buffer. This buffer goes out through C2 and then into a JFET (junction gate field-effect transistor), which is part of the switching. If the pedal is off, the signal goes out to the switching circuit and through the output through Q7, which is the other JFET. These JFETs act as a switch, allowing the signal to either go through the distortion circuit or out through the buffers, producing a clean signal.

When the pedal is on, signal travels to Q6, through C3 and into a transistor gain stage. R7 controls the gain of this circuit by changing the voltage bias, consisting of a 470k resistor which you can increase or decrease in value to adjust gain before the next stage. Increasing the value increases gain, while decreasing it will give you a little less gain overall but will tighten up the DS-1's low-end response, ridding it of the flubbiness many people dislike. We can also decrease C3 to get this same effect by not allowing as much bass to come through. I like to change its value to either .022ìF or .033ìF if I'm looking for a less flubby tone. To clarify, to me "flubby" means a deeply compressed tonality. C4, which has a value of 250 picofarads (pF) also filters out some highs. Changing this won't do too much, although you may be able to coax a little more brightness by changing it to a 100 pF capacitor.

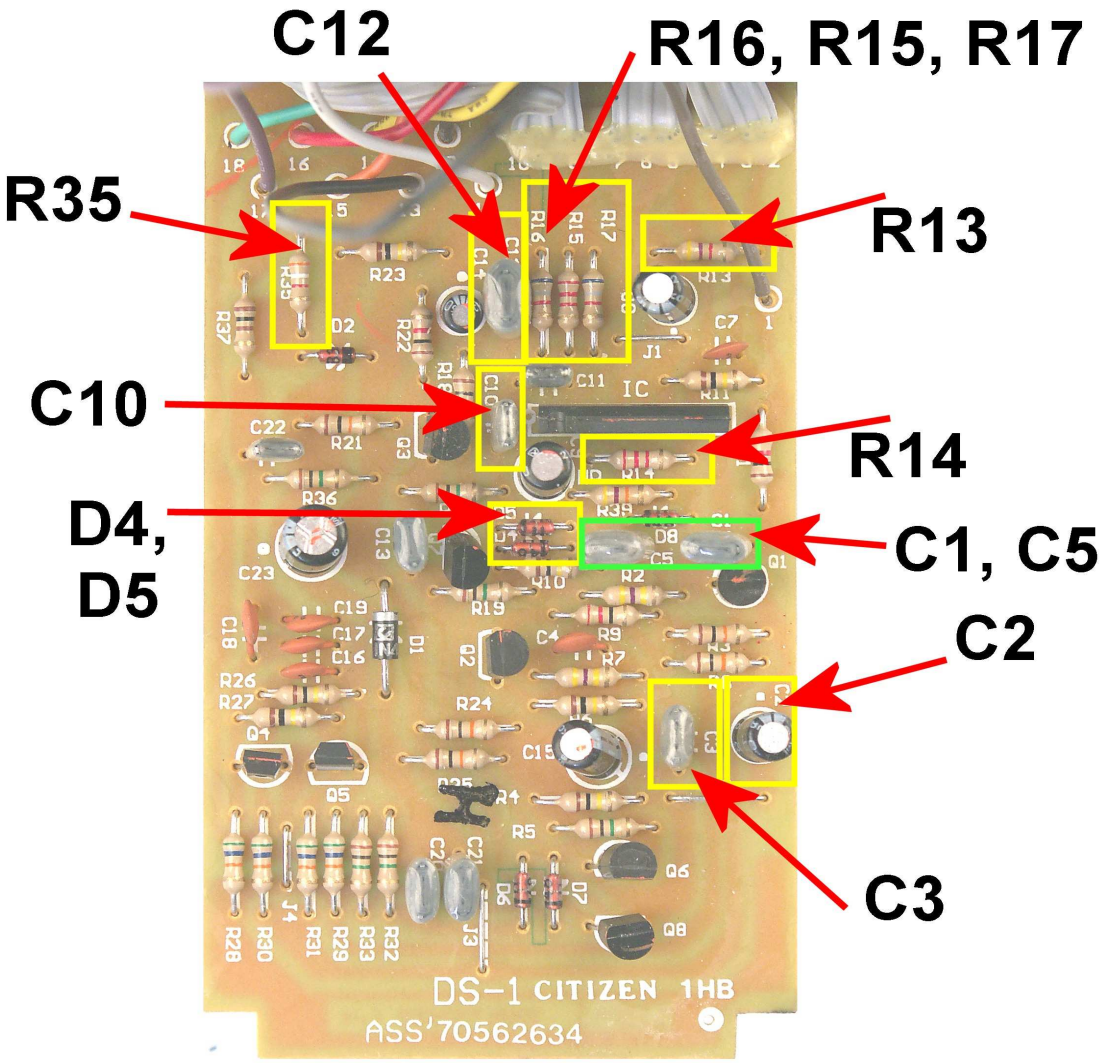
The signal then goes out through C5 into the opamp. This opamp is used in a unique way to clip the signal. R11 controls the gain in combination with the distortion knob, R13 and C8. The gain control is set up this way to enable the clipping of higher frequencies as you turn the distortion up. When it's turned down, it allows lower frequencies in – giving it a muddy sound since the signal is clipped beforehand through the transistor gain circuits, then clipped again when the distortion control is turned down. The first stage clipping is still occurring and as a result, the pedal doesn't sound as clear and articulate as many would like. R13 and C8 are part of this "non-inverting" opamp circuit which provides negative feedback to ground. This is important for several reasons. The resistor value of R13 and the capacitor value of C8 basically provide a frequency range where the signal is made to clip. In this case all frequencies above 33hz is being clipped. To contrast, a Tubescreamer only lets frequencies above 728hz clip. This means that none of the lower bass frequencies are being boosted and/or clipped in the Tubescreamer.

The signal goes out through R14, which is a 2.2k resistor, through C9, which is a .47ìF capacitor running across two diodes – D4 and D5 – and then to ground. All the usual diode tricks can be done here to allow more asymmetric clipping or different clipping flavors. Here C10 is also in parallel with D4 and D5 and is used to filter out highs in conjunction with R14. R14 and C10 form a low pass filter, cutting out high frequencies.

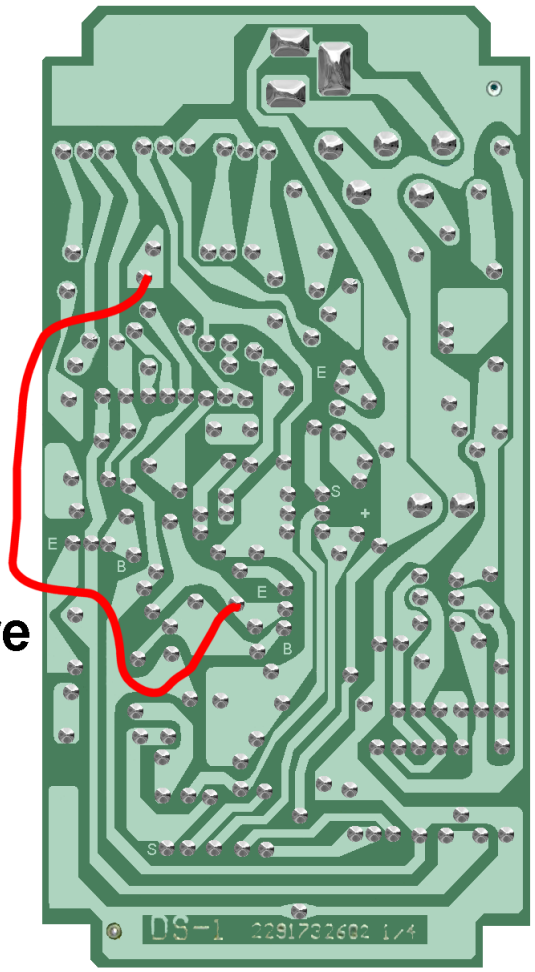
Go to indyguitarist.com/filter.htm and scroll to the bottom. Plug these values into the corresponding fields to determine which frequencies are being filtered. With the current values you will find it's filtering everything above 7k, which helps to smooth things out a little bit. If it's too bright, replace R14 with a resistor valued at 3.3k, allowing more highs to be filtered out, or try a 4.7k resistor to filter out everything above 3.3kHz.

After traveling through the diodes and the capacitor, the signal goes through a "Big Muff Pi" inspired tone control. There are many things we can do to manipulate the tone here, and a great resource is the Duncan Tone Stack calculator, available at www.duncanamps.com/tsc/. Experiment with different values to find the tone you're looking for. In the stock version of the pedal, the tone is a bit "scooped" meaning that there is little mid frequencies allowed through making the tone a little "thin" sounding. We can change that quite easily however. Check out the suggested changes in the charts below to get a warmer tone, a scooped mid tone or simply less highs.

After the tone control the signal travels through the level control and then out through R18, which is a 10k resistor, and then on to Q7, which is the other side of the JFET switching circuit. In its on state, it goes past Q7, through C13 – which is a .047ìF capacitor – through yet another output buffer and then a resistor, a capacitor and finally through the output.


