

# Guitar Amp Mods

By William Terry Newton, Copyright 1990-2011  
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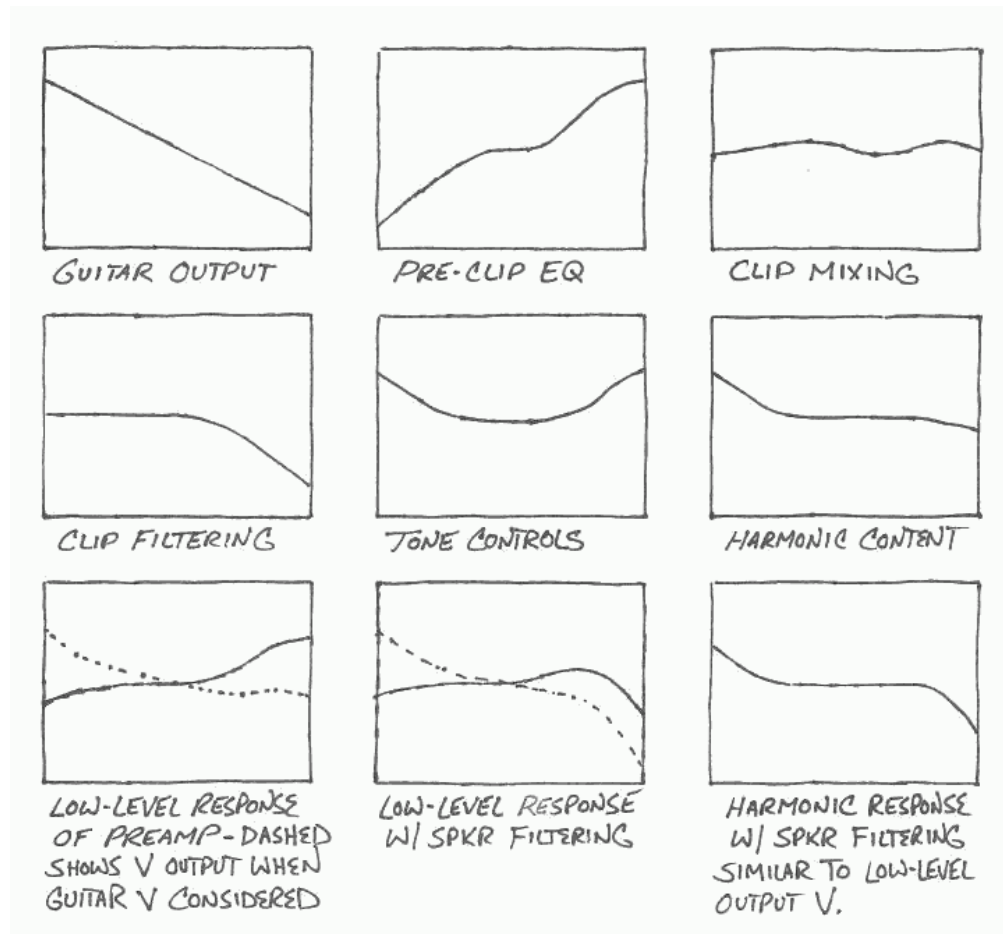
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## Overdrive Mod Theory

First of all, the tone produced by a properly-tuned stock 50 watt Marshall into a 4/12 cabinet is tough to beat for rock lead, the tone produced by an old Tweed Bassman or Twin is probably the best thing ever for blues, and a blackface Fender almost-anything Reverb is very nice for general-purpose clean. Don't get rid of your stock amps, and when modifying an amp, at least attempt to preserve its stock abilities if it already does cool stuff. The primary reason for doing an overdrive mod is to provide something at least resembling the "cranked up" sound but at lower volume levels that doesn't run everyone out of the room screaming in pain. As the volume goes down, the amount of gain that can be added goes up, produced the scooped-out "Seattle Grunge" tone so popular today. The additional headroom permits using post-clip effects without distorting the reverb and delay products into mush, and permits much better control of the overdrive harmonics, both with knobs and your palm.

Most of these mods follow a few principles which in my opinion results in better preamp distortion. Tones are placed after the clip stage, effects loop after that. Lows are rolled off going into the overdrive to balance out the pickup voltage differences between high and low notes, so that all are clipped equally, usually in a way that rolls off more and more lows as the gain is increased. Typical tone networks tend to boost up the lows so when placed post-clip they tend to restore bass response lost by pre-clip rolloff. Tones also tend to boost the highs so to avoid amplifying the clipping "buzz" the post-clip highs are rolled off so the response is roughly flat from the clip at normal treble settings. To make up for the high rolloff the highs are boosted prior to clip, so the treble still acts like a treble, just doesn't unnaturally boost the clipping products (just by the amount that sounds "right"). Often the gain control contains parts on it so more highs are boosted at lower gains, and the high-boost is limited in effect, too much will make it "glassy" sounding, or worse ultrasonic frequencies will distort the audible note causing "hash", to avoid this gain is rolled off at very high frequencies. At lower volumes our ears hear differently and more bass and less mids are needed to sound balanced. As playing volume is increased the mids need to come up and the bass reduced to remain balanced. Less gain is needed in the overdrive preamp so more lows can be allowed to pass, eventually turning into roughly the proportions found in a stock amp. If done just right, when set to fairly high distortion levels the guitar can be turned down and it'll "clean up" nicely. Usually anyway... this effect is also highly dependent on the guitar.

The following frequency response diagrams (crudely) show what is going on in the various stages of an overdrive preamp that follows these principles. A medium-volume application is shown.



In these charts "harmonic content" isn't exactly a precise term but is used to indicate the frequency response of circuitry after the clipping stage, roughly approximating the signal that will ultimately be applied to the speaker. The important things to note are the bass boost of the tones tends to make up for the low cut that has to be applied to clip different frequencies at roughly the same amount, and that when the voltage output of the guitar is considered, the spectrum is similar at low input levels (when the guitar volume is backed off, or just playing lightly) and under heavy overdrive conditions.

## Wiring Considerations

Amps should not hiss, hum or otherwise make racket it's not supposed to. Every gain stage added to an amp multiplies its tendency to amplify noise so proper component selection and wiring is very critical in the first stage of an overdrive mod, and fairly critical in the second stage. High-impedance wiring in the first couple of stages should be shielded, and also wiring which can transmit unwanted signals into other stages such as the distorted output leading to the overdrive volume control. To avoid hum pickup, the cathode wiring should be parallel to the grid wiring, all the way to the signal source. The first stage cathode should be grounded at the input jack, the gain stage cathode should be grounded at the gain control. The best way to ensure that the stage grounds remain parallel to inputs is to ground them through the shields all the way to the signal source.

## Component Considerations

There is no such thing as a low-noise resistor, ALL resistance makes "thermal noise" according to their value and temperature above absolute zero. This is the sound electrons make as they bounce off of atoms, even if no current is flowing, the higher the ohms, the more noise voltage is produced. I'm amazed at how many high-gain amps still employ a 68K resistor in series with the first stage grid, according to my calculations at 40 degrees C over a typical 6Khz speaker bandwidth that's about 2.66uV of noise. A couple of microvolts doesn't sound like much, and isn't if the preamp has a voltage gain of only a few hundred times like a clean Fender. Each additional stage can add as much as a 100x more gain, soon that couple of microvolts becomes several hundred millivolts and it doesn't go away when the guitar is turned down. Use something closer to a 1K input grid resistor and it does. At high gain you can hear the thermal noise produced by the guitar volume control, which for a 250K control is  $125K/2$  or 67.5K max, can't do much about that but at least make it so the noise goes away when you turn it down. The second stage grid resistor is less critical (less gain afterwards) but determines how much hiss the amp will have when set with less gain. Usually values up to 100K or even more are quiet enough for the second stage grid. Resistor noise doesn't factor in much in stages after that.

The first and second stage tube(s) should be selected for low hum and microphonics. Tube noise often depends on the grid impedance so if low-as-possible resistances are chosen for low hiss it will also tend to reduce microphonics. Preamp tube stages should be biased by their cathode resistors so the plate voltages rest at roughly 1/2 to 5/8 of the supply voltage. Generally a 1.2K to 1.5K cathode resistor is ok for a 100K plate resistor, 2.2K to 2.7K works for a 220K plate resistor, 3.3K for a 330K etc. Increasing the plate resistor increases the gain to a point, for best results the load from the following stages shouldn't be lower than the size of the plate resistor (at least for clean tones), best to not make the first stage plate resistor too high if it's also used for a clean channel. Balancing of the clip symmetry plays a fairly significant role in the type of distortion that's produced and how well it cleans up. Sometimes a trimmer on the clip stage cathode is nice.