C12
R16, R15, R17
R35
R13
C10
R14
D4,
D5
C1, C5
C2
C3
DS-1 CITIZEN 1HB
ASS'70562634

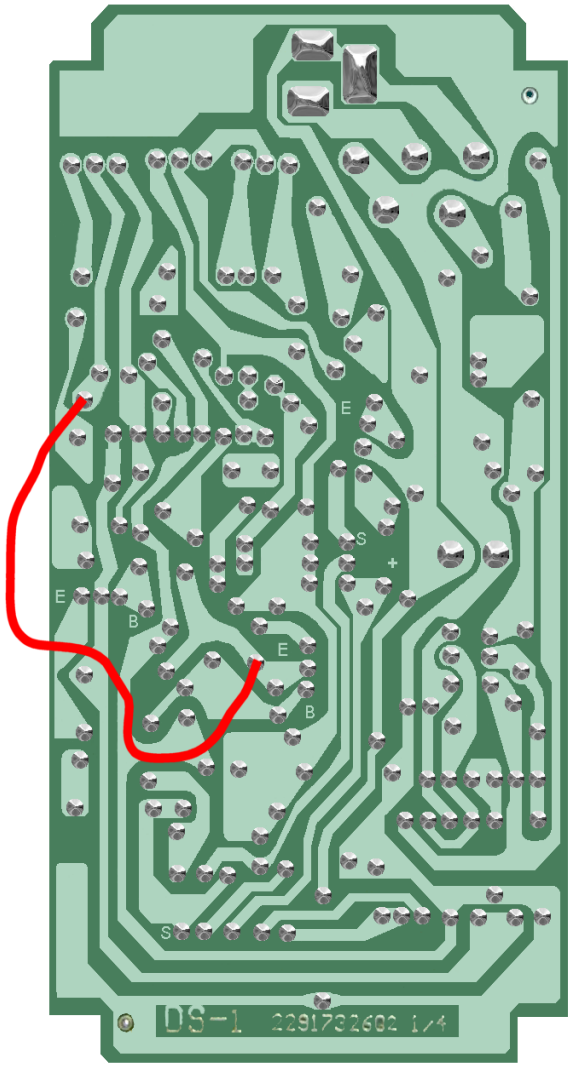
Gated synth-fuzz, with swell effect



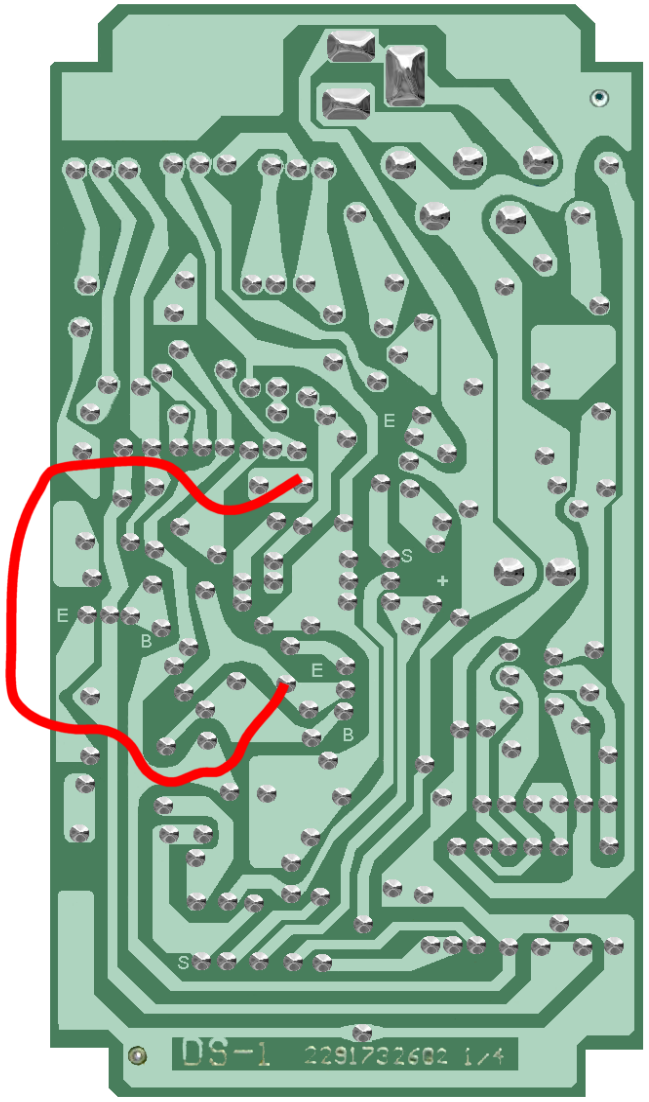
Connect a wire as shown

GATED SYNTH MOD

CONNECT A WITH A WIRE AS SHOWN

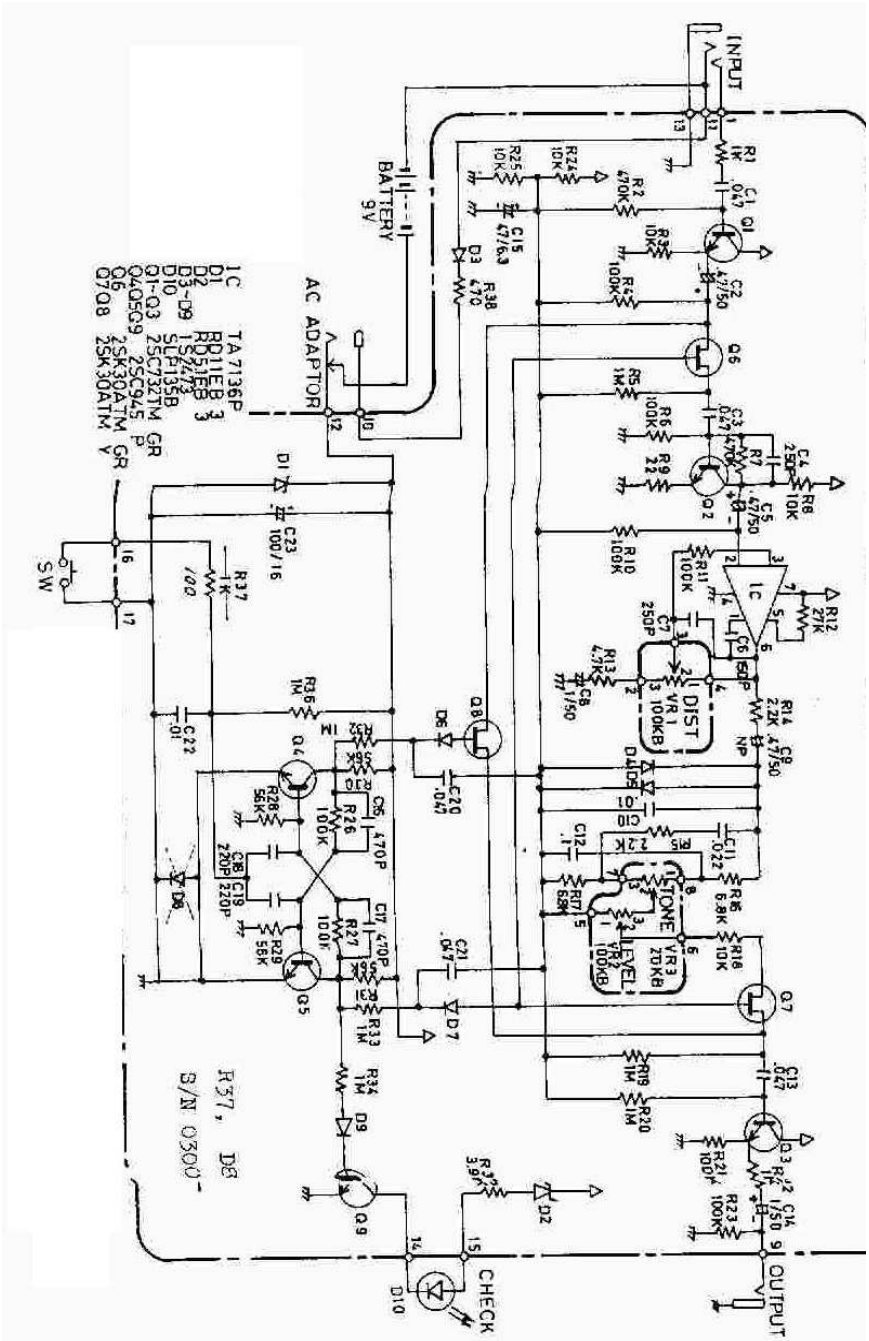


SYNTH FUZZ MOD WITH OCTAVE
Connect a wire as shown below

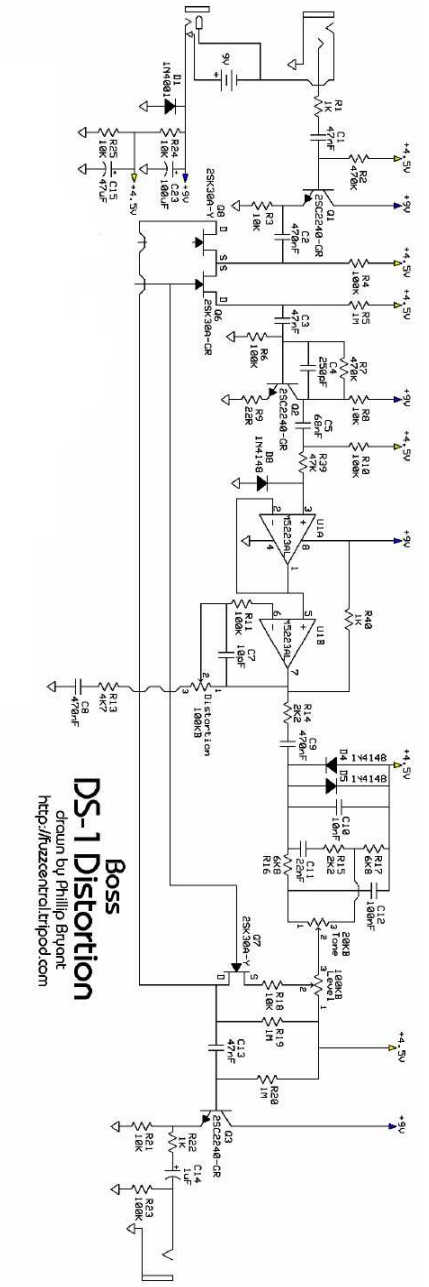


DS-1 Schematic

Older version:

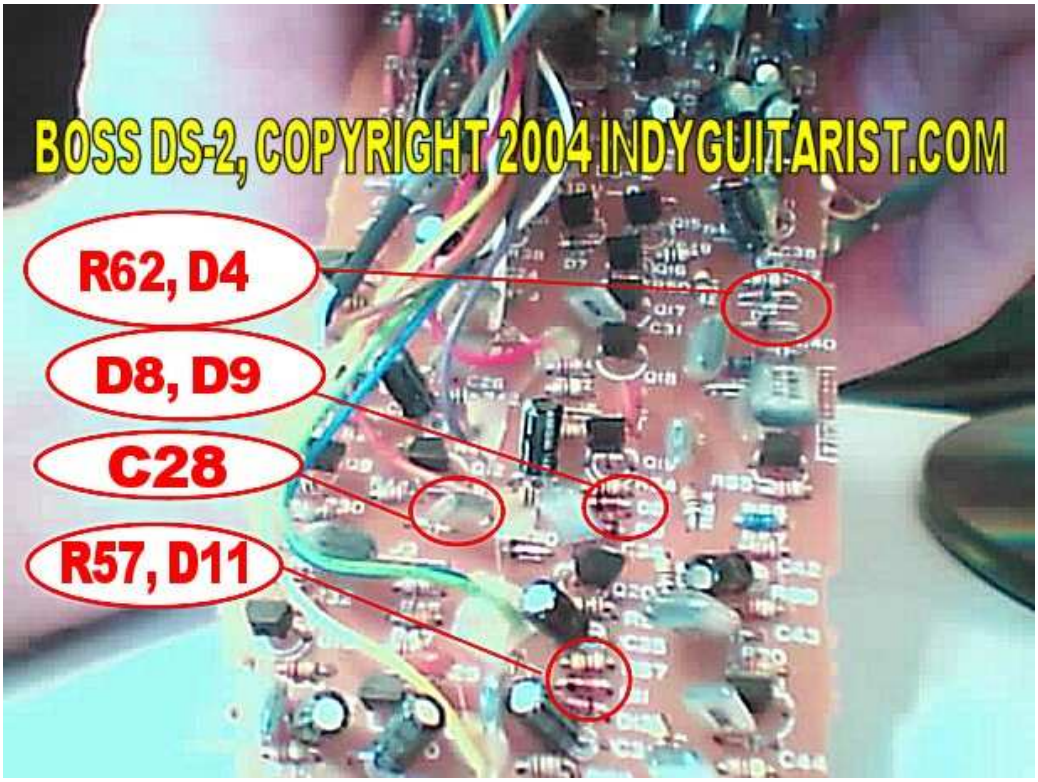


newer version:

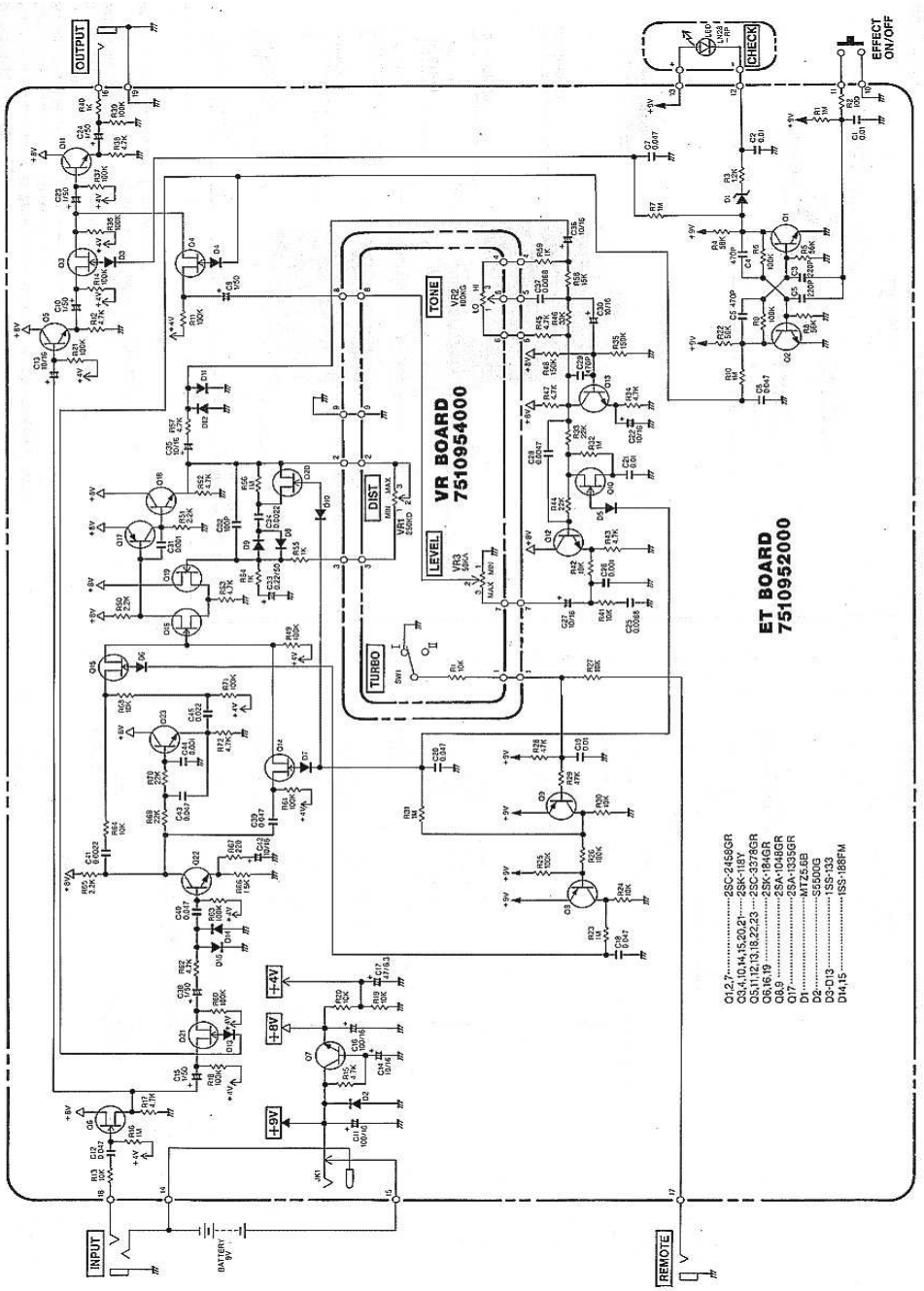


Boss DS-2 turbo distortion

Location	Stock value	Mod value	What it effects
R57	4.7k	3.3k	More bass, adds a bit of compression
R62		1k	More gain
Optional: R44		1k	Will take out highs
Optional: C28		1k resistor in parallel w/ stock cap	Scoops mids a bit
Optional: C28	.0047	.01 uf	Make rythym channel fuller
D8	4148	1n4001	Will make clipping (distortion) much fuller, more assymetric
D9	4148	1n4001 x 2 (series)	
D15	4148	LED	
D11	4148	LED	


BOSS DS-2, COPYRIGHT 2004 INDYGUITARIST.COM
R62, D4
D8, D9
C28
R57, D11

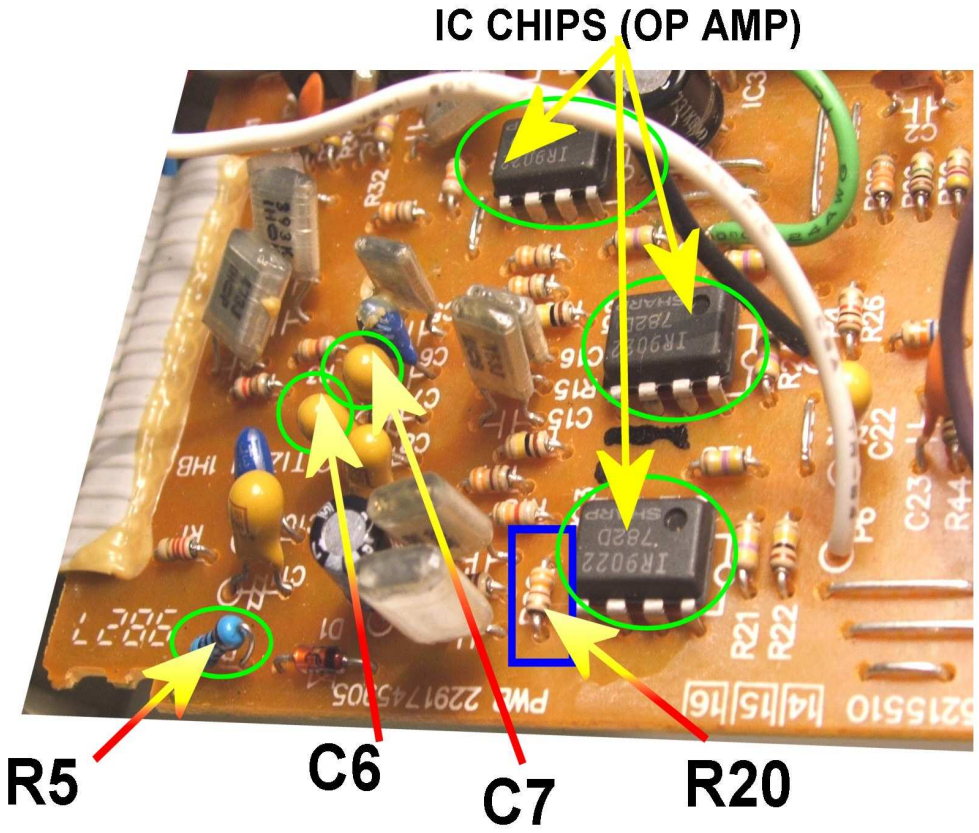
BOSS DS-2 SCHEMATIC

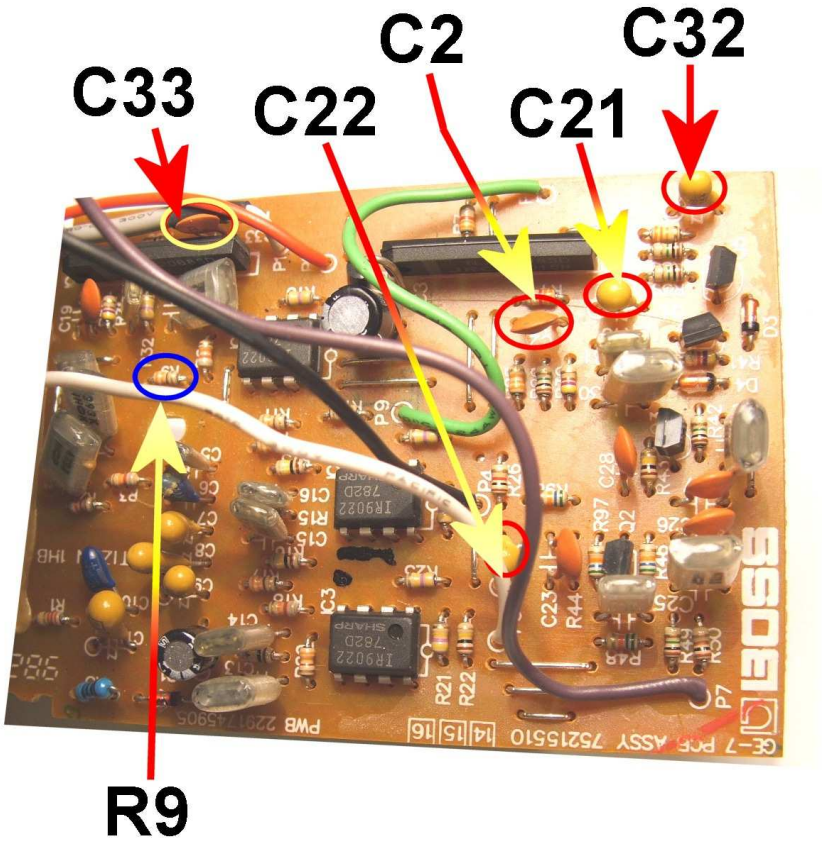


Boss GE-7 Equalizer QUIET / Twin mod

Location	Stock value	Mod value	What it effects
C7	.33 uf	.47 uf	Increases available low mids
C8	.15 uf	.22uf	
C21	1 uf elec	1 uf film	Lowers background noise
C22	1 uf elec	1 uf film	
C32	1 uf elec	1 uf film	
Change ic chips	IR9022	TLO72 or NE5532	Lowers background noise dramatically
R9	330 ohm	100 ohm	Turns 3.2k and 6.4k sliders into a Treble Presence control, can give a good fender or vox tone by adjusting these! At maximum boost, pedal can have a little bit more noise than normal, as it is increasing the high potential of the pedal.
C33	470PF	.001UF	Helps make background noise quieter
C2	470PF	.001UF	Helps make background noise quieter

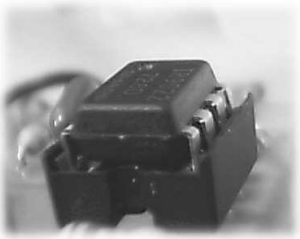
NOTE: Check to see which version of eq pedal you have – if the circuit board looks like the one in the picture below, use the mod above. If it looks like the one a few pages over, use that mod.


IC CHIPS (OP AMP)
R5
C6
C7
R20



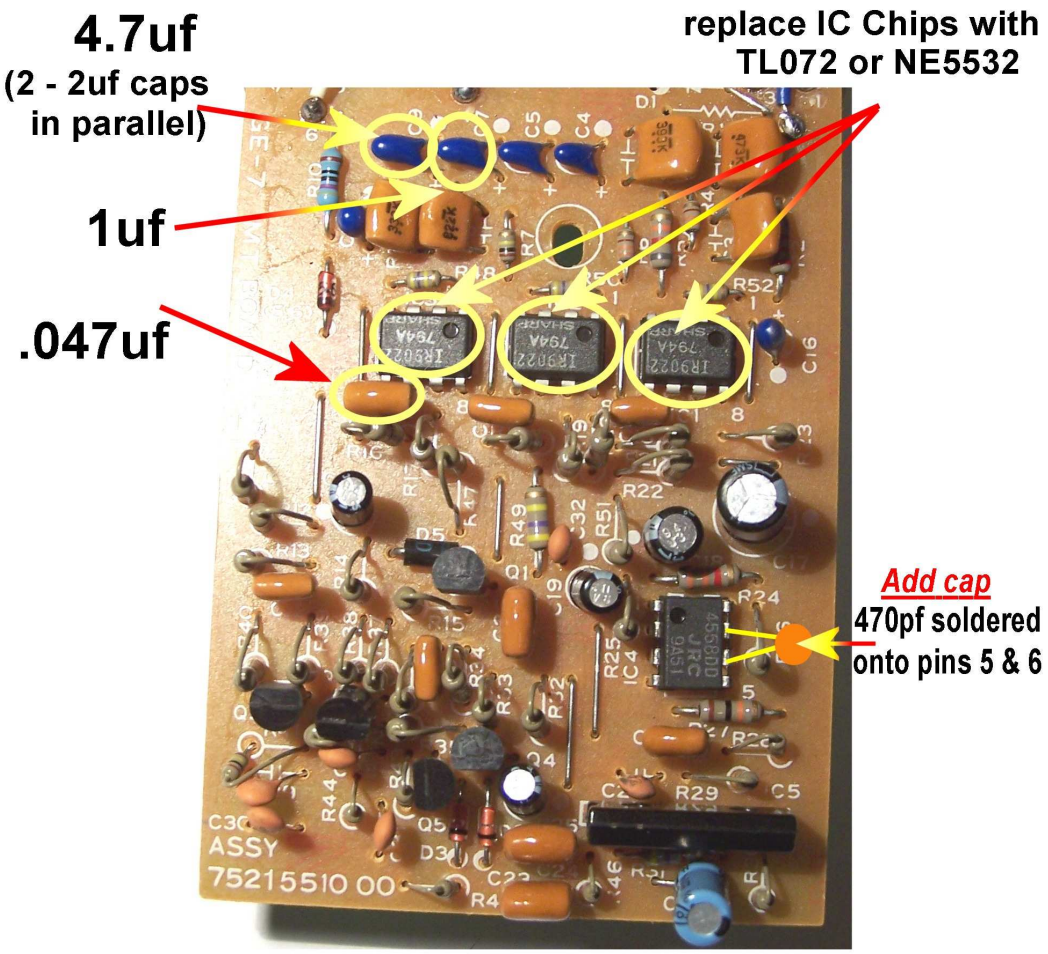
Note: When changing op-amps/ic chips (same thing), I HIGHLY recommend getting a ic chip adaptor/stand. It is easy to 'overheat an ic chip if you hold the solder iron on it too long. In this case, the pedal just won't work.
First, notice on each ic chip, there is a little marker, or bump to signify which end goes where. There is generally a corresponding mark on the circuit board. If not, make one! This is important. If the ic chip is not installed correctly, the pedal won't work.

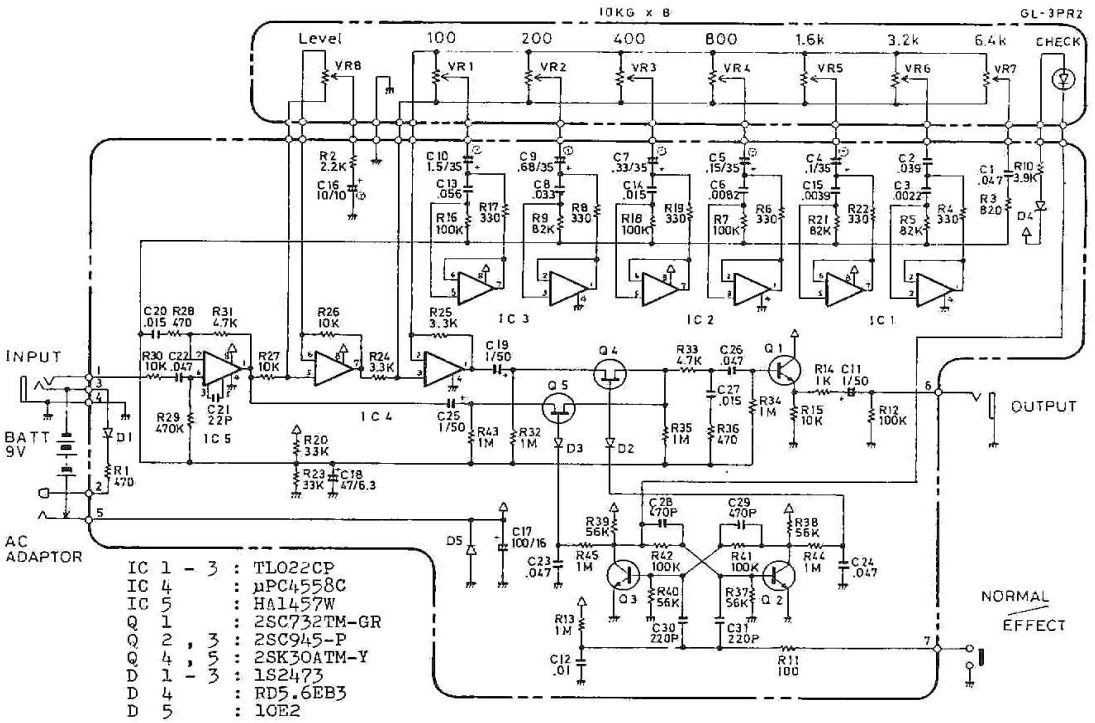
Solder the 'stand' in first, it will look like this:



CAREFULLY insert the ic chip in correctly.