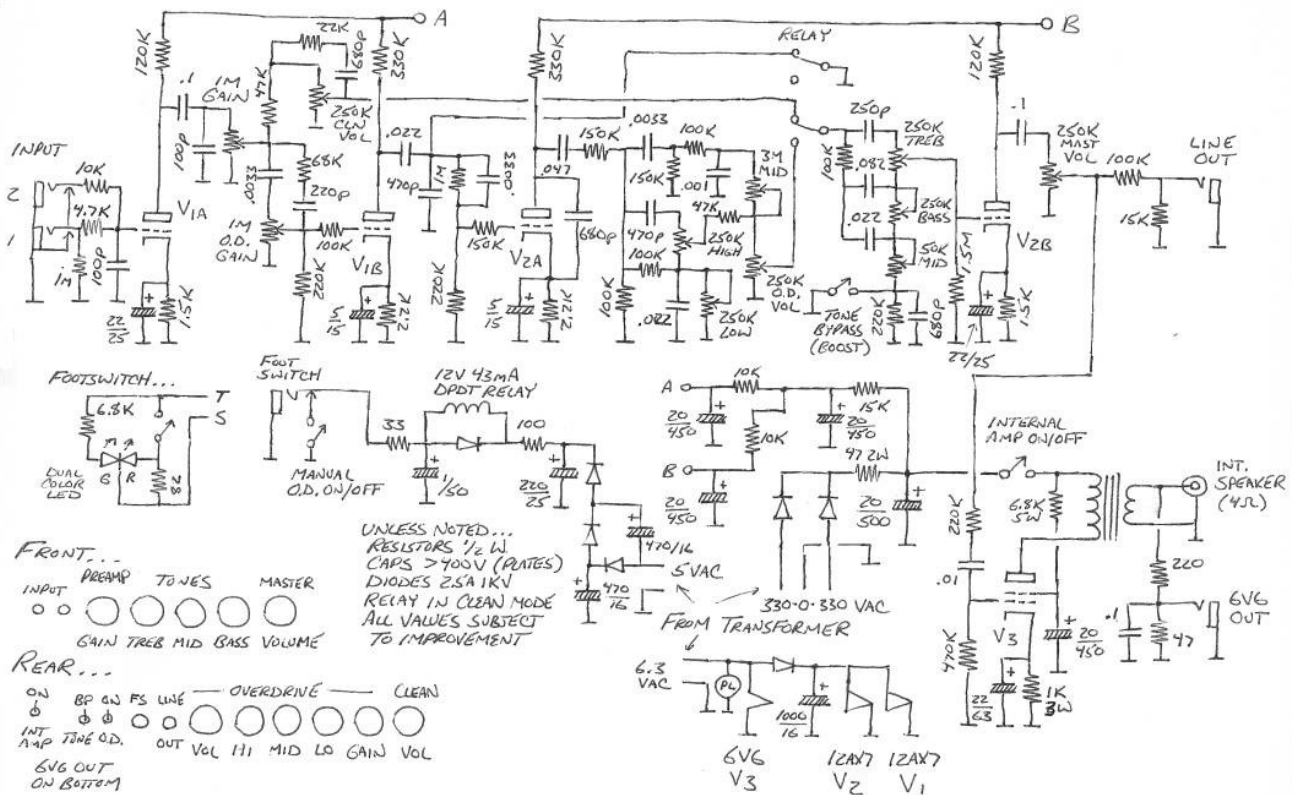
The components around the gain control and between the gain and clip stages (usually the 2nd and 3rd stages) determine the pre-clip EQ and play a huge role in how good the distortion sounds. Ideally separate controls would be provided to permit fine-tuning but there are only so many knob positions and other controls are more important, the most useful pre-clip EQ is a low-cut control. If knobs are available a high boost might be nice, the resistor in series with the capacitor used to brighten up the gain control would be a good candidate for a control. Or put a resistor in series with the capacitor placed parallel to the 1M typical (or low-cut control) between the gain and clip stages. The capacitor from the first stage to the gain and the resistor from the gain wiper to ground need to be selected so that the right amount of lows is passed at different gain settings. Don't assume the values I used are optimal, even if they were optimized it might have been for a particular guitar or playing style.

## The Mods

The following pages document mods I've done and also theoretical designs which were not exactly implemented (that I recall) but nevertheless express significant ideas. Many tone-affecting details were not documented such as the guitar and speakers being used and the volume level for which the design was optimized to sound best at. Layout details have been preserved only for the mods I was able to take pictures of. These things change the overall response and while for the most part the designs should be fairly close (to my ears anyway) they may need tweaks. Relays usually had 12V 43ma coils and the associated resistor values were chosen for proper operation, adjust accordingly for proper coil voltage.

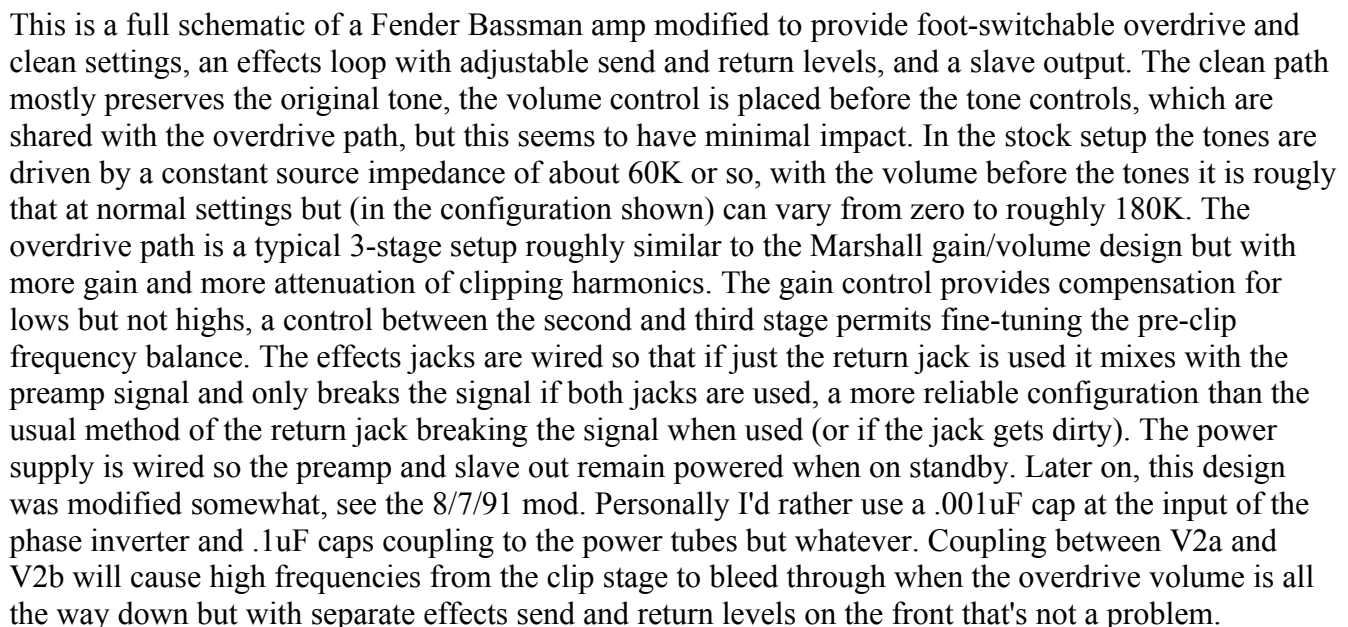
## 5/10/90 - Fender VibroChamp Overdrive/Switching Mod

VIBROCHAMP MOD/REBUILD  
DESIGNED BY TERRY NEWTON  
5-10-90



This amp was used mainly as a preamp in front of multi-effects and a power amp, the internal 6V6 could be switched in for low-volume stand-alone use. To keep the front panel clean and make it easier to use an overall preamp gain was used, with individual clean volume and overdrive gain/tone/volume on the rear panel. For using in front of another amp with traditional tones, a tone bypass switch was included, which also boosts the level so to avoid unwanted clipping the clean/OD volumes had to be reduced. The clip stage and tone pickup stage are in the same tube so when the OD volume was all the way down some of the clipping highs were still present in the signal, to avoid this effect the OD volume should be at a normal setting to match the clean volume and the master volume used to set the final output level without affecting the frequency response.

5-25-90  
WTN



## 10/2/90 - 2-Input Gain/Volume Marshall Gain Mod

JCM800 MOD 10-2+90 BY WTN  
(THE ONE WITH HI/LO INS, GAIN, MASTER, TREB, MID, BASS, PRES)  
(VOLUME)

REMOVE WIRING FROM HI-GAIN IN TO  $68K + 68K$  TO GRID (SHIELDED)  
(RIGHT SIDE OF 1ST TUBE)

ADD  $4.7K$  FROM HI-IN TO  $220pF$  TO GROUND. RUN SHIELDED WIRE  
FROM JUNCTION (SHIELD TO GROUND) TO GRID. ~~XXXXXXXXXX~~

SOLDER  $2.2K$  RESISTOR AND  $22\mu F$  CAPACITOR (+ TO TUBE CATHODE)  
ACROSS  $10K$  RESISTOR

SOLDER  $100pF$  CAP ACROSS 1ST  $100K$  RESISTOR,  $330pF$  CAP ACROSS  
2ND  $100K$  RESISTOR AND  $330pF$  CAP ACROSS  $100K$  RESISTOR  
OVER 2ND TUBE SOCKET

REMOVE  $470K/470pF$  NETWORK FROM LO-GAIN INPUT TO VOLUME  
POT. REPLACE WITH  $.0047\mu F$  CAP.

REMOVE CAP ON VOLUME CONTROL. ADD  $330K$  FROM WIPER  
TO GROUND. (TAKES OUT EXCESSIVE LOWS AT HIGH GAIN)

TRACE WIRE FROM WIPER OF VOLUME TO GRID OF 1ST TUBE (B)  
UNSOLDER & REMOVE FROM UNDER BOARD. SOLDER  $100K$   
RESISTOR TO GRID. ROUTE WIRE OVER BOARD & SHORTEN  
& SOLDER TO  $100K$  RESISTOR. (ON LEFT SIDE OF 1ST TUBE)

REMOVE GRID WIRE FROM 2ND TUBE, SOLDER  $100K$  RESISTOR  
TO GRID & SOLDER GRID WIRE TO  $100K$  RESISTOR. (LEFT OF 2ND TUBE)

FOR ADDITIONAL LOW END ON OUTPUT, BRIDGE  $.1\mu F$   $400V$   
CAPS (2) ACROSS EXISTING  $.022\mu F$  CAPS FROM  $82K + 100K$  RESISTORS  
TO CORRESPONDING  $150K$  RESISTORS IN DRIVER STAGE.

NEW SCHEMATIC...