Old Version of the GE-7:
Notes:
* Replace all 1uf caps with a film capacitor of the same value





*Note: The GEB-7 is identical to the ge-7, the difference being the values in the "gyrator" circuits which are controlling the frequency for each band. For example, VR1 in the schematic above shows a frequency of 100hz. On the geb-7 it is 50hz. This is changed by changing the parts C10 and C13. For VR2 it would be C9 and C8, and so on for each frequency and slider.

Boss HM-2 mod

Location	Stock value	Mod value	What it effects
C30	.068uf	.022uf	Lower value for more bottom end
C6	.047uf	1uf	Adds bottom end
D3	1n4148	1n4001	These changes will remove as much of the fuzziness as possible, making it as rich and full of a distortion as the circuit will allow.
D5	1n4148	led	
D8	1n4148	Led	
D9	1n4148	led	
D6	Germanium	Jumper	
D7	Germanium	Jumper	
C15	1uf elec	1 uf (film cap)	Will quiet some of the background noise.
C12	1uf elec	.033 uf	Will lower the bass before clipping, this will help eliminate some fuzz as well.

*any size/shape/color led will work the same when used as clipping diodes as they are with this pedal.

Big fat full distortion, much better tone control, less fuzziness

Location	Mod value	What it effects
R16	10K	LOWER GAIN AT TRANSISTORS
R29	220K	LOWER GAIN AT TRANSISTORS
C14, C10	REMOVE	DO NOT REPLACE WITH ANYTHING
D6, D7, R23	JUMPER	REPLACE THESE PARTS WITH JUMPER WIRES
R42	1K	
C31, D3, D4, D5	REMOVE	DO NOT REPLACE WITH ANYTHING
D8, D9		1N34a OR SIMILAR GERMANIUM DIODE for a od250 type distortion, or for a more aggressive distortion, just change D8 to 2 separate 1n4148 diodes connected in series and inserted into D8's holes.

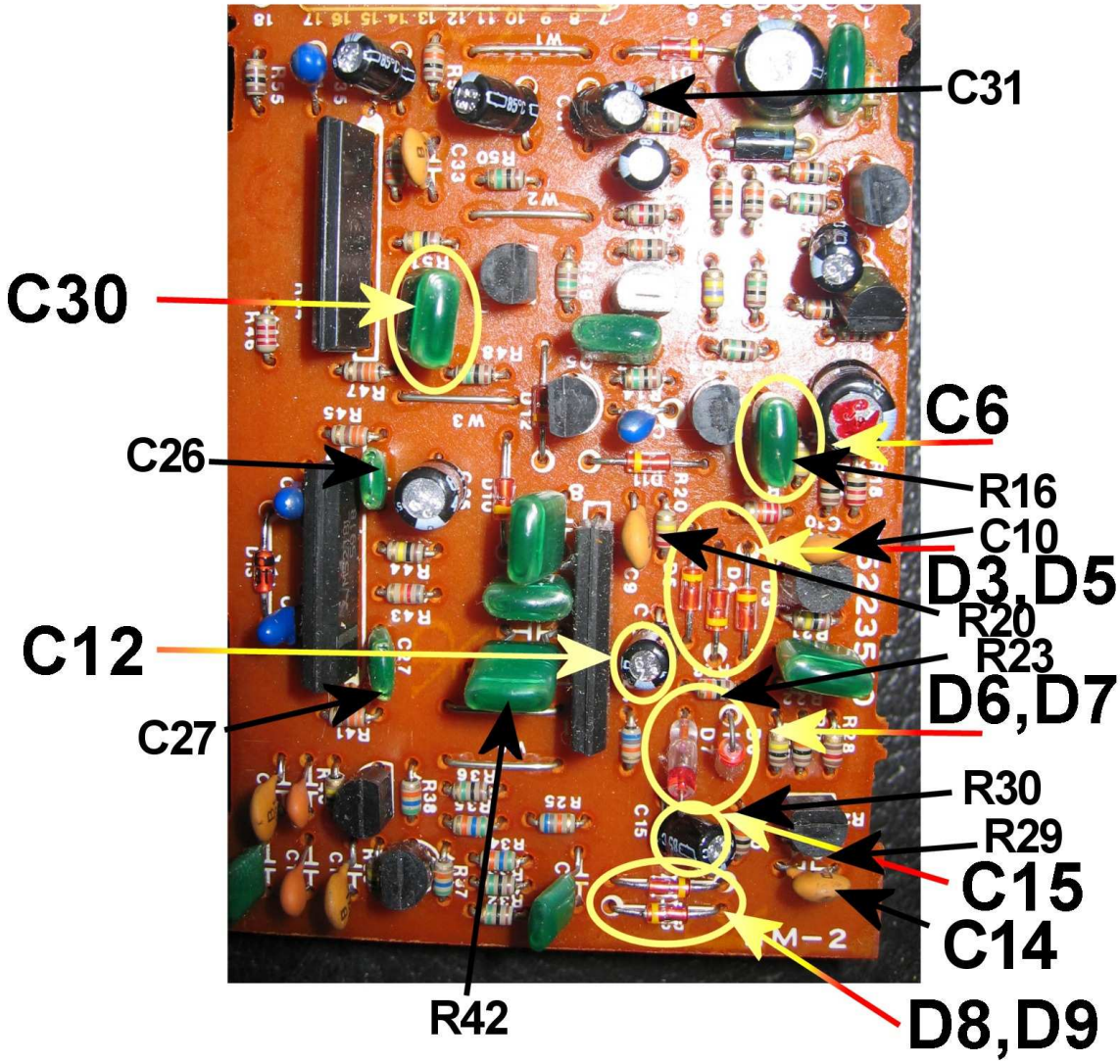
Options

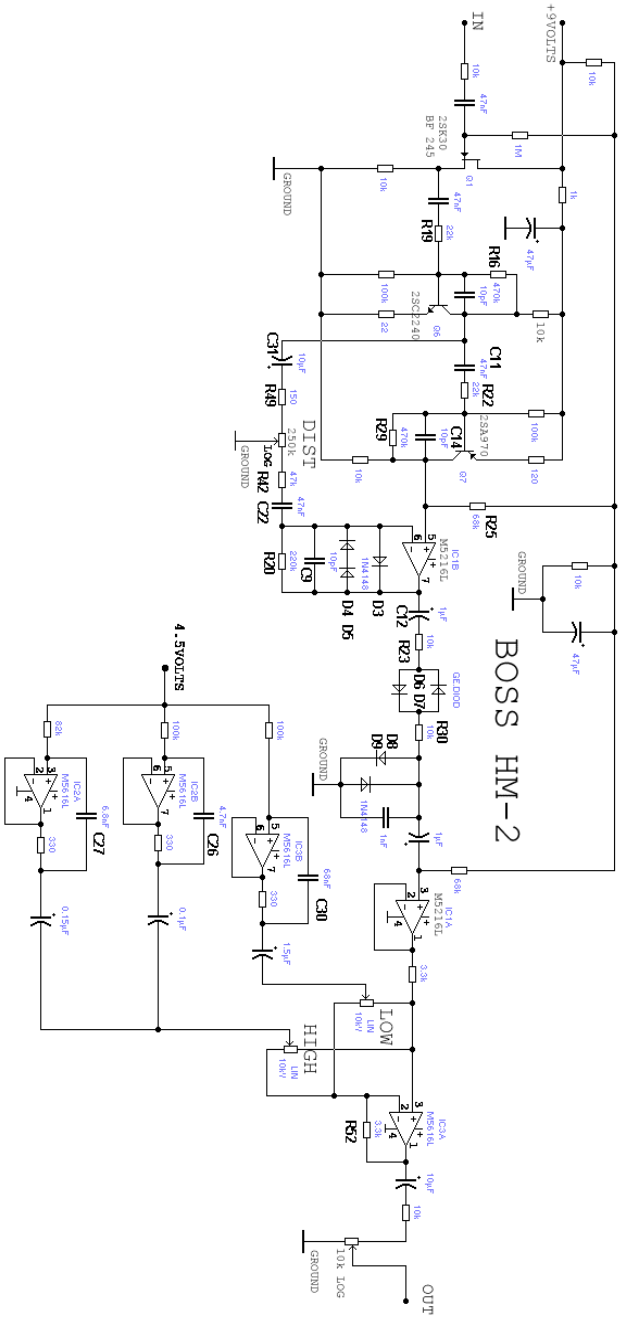
Location	Mod value	What it effects
C27, c26		Lower value for higher frequency of highs. Stock is around 3k. Mod @: c26: .0022uf, c27: 500pf. That will give you roughly around 7k frequency center.
C30		Lower value for higher frequency, raise value for lower frequency. However, anything past .68uf or so doesn't do that much. Mod: .022uf=250hz or so, .056uf=100hz or so. Recommendation: . 047uf
R52		Raising R52 will allow you more volume, but also more mids. Stock is 3.3k.
D1, R2	For psa power adaptation	If your pedal is set for a Boss ACA adaptor and you want to use a PSA type, simply jumper these two locations.

About the circuit...
Signal comes into a buffer @ Q1, then into 2 gain stages, both of them "non-discrete", or transistor gain stages.In the first stage, gain is controlled at r16, in the second, it is controlled by r29. The stock gain control uses a form of controlled signal feedback to control gain, hence the muddy sound and lack of good low gain sounds. This is why I recommend disconnection C31, though the gain control may be wired backwords. To counter this, you can cut the traces on the little circuitboard that the gain pot is attached to (lugs 1 and 3), and just switch their places (lug one becomes lug 3 and vice versa).

After this second transistor stage (Q7), the signal goes to an opamp clipping stage with diodes in the feedback loop (d3,d4, d5). From there, the signal is clipped further by something we don't usually see in a distortion pedal... a parallel pair of diodes in parallel with the signal flow AND a pair of diodes to ground immediately after. This is why the stock fuzzy tone.

From there, the signal goes through a buffer (IC1A) and into a simple low/high eq section. From here the signal goes out through the volume pot.


C31
C30
C6
C26
R16
C10
D3,D5
R20
C12
R23
D6,D7
C27
R30
R29
C15
C14
R42
D8,D9


BOSS HM-2
+9VOLTS
4.5VOLTS
GROUND
IN
OUT
DIST
LOW
HIGH
2SK30
BF 245
2SC2240
2SA970
M5216L
M5616L
GE,DIOD
1N4148
10k LOG

Boss MD-2 mods

Max distortion

Location	Mod value	Notes
R37	1K	Increases distortion capability along with c19
C19	.47UF	
C7	1k	
R22	1K	
R30	100K	Stock is 22k. The larger the value, the more gain.
R23	10K	
It should be noted that with any circuit there will be a max "usable" distortion, and anything past that just adds noise, hum, and hiss. If you are experiencing this, simply change the values listed (in relation to the schematic).		

Overdrive tones

Location	Mod value	Notes
R37	1K	We are changing the first frequencies clipped here.
R71	1k	
R21	470k	
C7	470pf	
R30	47k	
R75	2 – 1n4148 diodes	Connect in parallel, opposite directions.
R73	Jumper	
C40	.008uf	Rolls off some of the 'fizz'
See "jumper mod", next page. Install this mod.		