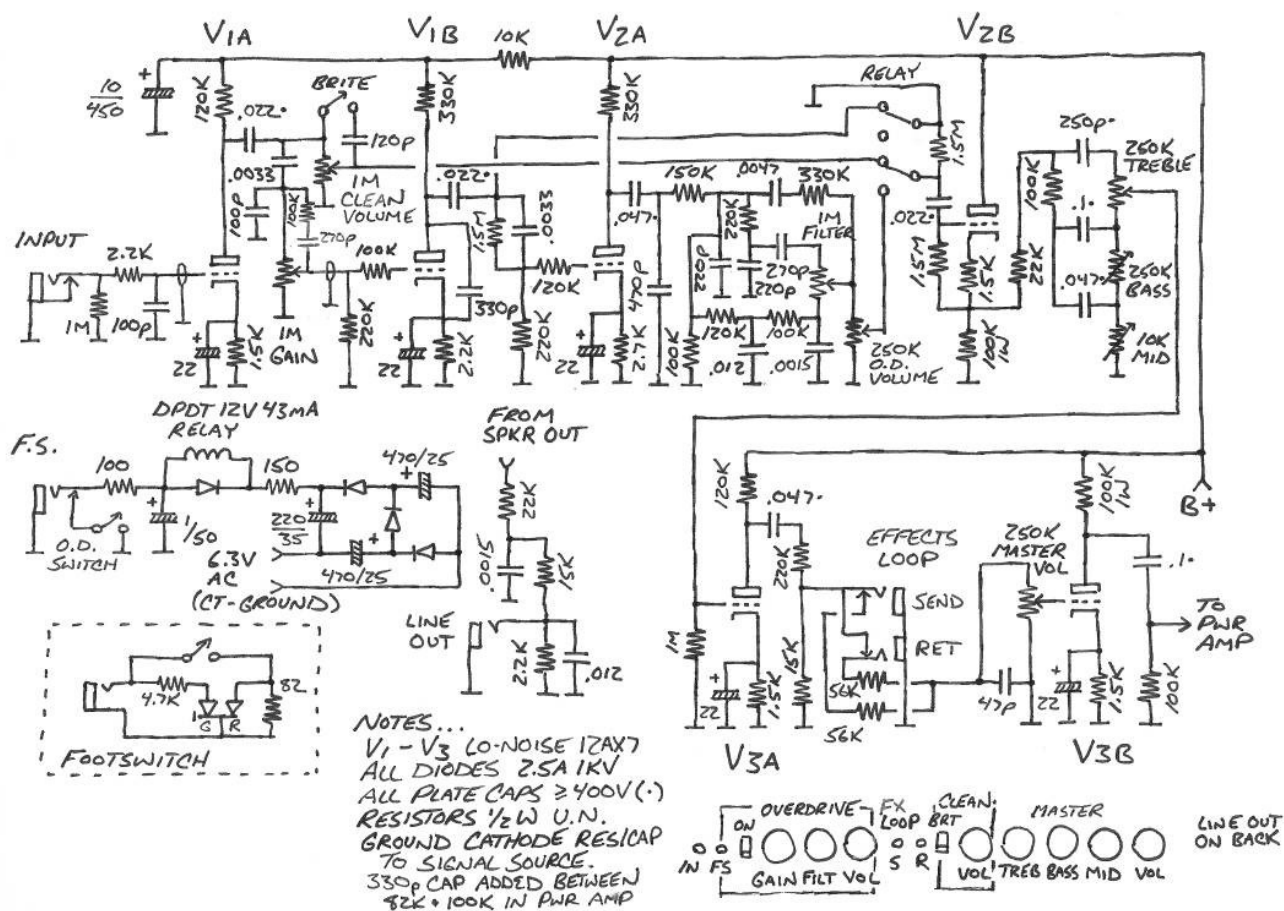
\* = ADDED OR ALTERED CIRCUITRY

THIS MOD INCREASES OVERDRIVE GAIN & STABILITY AND  
SMOOTHS OUT HI-END (TAKES THE 'GLASS' OUT). LOTS OF  
HARMONIC-TYPE FEEDBACK WITHOUT PICKUP WHISTLES.

This is a generalization of the kind of mods I was doing to JCM-800 gain/volume Marshall amps to increase the gain and smooth out the tone, the stock circuit was already the "correct" topology just needed to be opened up and toned down. Not sure I agree with the  $4.7K$  cathode resistor on the 1st stage but with the  $.68\mu F$  cap would give quite a mid boost and apparently was the stock value. The schematic doesn't show it but the jack side of the  $.022\mu F$  capacitor from the 1st stage connects to a ground side switch on the high-gain input to avoid pops when plugging into the low-gain input.

# 12/06/90 - Fender Bandmaster Overdrive/Switching/Loop Mod

BANDMASTER MOD 12-6-90 WTN



This mod keeps the amp chassis stock except for the line out jack and doesn't have to have that. V2B is used as a unity-gain buffer for the tones, not strictly necessary (could just run the output of the relay right to the tones) but probably helps make the tone controls work better. At least it avoids the bleed-through issue, when the overdrive volume is down it shorts out any signal picked up by the grid. The vibrato section is removed so its tube and control positions can be used for an added mid control and the master volume. The overdrive and clean volumes set the send level, the master volume sets the return level. The line out jack has high-frequency rolloff to make it sound (sort of) like a speaker.

I don't remember who's amp this was but notes on the schematic indicate it was something that was built for someone - the 100K and 270pF on the gain control appear to be added after the original drawing was made (and the 270pF was white-out corrected), 1-watt resistors used in a couple places (silverface), and the clincher is the note about a 330pF capacitor added to the power amp section.

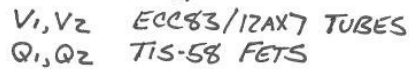
THEORETICAL EFFECTS LOOP FOR A MARSHALL 12-25-07 WTN

The line out filter is more of a mystery, probably some kind of positive-feedback active filter based on a FET buffer, similar to the FX send buffer but with additional R/C's in the gate circuit. The V2 circuits had to be shielded to avoid clipping bleed-through into the loop and line out circuits when the master volume was all the way down, was easier to shield the source of the noise than the modules.



Here are a couple of mod designs that weren't built exactly as depicted (that I can recall) but represent some of the ideas I was fooling around with at the time.

2-4-91 WTN

[illegible]

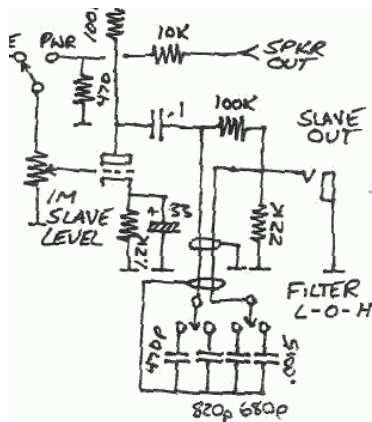
BASSMAN MOD (PREAMP SECTION) 8-7-91

POWER AMP ...  
2.2K/150 FB CHANGED TO  
80K/100K RATE 100K/110K  
.002 COUPLE  
220K GRIDS

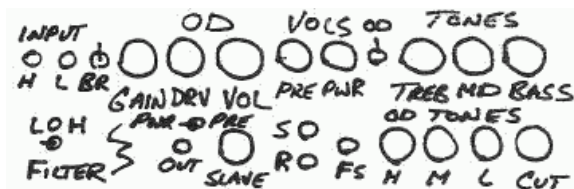
446V (446)  
P.S.

DESIGNED BY TERRY NEWTON

Here's a better-drawn detail of the modified slave out circuit...

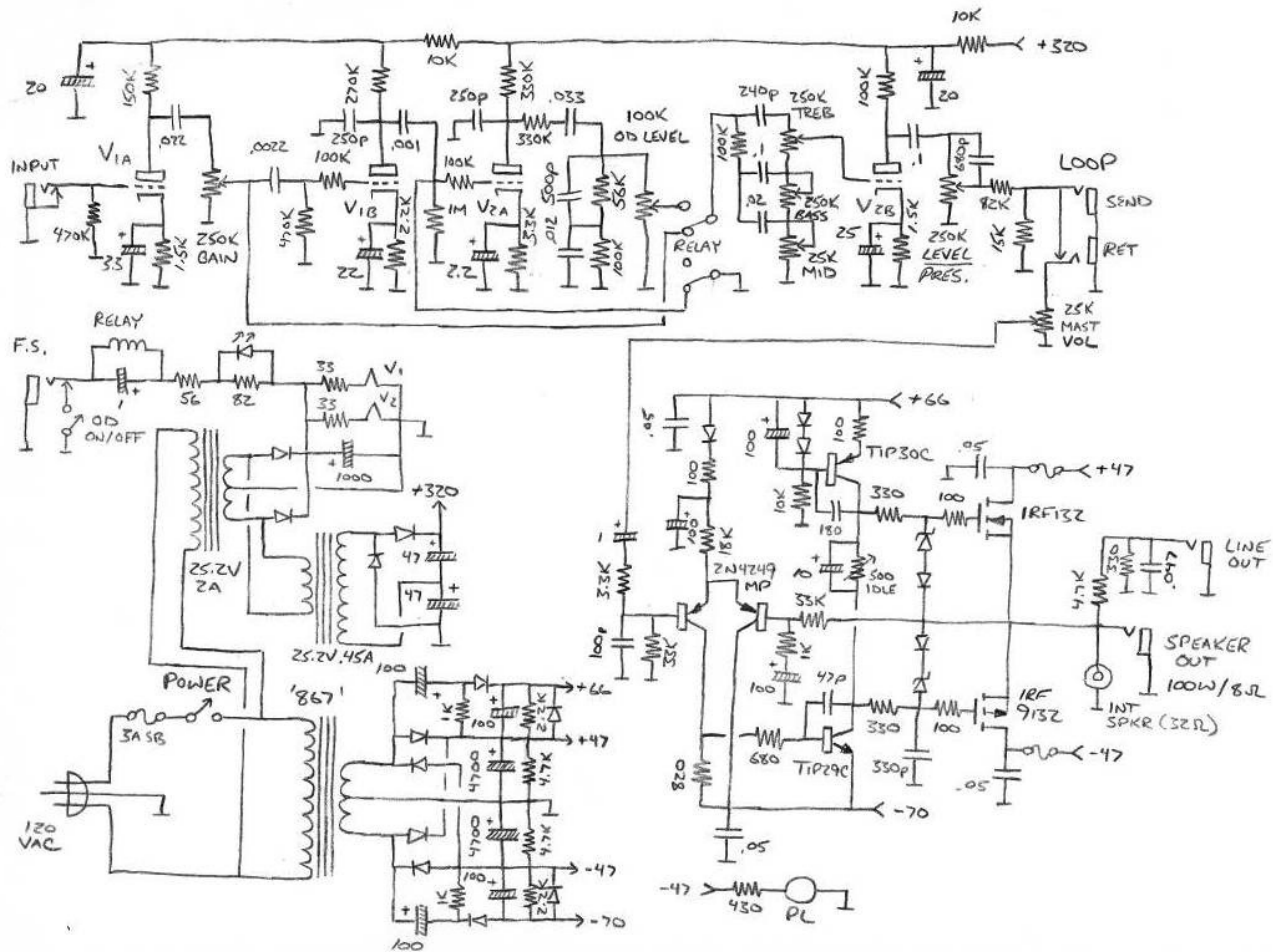


The other side of the switch is connected to the FX mixed signal at the junction of the two 47K resistors. The control layout became...