More mids

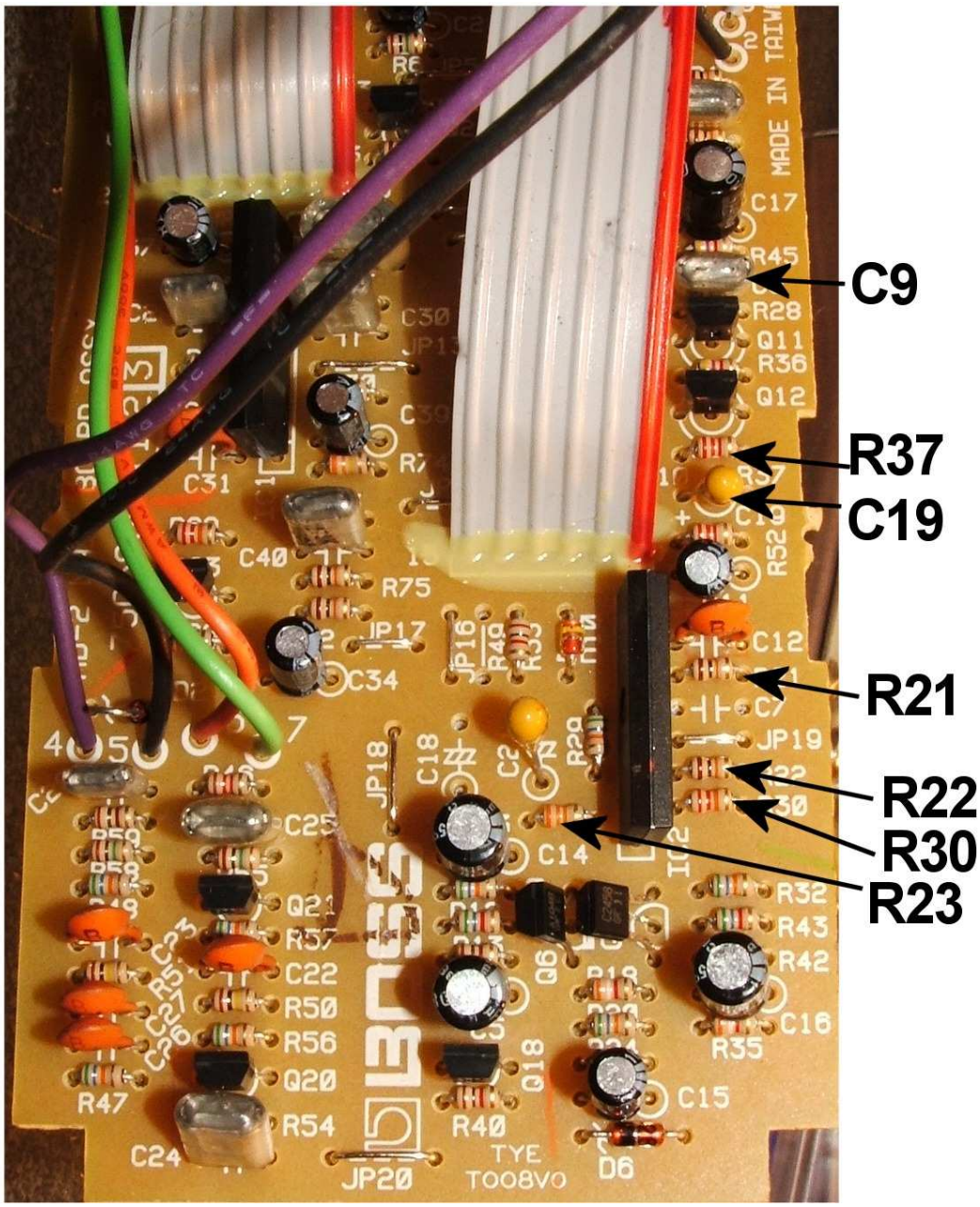
Location	Mod value	Notes
R61	Install 4.7k trim pot	Changing the value of r61 will change the frequency that the "bottom" knob controls.
C9	.0047	
C7	.0047	
R21	47k	

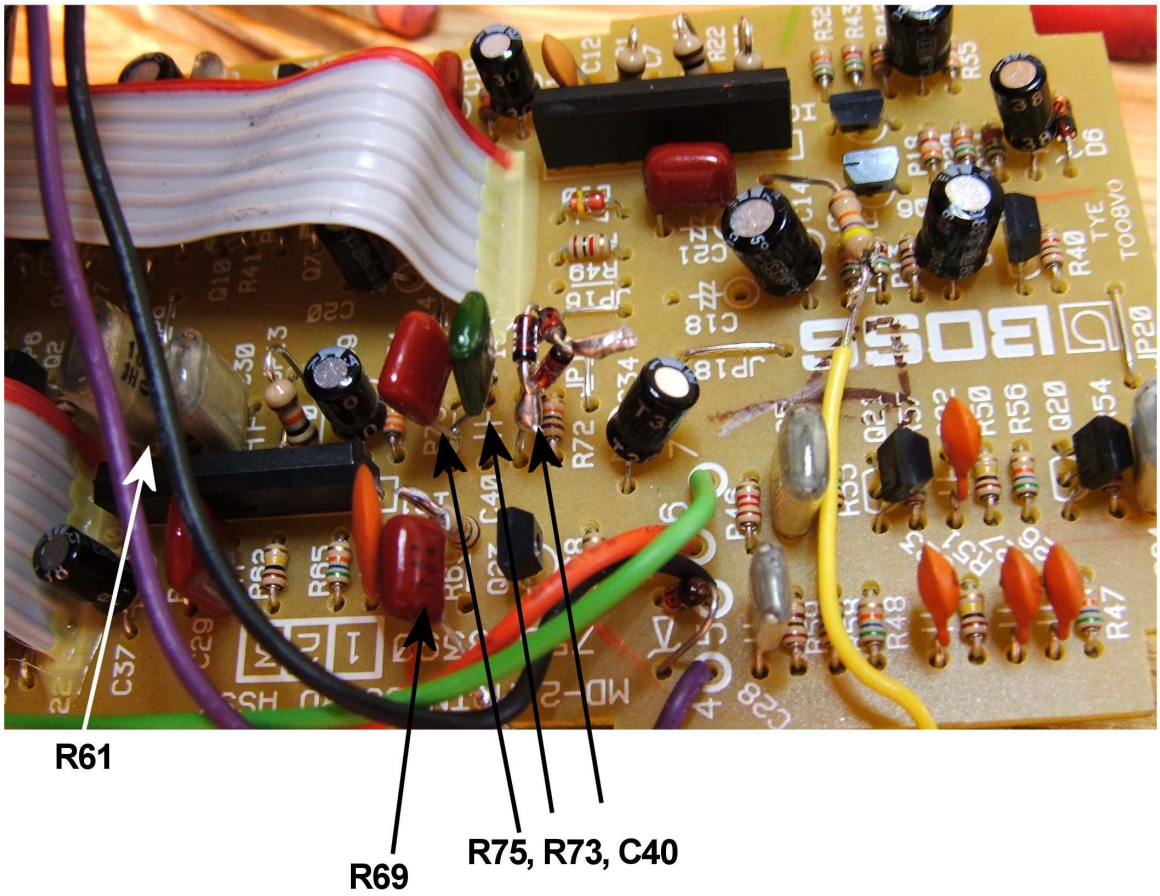
Circuit Analysis
Ignoring all the switching, the signal enters through c9 into a 'discrete' opamp, which is everything from Q11 – the 1uf cap before R21. R37 and c19 are the negative feedback portions of this clipping circuit.

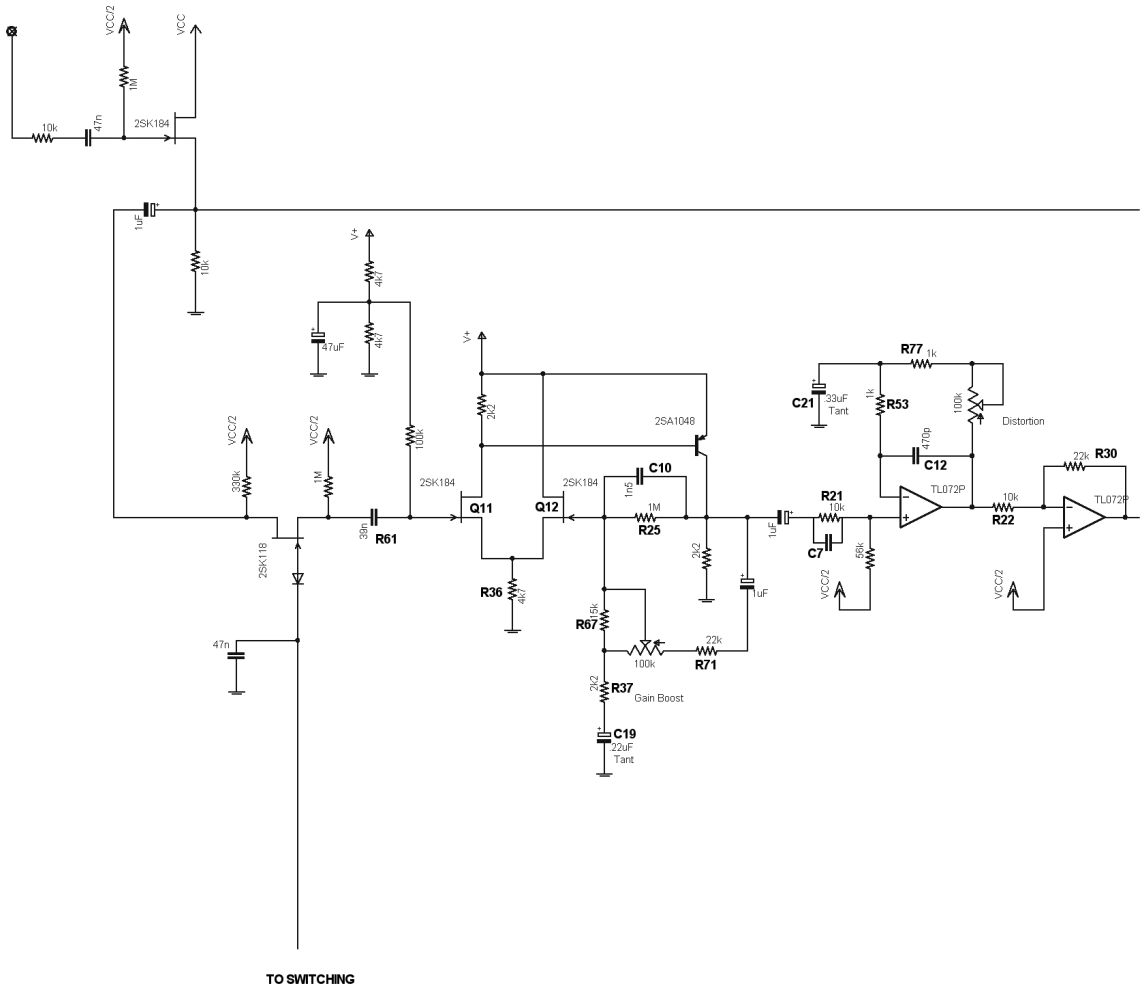
From there it goes into several standard opamp clipping circuits. The first is a non-inverting, and then directly into an inverting opamp.

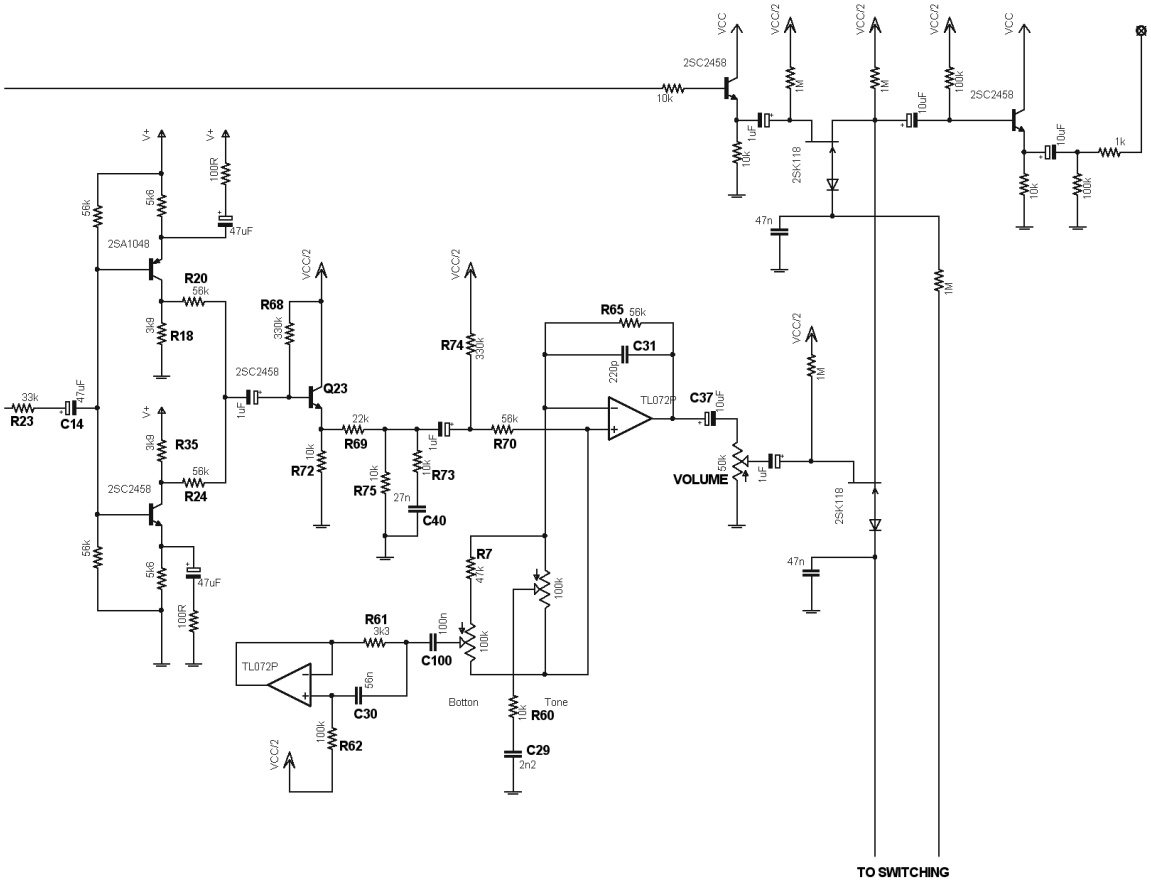
From there it goes into a 'mu-amp' type circuit...sort of a transistor equivalent to a power tube circuit in an amp. After this it goes into a buffer (q23), the signal is divided down via r69 and r75, and r73 and c40 form a low pass filter of sorts, attempting to remove some of the fizziness.