## 12/25/91 - Fender Champ Reconstruction

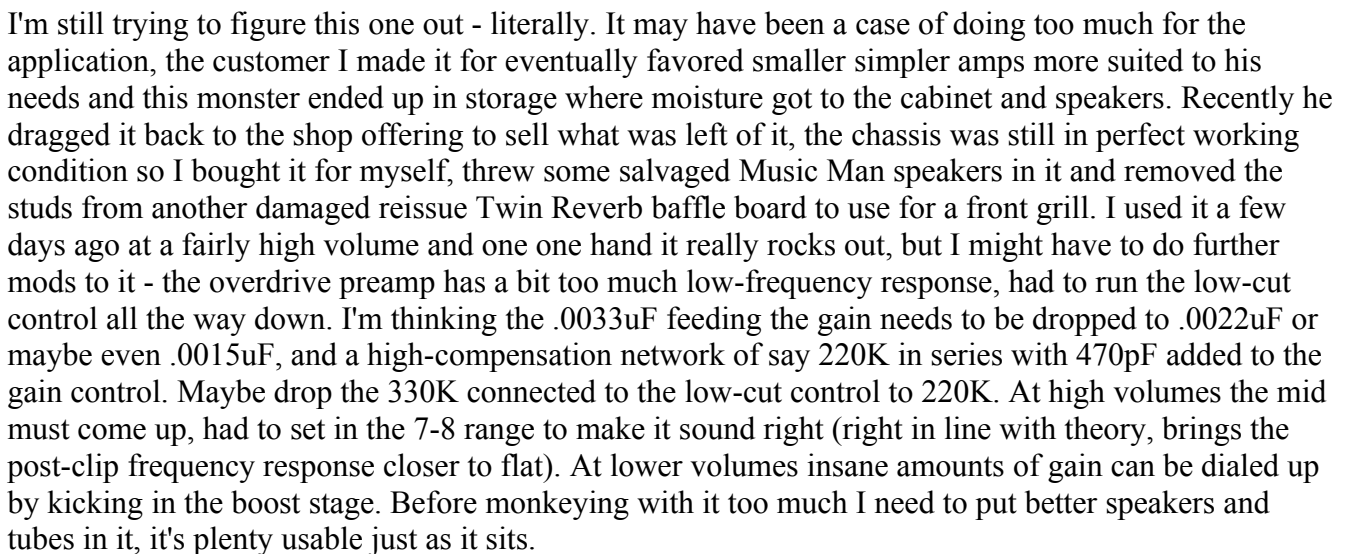
SUPER-CHAMP (AS OF 12-25-91)



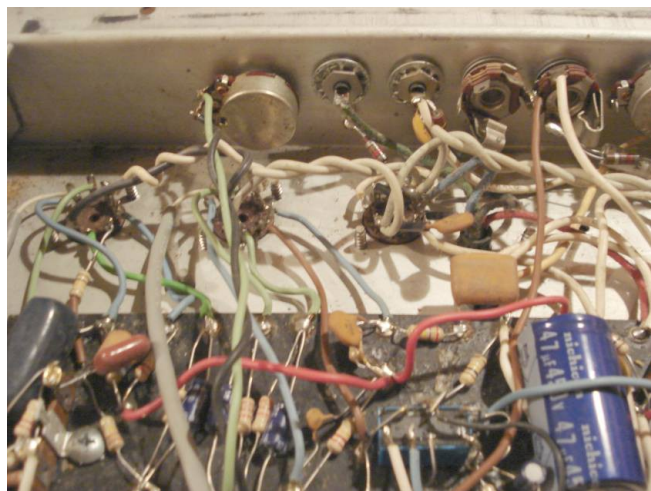
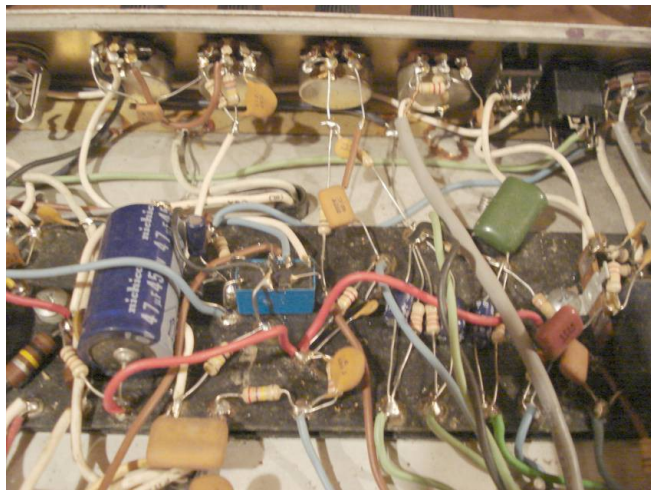
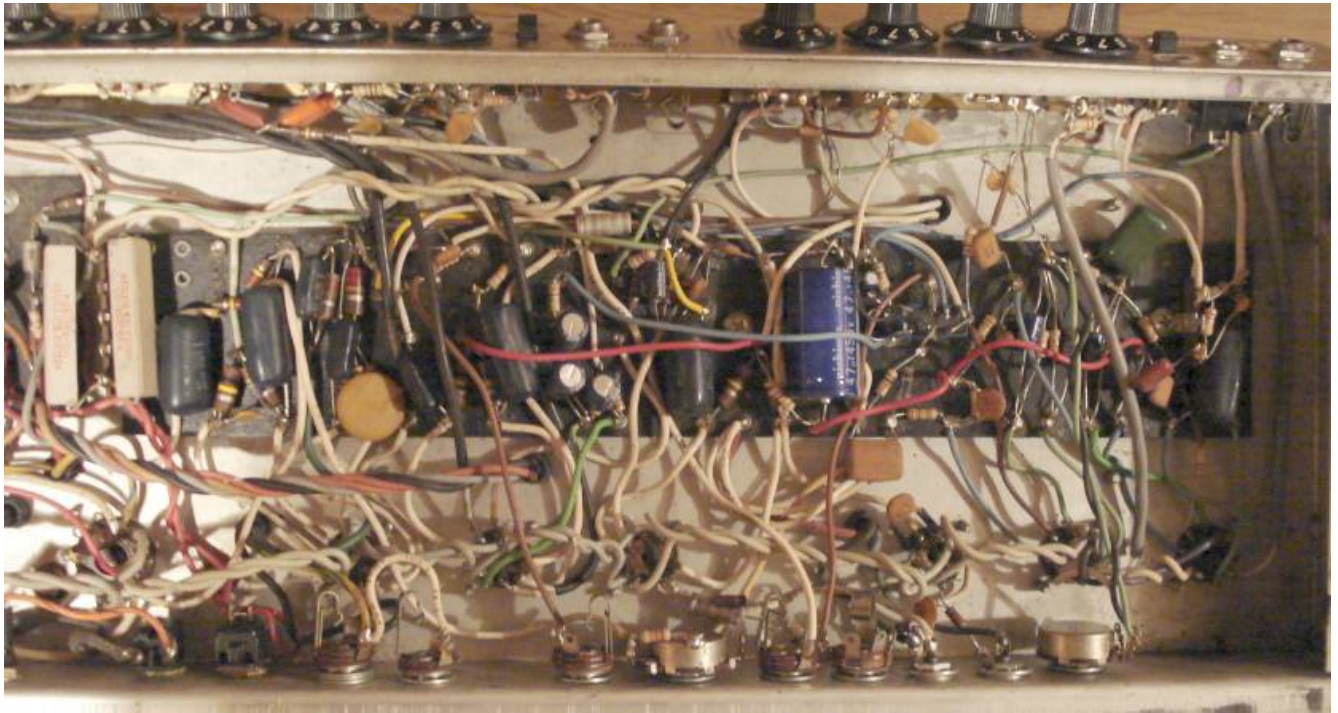
I built this amp for myself, not much remained of the Champ it was made from except for the chassis, preamp tube sockets and some of the controls and jacks. The "super" in the name referred to its power of over 100 watts into 4 ohms, nothing to do with Fender's Super Champ. The preamp had channel switching of sorts but the preamp gain was shared with both the clean and dirty selections so to get maximum overdrive the clean got dirtied up too. The zener diodes protecting the gates of the output mosfets were probably 6.2V or thereabouts but the design didn't have any protection from thermal overload or anything more than a momentary short.

This was my main amp until I put together the "mod gone mad" bandmaster then it served time as my backup and sidefill amp, I'd put it on the corner of the drum riser opposite my main rig so the back provided monitor for the drummer and the front provided monitor for myself and the bass player, using a signal from the other "stereo" output of my delay unit plugged into the power amp in jack. Sadly it died at a strange gig in the old jail in Manchester, TN when the sound dudes blew their monitor amp and I stupidly let them drive the monitor chain with it, smoke came out. Never bothered to fix it and the poor thing got salvaged for parts.