After this, the signal goes through a basic eq circuit – an active bass boost and treble cut filter.


C9
R37
C19
R21
R22
R30
R23


R61
R69
R75, R73, C40


VCC/2
VCC
1M
10k
47n
2SK184
1uF
10k
V+
4k7
47uF
4k7
100k
2k2
2SA1048
C10
1n5
2SK184
2SK184
Q11
Q12
1M
R25
R61
39n
330k
1M
VCC/2
VCC/2
2SK118
R36
4k7
2k2
1uF
R67
15k
100k
22k
R71
2k2
R37
Gain Boost
C19
22uF
Tant
47n
R77 1k
C21
33uF
Tant
1k
R53
100k
Distortion
470p
C12
22k
R30
R21
10k
C7
56k
TL072P
10k
R22
TL072P
VCC/2
VCC/2
TO SWITCHING


VCC
VCC/2
2SC2458
10k
1M
1uF
10uF
100k
2SK118
1k
47n
V+
100R
47uF
2SA1048
R20
56k
3k9
R18
R68
330k
R74
R65
C31
220p
C37
R23
33k
C14
R35
R24
R69
22k
R70
R72
R75
27n
C40
R73
TL072P
VOLUME
50k
R7
47k
R61
3k3
C100
100n
C30
56n
R62
Botton
Tone
R60
C29
2n2
TO SWITCHING

Boss MT-2 Metalzone

Mt-2 "Dieznerr" mod

Location	Mod value	Effect
c35	Remove	Removes nasally mids
C34	.047uf	
C25	remove	
C42	.1 uf	Makes distortion fuller, more dynamic
D3	led	
D4	1n4001	
C36	.1 uf	Gives the eq a huge range –many more tones available!!

Mt-2 "JCM-boogie" mod *

Location	Mod value	Effect
c35	Remove	
C34	.047 uf	
C25	remove	
C36	1 uf	Gives the eq a huge range –many more tones available!!
D3	led	
D4	1n4001	

Other mods for great tone

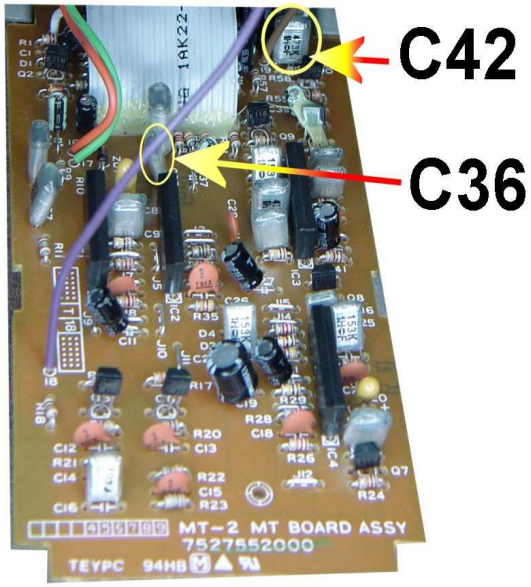
Location	Mod value
C029	.033uf film cap
C027	1uf film cap
C021	1uf film cap
C032	100pf film cap
C011	1uf film cap
C004	1uf film cap

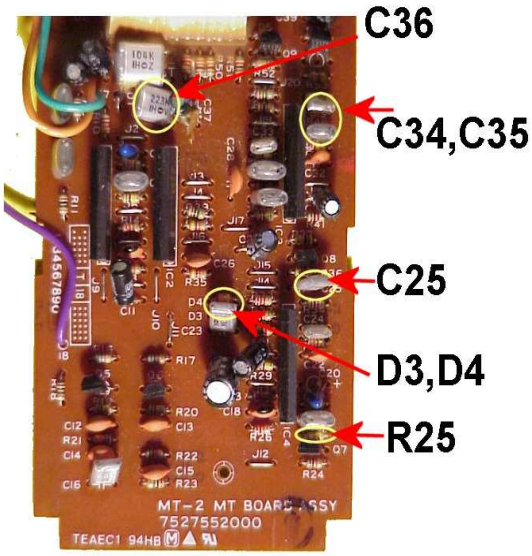
Modern Tones modification

Location	Mod value	Effect
R33	10k and .047uf connected in parallel	Better pre-clipping eq
R44	100k	Less fuzzy distortion
R30	10k	More clipping after diode clipping
R15	47k	Better eq response

Options
R46 - Increasing will reduce pre-distortion mids boost
R41 - Lowering will increase distortion (470 ohms or so will sound good)

- We are not affiliated with Marshall, Diezel, Bogner, or Mesa Boogie in any way. Marshall, Diezel, Bogner, or Mesa Boogie are used here as a point of tonal reference, and appear in conjunction with their trademark.

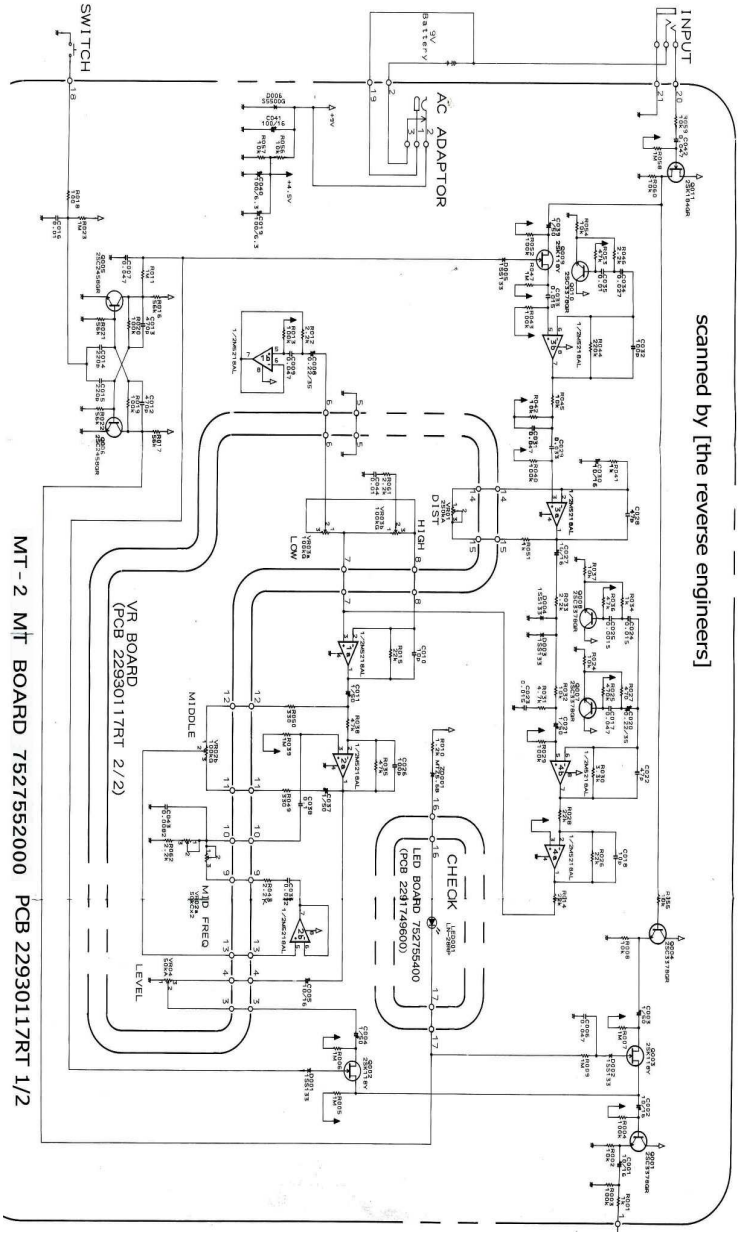




Suggested Settings for the MT-2

These settings will not sound the same when you change c36 -- when you change c36, make very small, incremental tweaks. The next few pictures show possible settings when c36 is not changed.

WITH C36 CHANGED:


CIRCUIT DIAGRAM
scanned by [the reverse engineers]
MT-2 MT BOARD 7527552000 PCB 2293011 7RT 1/2
VR BOARD (PCB 2293011 7RT 2/2)
LED BOARD 75275400 (PCB 2291749600)
INPUT
SWITCH
AC ADAPTOR
CHECK
DIST
HIGH
LOW
MIDDLE
MID FREQ
LEVEL

Boss od-1 mod

Effect Explanations

Max gain mod	
Location	**Mod value**
R6	1k
C3	.22uf
C5	1uf film cap
R8	47k – 100k
C4	If too bright, increase size of this cap
Volume pot	For more volume, change to a 100ka

Boutique overdrive tones	
Location	**Mod value**
C2	.1uf
C4	.1uf
C5	1uf
D5	1n34a and 1n4148 in series
D7	1n34a
R5	10k

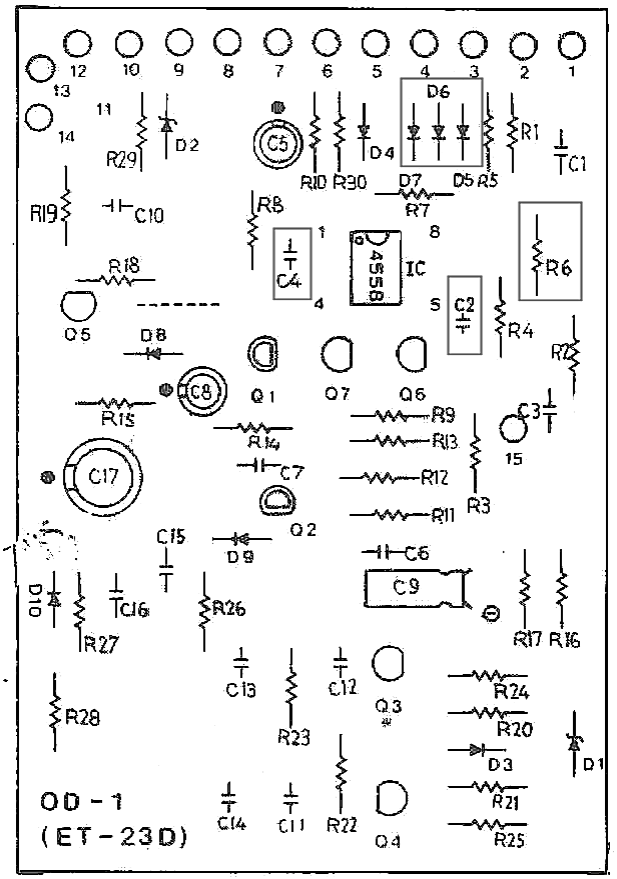
Warm, rich tonality	
Location	**Mod value**
c2	.047 uf
C3	.1 uf , for more bass, use .15 uf
C5	1uf film cap
D5	LED
D7	1n4001
R5	10k

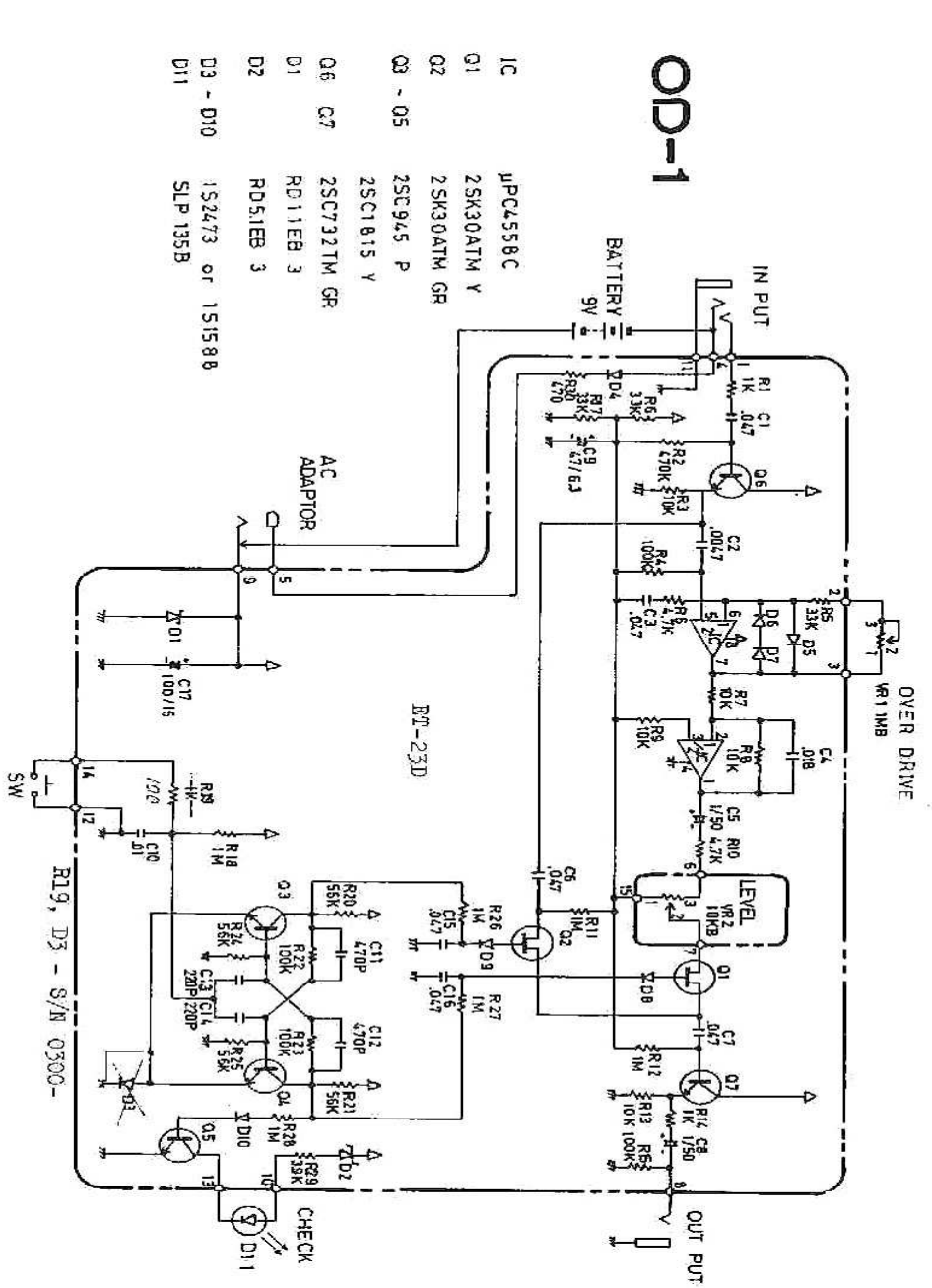
Boutique overdrive tones	
Location	**Mod value**
C2	.1uf
C4	.1uf
C5	1uf
D5	1n34a and 1n4148 in series
D7	1n34a
R5	10k

Circuit explanation:
The circuit enters through r1, then through c1, and hits the input buffer. The signal exits through c2 then enters the first opamp gain stage. The combination of the gain pot, c3 and R6 controls the gain and what frequencies are boosted and clipped. R5 dictates the minimum gain with the gain pot at it's minimum.

The signal exits and goes through R7 and then into the next opamp stage which is set up as an inverting opamp stage. R8 sets the gain, while c14 cuts highs. It actually acts as a low pass filter, filtering out high frequencies. To increase highs, make the cap smaller, and to decrease highs make the cap larger.

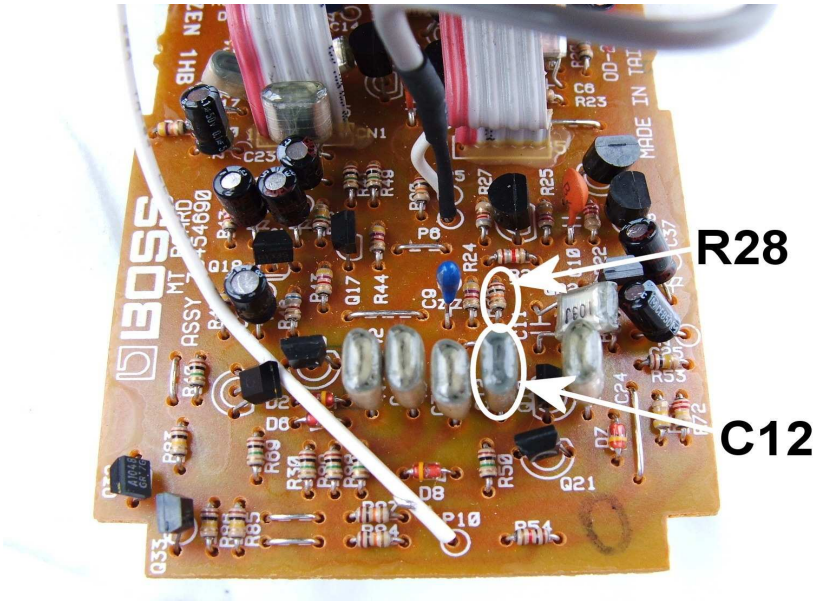
After leaving this stage, the signal goes through c5, r10, then connects to the volume pot. The volume pot signal passes through a jfet (used for switching only) and then through c7 before hitting the output buffer, r14 and finally c8 before exiting to the output.

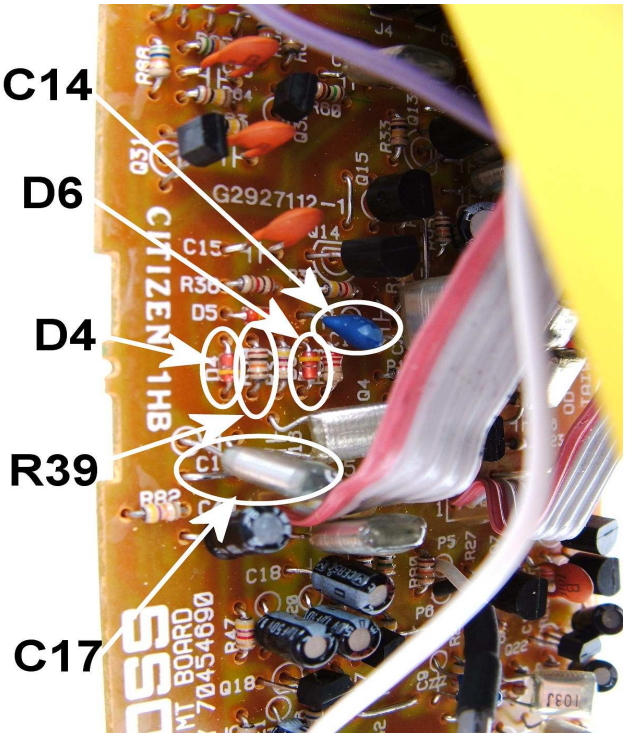



OD-1
IN PUT
BATTERY 9V
AC ADAPTOR
SW
OVER DRIVE
VR1 1MB
LEVEL
VR2 10KB
OUT PUT
CHECK
EF-23D
R19, D3 - S/N 0300-
IC μPC4558C
Q1 2SK30ATM Y
Q2 2SK30ATM GR
Q3 - Q5 2SC945 P
2SC1815 Y
Q6 Q7 2SC732TM GR
D1 RD11EB 3
D2 RD5.1EB 3
D3 - D10 1S2473 or 1S1588
D11 SLP 135B

Boss OD-2 R MOD

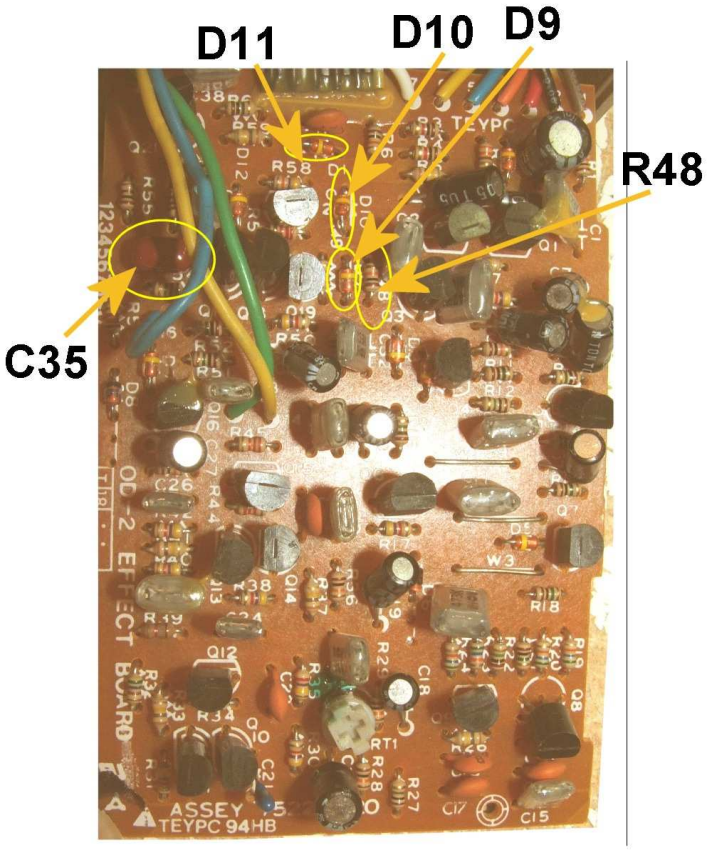
Location	Stock value	Mod value	What it effects
C12	.018 uF	.22 uF	Adds bottom end on turbo channel
C17	.018 uF	.22 uF	Adds bass normal channel
D4	1n4148	Led + .0047 uF cap in parallel	Will make clipping fuller, and much more dynamic. *on this change, the diodes are installed in series, and the capacitor is installed in parallel with either of the diodes. This filters out some crispiness of the distortion
D6	1n4148	Led + 1n4148 in series	Will make clipping fuller, and much more dynamic.
R28	10K	6.8K	Increases gain potential on turbo channel
R39	10K	6.8K	Increases gain potential on normal channel
C14	.22 uF tantalum cap	1 uF film capacitor	Increases low mids on normal channel