MASTER TWIN MOD 1-25-92 WTN

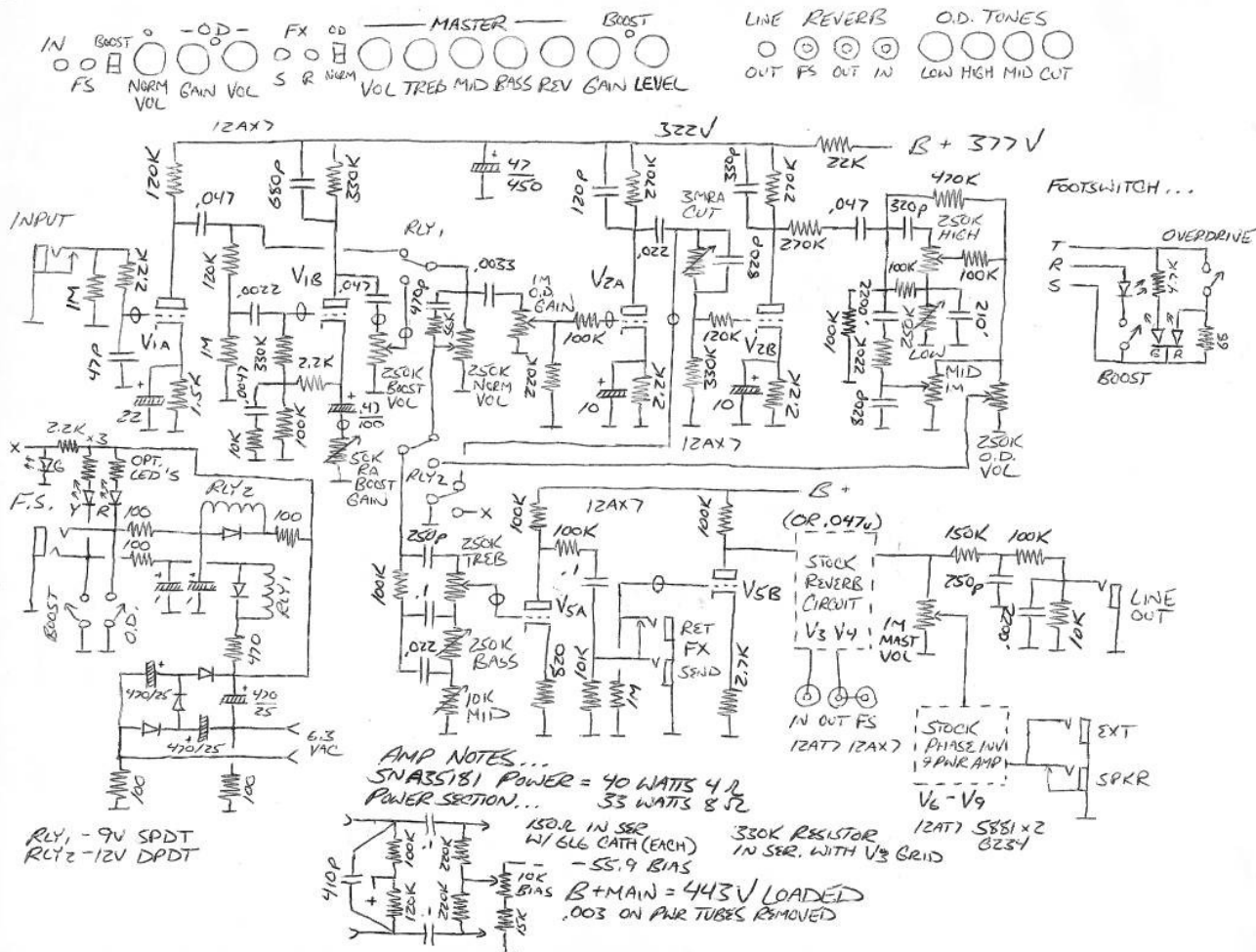






### 3/16/92 - Fender Bandmaster Reverb Boost/Overdrive/Switching/Loop Mod

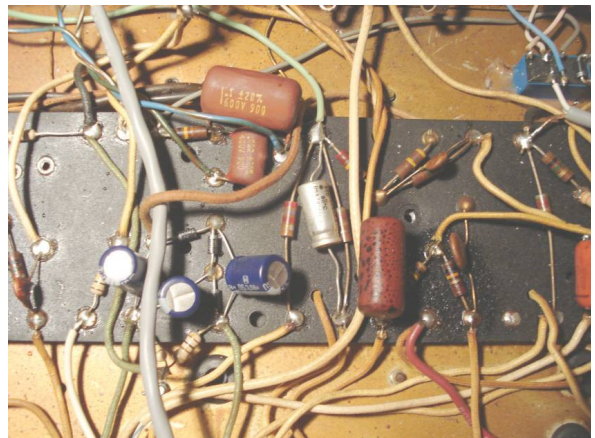
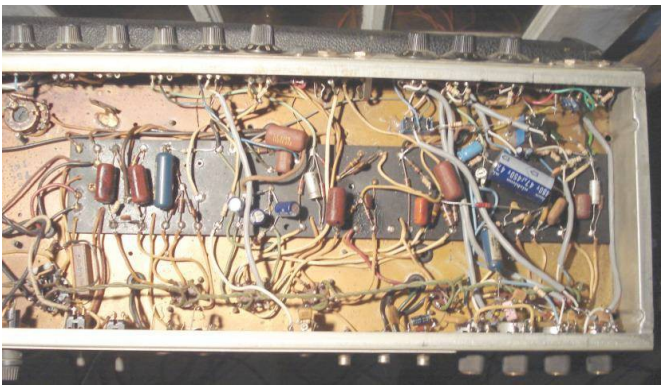
BANDMASTER REVERB MOD 3-16-92 WTN



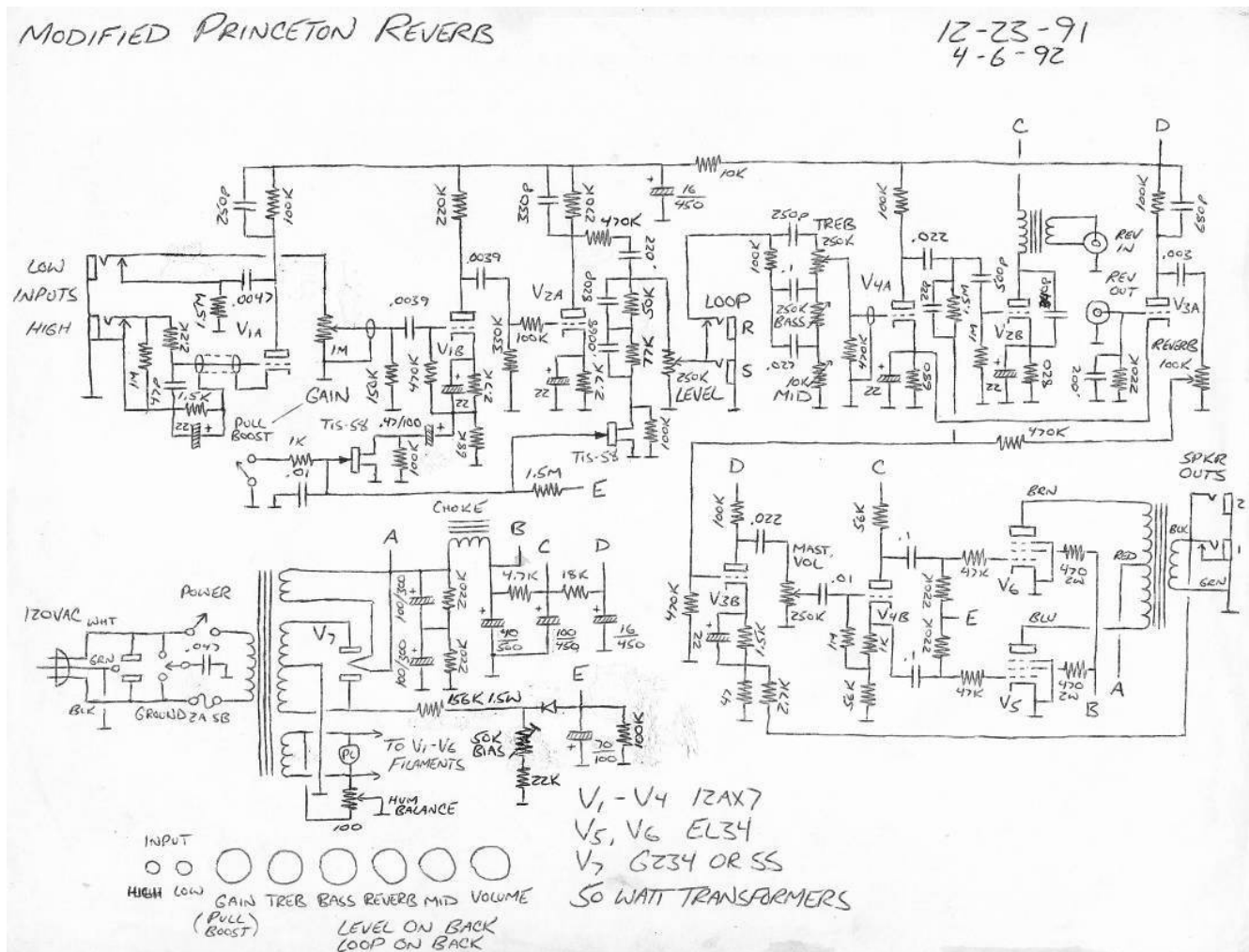
This design provides footswitchable boost and overdrive settings for clean, crunch, regular distortion and extra overdrive. The optional LED's were not fitted, the knobs aren't labeled so from the front it looks like a totally stock silverface Bandmaster Reverb head. The boost gain is arranged so that as the gain is increased, lows are decreased, and at lower gain settings highs are increased. The gain control has low compensation but not for highs, the low-cut control has a fairly high turnover frequency and it doesn't seem to need any more highs. A 330K resistor was placed in series with the 12AT7 reverb driver grids to keep it from distorting the highs at higher preamp levels, later on the 150 ohm resistors in series with the 6L6 cathodes were bypassed for more output power.