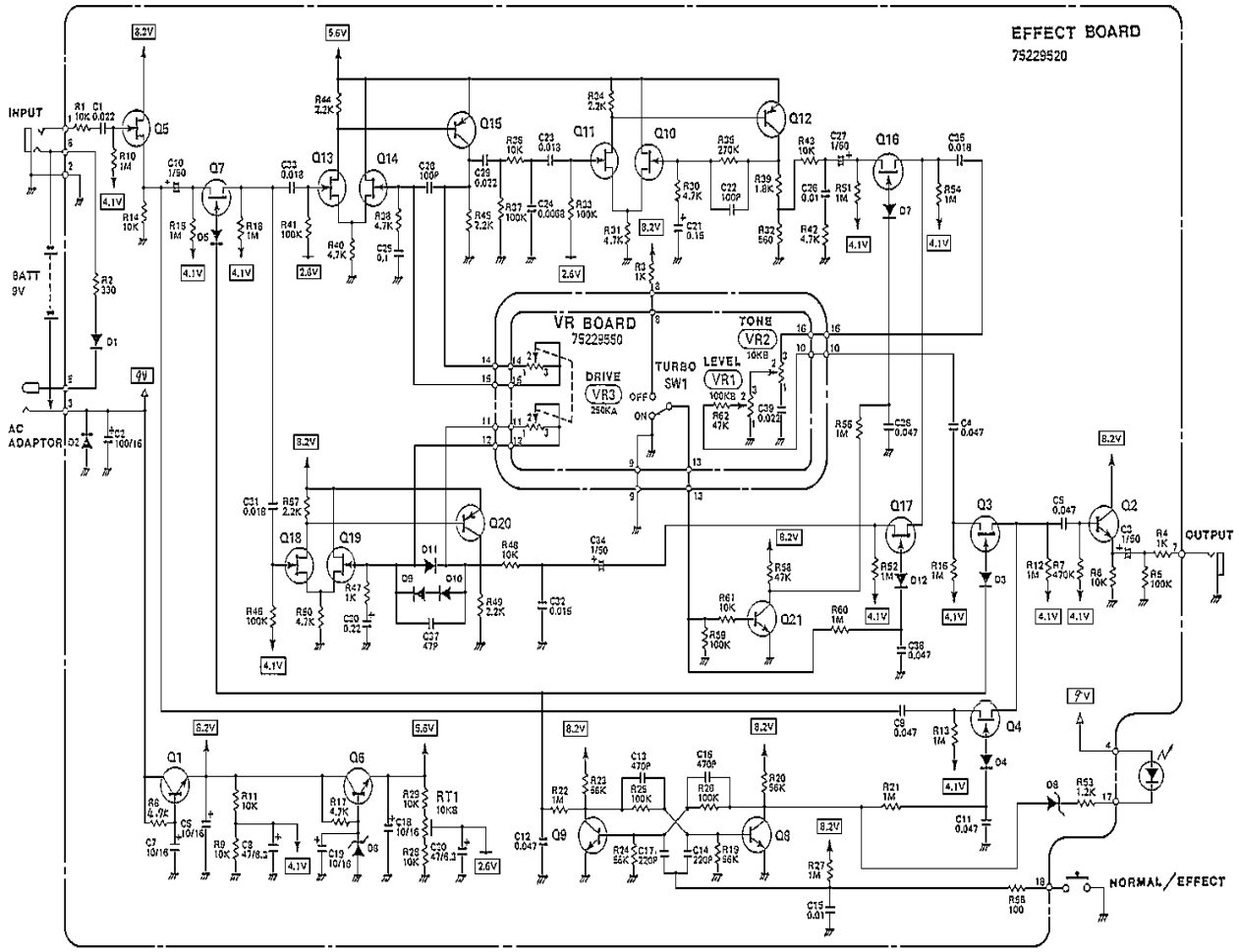



C14
D6
D4
R39
C17

Boss OD-2 MOD

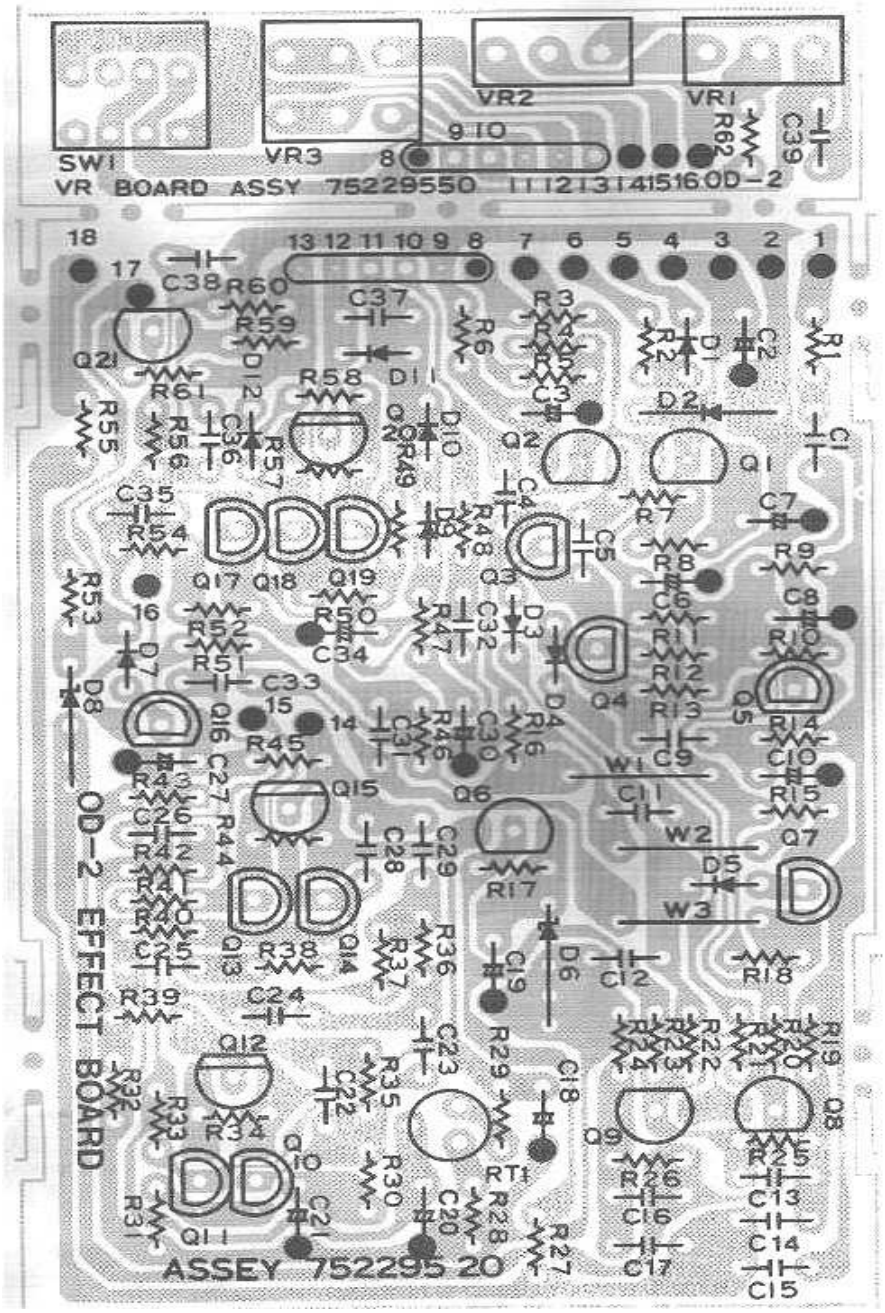
Location	Mod value	What it effects
C35	.47uf	Adds bass
D11	1n4148 - 1N34A germanium connected in series	Makes overdrive tones fuller, warmer, more organic
D10	1n4148 - 1N34A germanium connected in series	Makes overdrive tones fuller, warmer, more organic
D9	LED	Makes overdrive tones fuller, warmer, more organic
R48	4.7k ohm	Allows pedal to clean up better
R39	470 ohm resistor and 4.7uf cap in parallel	Adds more volume, distortion to turbo channel. To orientate the cap correctly, look at the picture below. Make sure the negative side of the capacitor is put in the hole closest to the left side of the circuitboard (left side of the circuitboard while looking at it as pictured on the image below).
R35	470K	Tailors the eq to be more 'marshall sounding'
C22	470 PF	


D11
D10
D9
R48
C35
OD-2 EFFECT BOARD
ASSEY
TEYPC 94HB



D1,3–5,7,9–12 ..... 1SS-133
D2 ..... S5500G
D6 ..... RD6.2JB-2
D8 ..... MTZ6.8

Q1,6,8,9,21 ..... 2SC945-P
Q3,4,7,16,17 ..... 2SK30A-Y
Q5,10,11,13,14,18,19 ..... 2SK117-GR
Q12,15,20 ..... 2SA970-GR
Q2 ..... 2SC2240-GR


VR2
VR1
SW1
VR3
VR BOARD ASSY 75229550
OD-2
OD-2 EFFECT BOARD
ASSEY 752295 20

Boss OD-3

Paisley Mod

Location	Mod value
C29	.22 uf
C7	.01 uf
D10	Germanium 1n34a
D11	LED

Wang Dang Mod

Location	Mod value
D7	Germanium 1n34a
C28	.047 uf
C22	.1 uf
C16	.1 uf
C23	.1 uf

Bsm mod

Location	Mod value
D6	Germanium 1n34a
D7	1n4148
C22	.1uf
C1	.1uf
C16	.1uf
C23	.1uf
C7	Remove completely
C8	.047uf

Mod #3

Location	Mod value
D6	1n4001
D7	1n34a germanium
C29	.22uf
C22	.1uf
C1	.1uf
C16	.1uf

Marshall Crunch

Location	Mod value
R11	Optional: Connect a 10k trim pot (lugs 1 and 2) to tailor high frequencies
R15	22k
C16	.033uf
C13	1uf
C22	.1uf
C28	.22uf
D7	Connect a LED and 1n4148 series
D11	1n34a

Big and full overdrive

Location	Mod value
C18	.15uf
C22	.1uf
C33	1uf
C34	470pf
C13	1uf
C7	Remove
C8	Remove

Santana mod

Location	Mod value
C28	.22 uf
C7	.01 uf
D10 - diode	Germanium 1n34a
D11 - diode	LED
D9	Germanium 1n34a
D10	Germanium 1n34a
*This modification is not affiliated with Carlos Santana in any way, it's name is derived from the tones we are trying to emulate.	

Circuit Explanation
The circuit goes through a jfet buffer, q8, whether the pedal is on or off. The signal goes through a cap (c21) and then hits part of the switching circuit, a jfet that either allows signal to pass when it's in the 'on' state. The signal then goes through c29 and through another jfet buffer (q10). From here, the signal goes through c30 and then through a filtering stage which limits the mids and highs a bit - basically making a little bit of a bass boost. From there, d9 and d12 help to limit any huge signals which might make the upcoming descrete opamp sound bad. It provides a small amount of clipping, depending on how strong the signal is at that point.

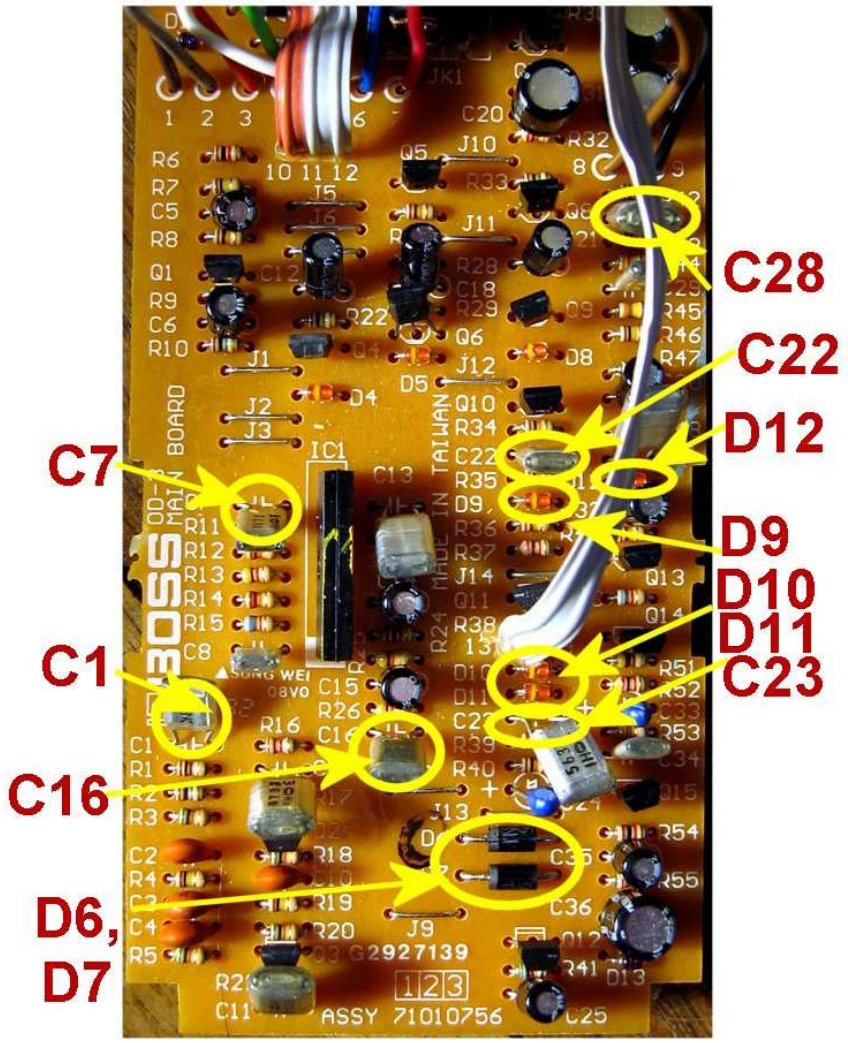
From there, a discrete opamp containing two jfets and a transistor for a gain stage. Gain is set by the drive pot in conjunction with r51 and c33 which form a feedback path to ground, similar to a normal opamp. This frequency is basically boosting and clipping right around 720hz, which is mostly midrange on guitar. D10 and d11 do a majority of the clipping here before going into the next stage, a simple jfet boosting stage. Gain is set by r55, c35/r54 while r40 keeps the jfet biased. D6 and d7 provide a bit of clipping as well.

The signal exits through r26 which forms a low pass filter along with c16, limiting the highs above 2.8khz.

The next stage boosts bass, it is a normal non-inverting gain stage. Gain is set by r15 and r24/c14 which provide the path to ground and set the frequency to be a very bass heavy signal. R14, c8 and r13 help to limit highs while the next stage, an inverting gain stage, uses this same type of filter to limit mids and highs which allows more bass through the circuit.

After leaving this stage, the signal goes through a normal low pass filter type of tone control and then through the volume pot. After the volume pot is another jfet used for switching and then another buffer.

tone pot cap


C28
C22
D12
D9
D10
D11
C23
C7
C1
C16
D6,
D7
BOSS
MADE IN TAIWAN
MAIN BOARD
IC1
ASSY 71010756