This amp came to visit me for our yearly Holiday jam and I took the opportunity to snap a few pictures of its insides, if any changes were needed something would have been said then or the other times it's come in for tubes and cleaning but it sounds fine just like it is. Long ago apparently the transformer blew and coated everything with a layer of brown tar, doesn't seem to hurt anything now but initially I really had to spray out the controls and scrape the jack contacts. Pictures are on the next page.





## 4/6/92 - Fender Princeton Reverb Overdrive/Loop Mod

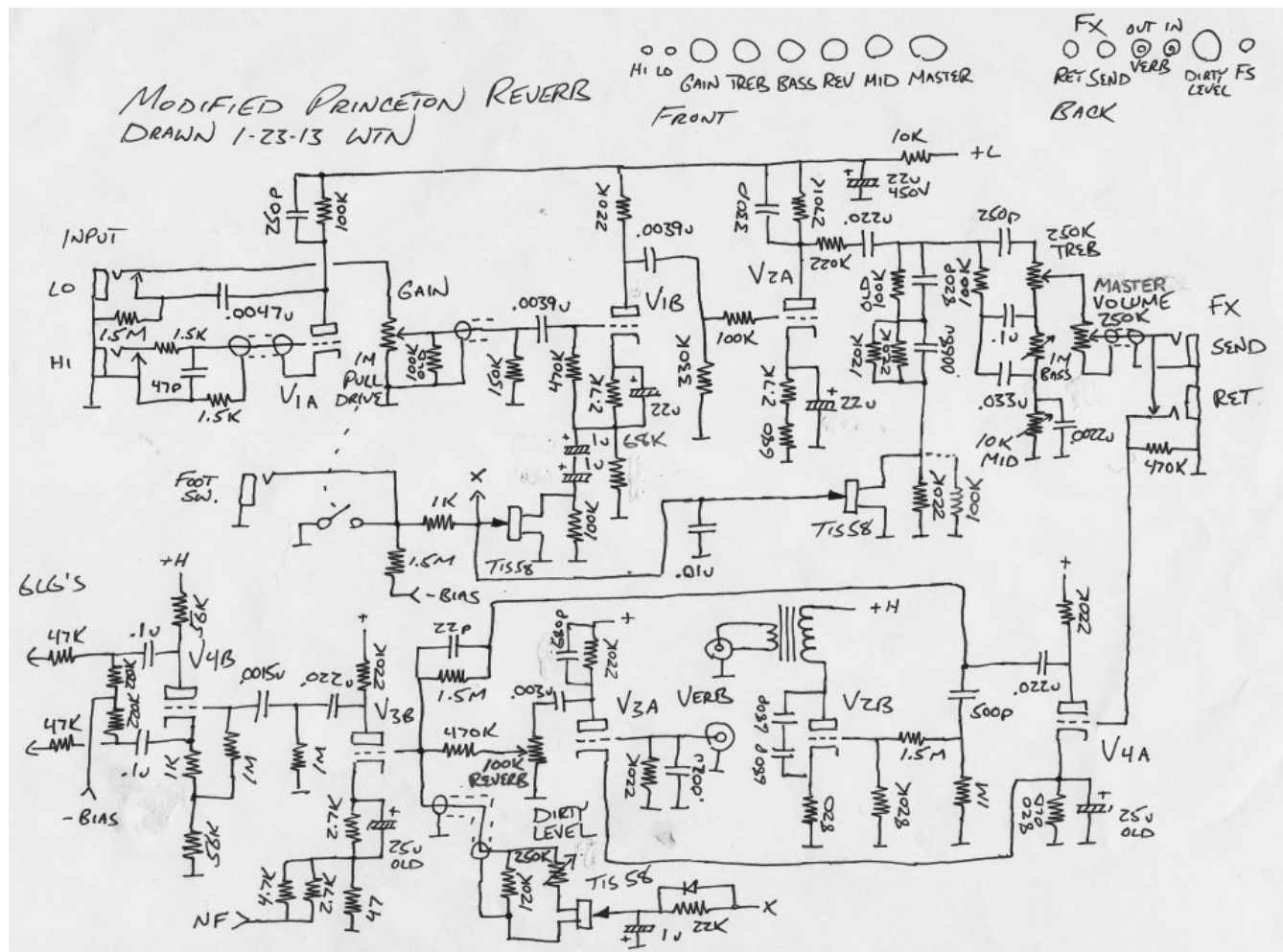


This amp is a little rock-and-roller! The transformers were replaced to add a 50W EL34 output section driven by a single-ended phase inverter, the grid resistors are 47K to avoid too much shifting of the duty cycle when the power tubes are clipped. It doesn't have channel switching (just a switchable gain boost that drops the level and applies post-clip filtering) and doesn't do clean all that well. The reverb works but isn't as strong and sweet as a regular Fender reverb. The customer I originally made it for liked it for rock but blew out the speaker and got a gig that required clean tremolo and sold the amp back to me, all I did to it was put another speaker in it (didn't bother to change the worn out tubes, they still work). Not too long ago I carried it to a club where they needed another amp for Razzie Bailey and other musicians to play through, don't know what he thought of it but I thought he sounded good, at lower gain settings it produces a nice blues tone. The next guitar player found the pull boost and probably dialed up too much overdrive but he seemed like he was having fun.

Note... this schematic is for the original mod, at some point the old tubes finally gave out and I converted it to 6L6 power tubes and did other mods, see next page.



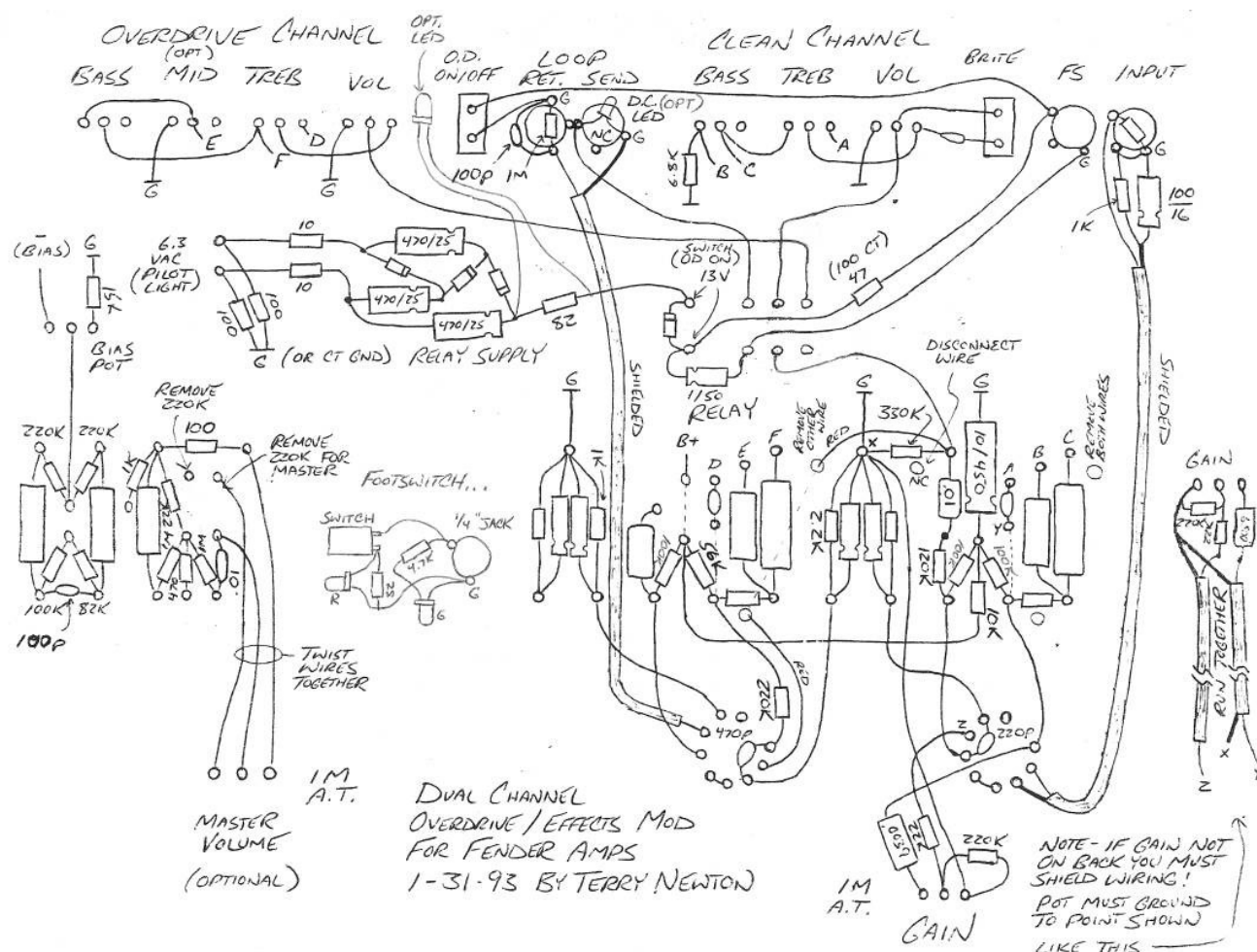
## Modifications to the Modified Princeton Reverb



I'm not sure when these mods were made, but eventually after I got the amp back the original EL34's finally got too cruddy and I wanted a better clean and the ability to use a footswitch to select dirty or clean with a way to set the dirty volume separately. So I converted it to use 6L6 output tubes and wired the master volume directly after the tone stack, the effects loop after the master volume, and added an extra FET to switch in the rear panel level control so it pads the signal at the reverb/dry mix point when dirty is selected. Other component values were adjusted to compensate for the altered signal levels, in particular in the network after V2a that kicks in when the second FET is on, and added a divider to the reverb driver so it wouldn't crunch as much in "clean" mode (clean is still rather hot). Did other tweaks. This has been my main amp for the last couple of years, a few days ago it went down after being pushed rather hard in clean mode (bad power tube).. was going to change the speaker anyway so while at it traced out the new schematic... not sure about the extra 100K across the 220K across the second FET, wasn't connected but possibly due to me knocking something lose while documenting – left it disconnected. I installed a 12" Eminence Lil' Texas neo speaker (it had a 12" 100W Jensen)... so far I like it a lot, not that different from the Jensen but weighs less and is more efficient.

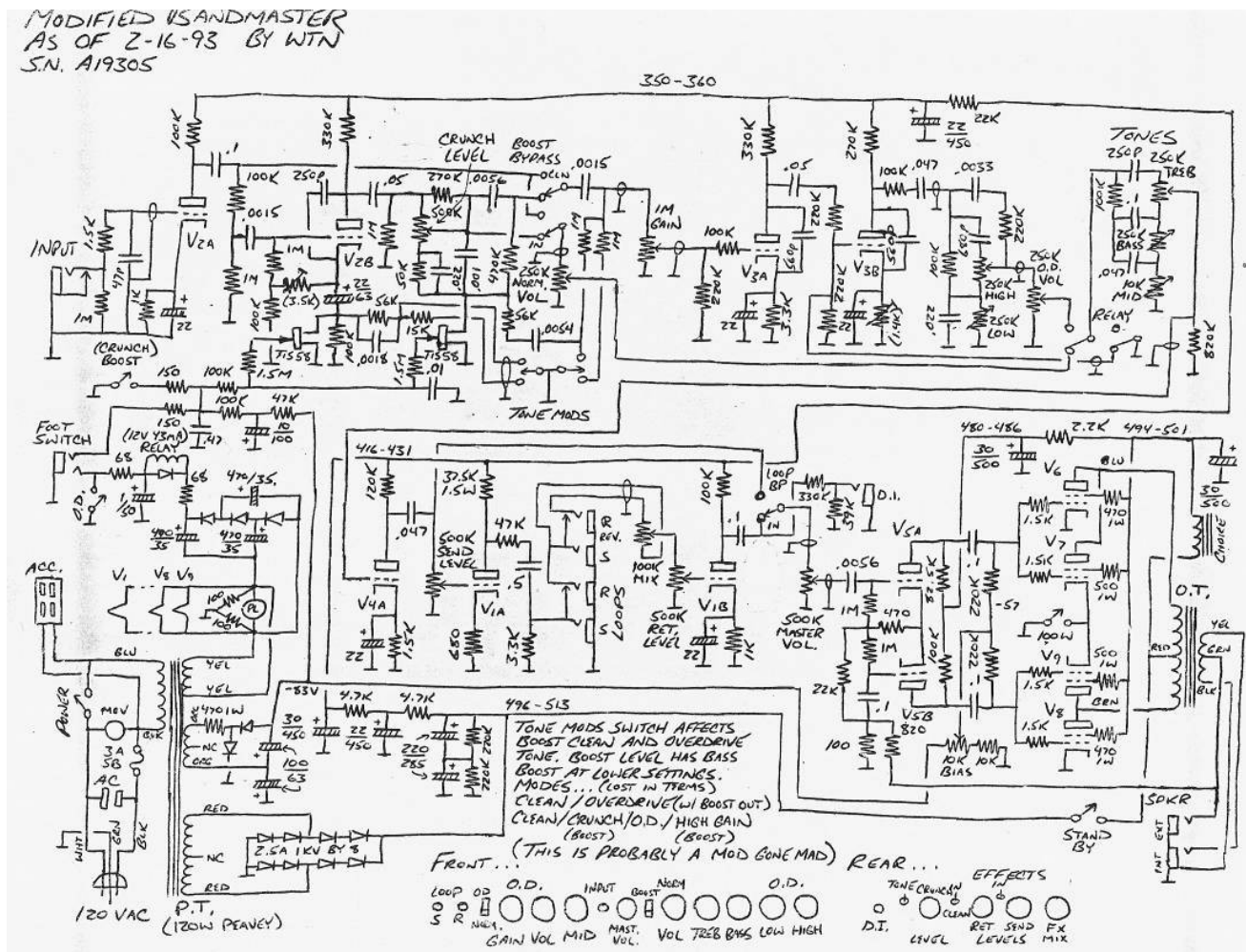
TIS58 FETs are practically unobtainium these days.. the FETs need to be able to withstand gate voltage of up to 60 volts and channel voltage of over 100 volts. I'm thinking about making a new version of this amp (at least one more for me), probably will redesign to use photocoupler switching and maybe one of those Accutronics digital reverb modules, freeing up tube stages to implement a normal phase inverter.

# 1/31/93 - Theoretical Fender Overdrive/Switching/Loop Mod



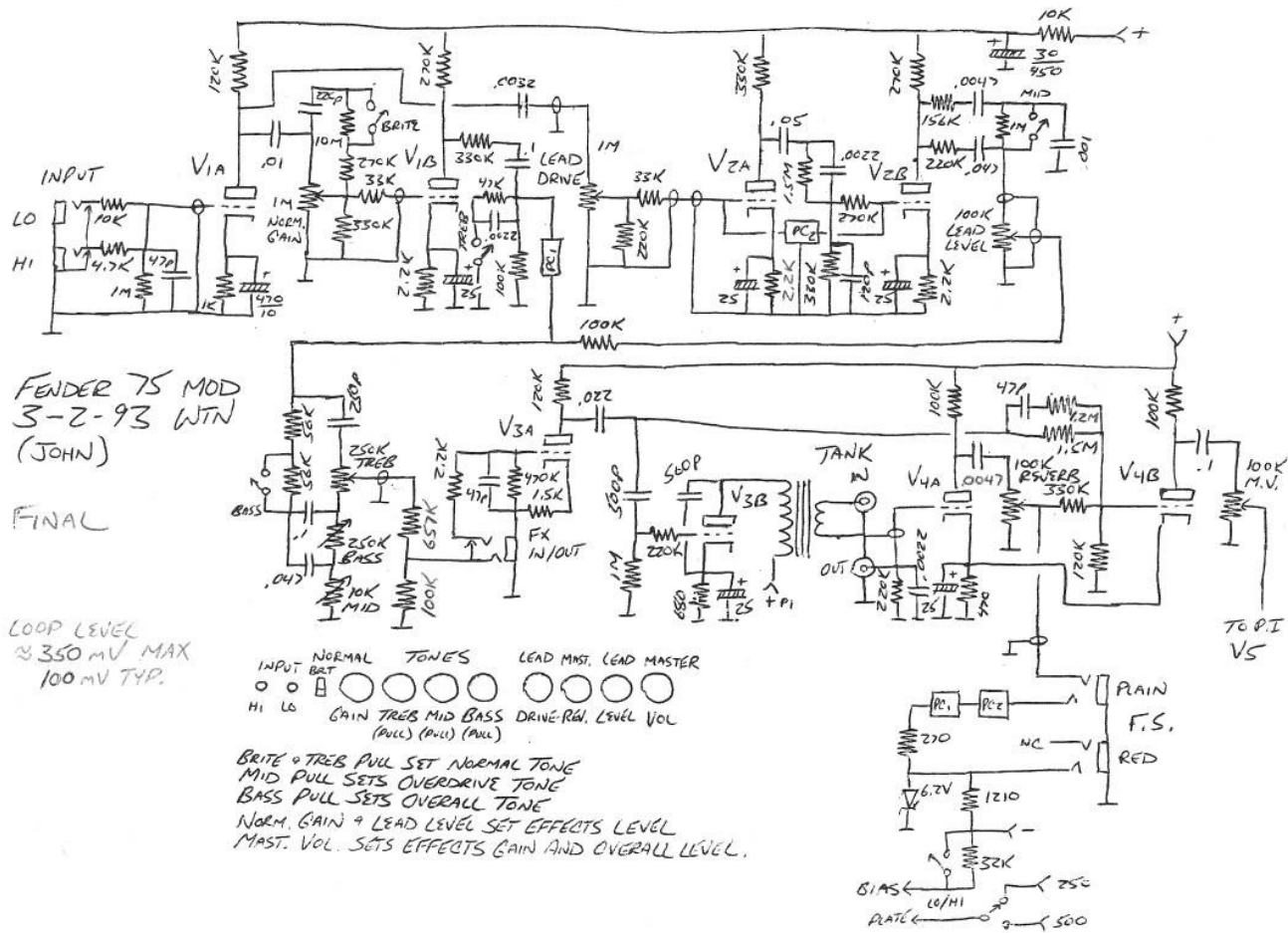
This is a hypothetical hookup diagram for rewiring the first two preamp tubes to provide channel switching and a simple effects loop. The tremolo can remain intact but can be disconnected and used for knob positions for the added gain and master volume controls. The diagram shows a 1 meg control for the master but a 250K control is probably better. The relay (like the other mods) has a 12V 43ma coil, if different adjust the size of the 82 ohm resistor accordingly. If the current is too different the footswitch design needs to be altered. If the power transformer has a grounded center-tapped heater winding the 47 ohm resistor should be increased to 100 ohms to compensate for not having the 100 ohm heater resistors. Unlike the other mods this one provides separate tones for the clean and dirty channels. I haven't actually tried this design that I recall but it is similar to other dual-channel mods I've done, I'm guessing it sounds pretty good or at least is close enough to tweak in with a few component changes, if too much low end going into the overdrive reduce the value of the .0039uF cap feeding the gain control. If more highs are needed at lower gain settings add a resistor and a cap between the gain control's wiper and max terminal, start with something like 470pF in series with 220K. Or perhaps alter the coupling between the second and third stages as done in some of the other mods, in this design it's just a 120K and .01uF in series. If the clipping harmonics are excessive try adding another capacitor in the .001uF range across the 56K resistor, which also sets the relative output of the overdrive channel.

## 2/16/93 - Radical Fender Bandmaster Boost/Overdrive/Switching/Loop Mod



This was a blackface Bandmaster, it had already been modified by someone else with different transformers to increase the power somewhat. It started out as a fairly normal mod typical of the others but the original customer wasn't happy with it, kept wanting more gain. That's different... usually if anything they want to back it off. No matter what I did I could not achieve the desired tone, by then it had so much gain it was practically unusable and the owner put it up for sale, of course I bought it right away. First thing I did was add a switch so all that radicalism could be turned off, returning it mostly to the way it was after mod'ing it the first time around. I used it that way for a spell but found myself having to turn the bass all the way down to keep it tight and still wasn't loud enough so popped the covers off the chassis cutouts and added two more 6L6's, straining the existing power transformer so replaced it with a transformer from a 120 watt Peavey VTM. Now I could turn the bass up but it ran dangerously hot, about the same time I got a Yamaha "REX" effects unit which fit perfectly underneath so added the end from an extension cord for switched "accessory" power and plugged in a fan and an AC adapter, and drilled yet more holes to add additional loop jacks and an effects mix knob. This was my main rig for years until I decided to try to make it in Virginia Beach, broke and dejected had to take a bus back to Nashville (where amps were stacking up for me to work on) and had to leave it behind. I was intending on having it shipped back but it kinda got adopted by another musician... that seems to happen a lot with amps. One day maybe it'll find its way back home.

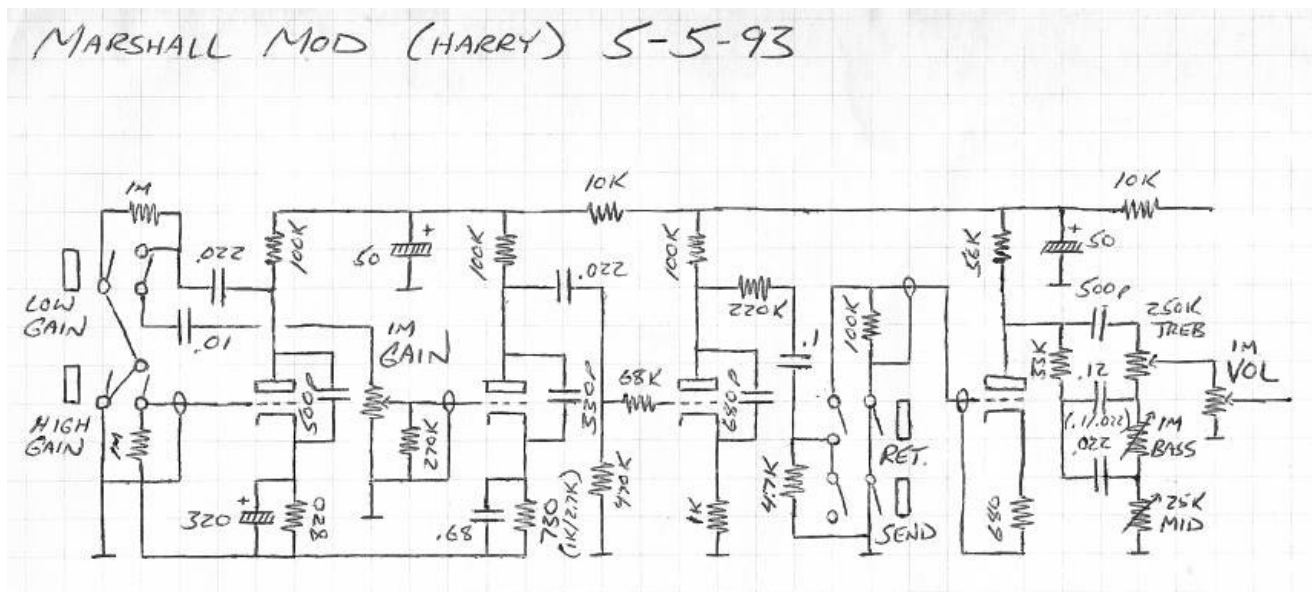
## 3/2/93 - Fender 75 Overdrive Mod



Back in the '80's Fender produced a couple of historically significant amps with overdrive, the Concert and the 75. Both were typical of distorted amps back then, tones were placed pre-clip and pretty much only sounded right if cranked. The Concert had independent clean and dirty channels and is fairly easy to mod for higher-gain lower-volume ability, not much more than moving the tones after the clip stage and putting a capacitor across the gain control so it'd function as a pre-clip EQ, the switching and loop circuits don't have to be changed. The 75 is another story, it shared the same tones and signal path with both the clean and dirty settings, pretty much the preamp section has to be ripped out and replaced.

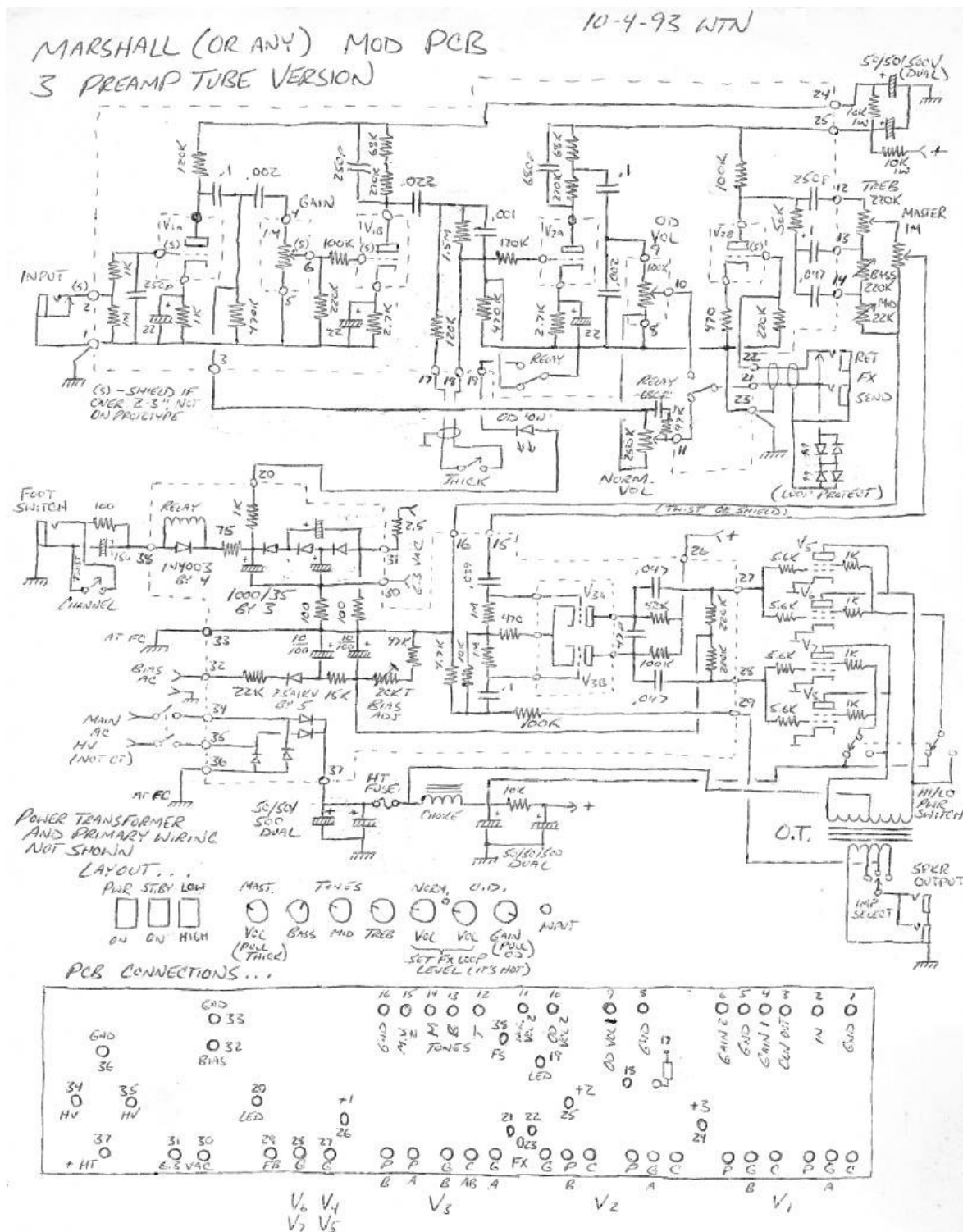
This rendition provides a normal channel that can be set on the dirty side by cranking the normal volume and pulling the treble switch (or pushing it, can't recall, in any event by closing the switch) to drop the level and apply a bit of filtering. The dirty channel is a fairly standard-issue 3-stage design with fixed pre-clip high EQ and a low-compensated gain control, the mid pull controlled the post-clip filtering. Rather than select the paths directly the overdrive output was connected all the time, when all the photocells energized it connected the normal path's output and a dual photocell disabled the overdrive gain stages. A dual cell was used to avoid having to have 3 LED's in series, not enough voltage in the switching circuit for that. The bass pull was wired to change the tone control network and shift the overall response. The effects send had no buffering, driven directly from the tones, from there it was pretty much a normal effects return and reverb circuit with a master volume before the phase inverter. Worked out well, used it a few times for rehearsal and it had what I liked.

## 5/5/93 - 4-Input Marshall Overdrive/Loop Mod



I really like this one... nice and simple and to the point, no holes or extra tubes needed. The effects loop level depends on if overdriven or not, oh well. At least it has a fairly low output impedance. I don't remember much about the amp this was done to, pretty sure it was a plain 50 watt.

# 10/4/93 - Marshall 25/100 Watt Overdrive/Switching/Loop Rebuild

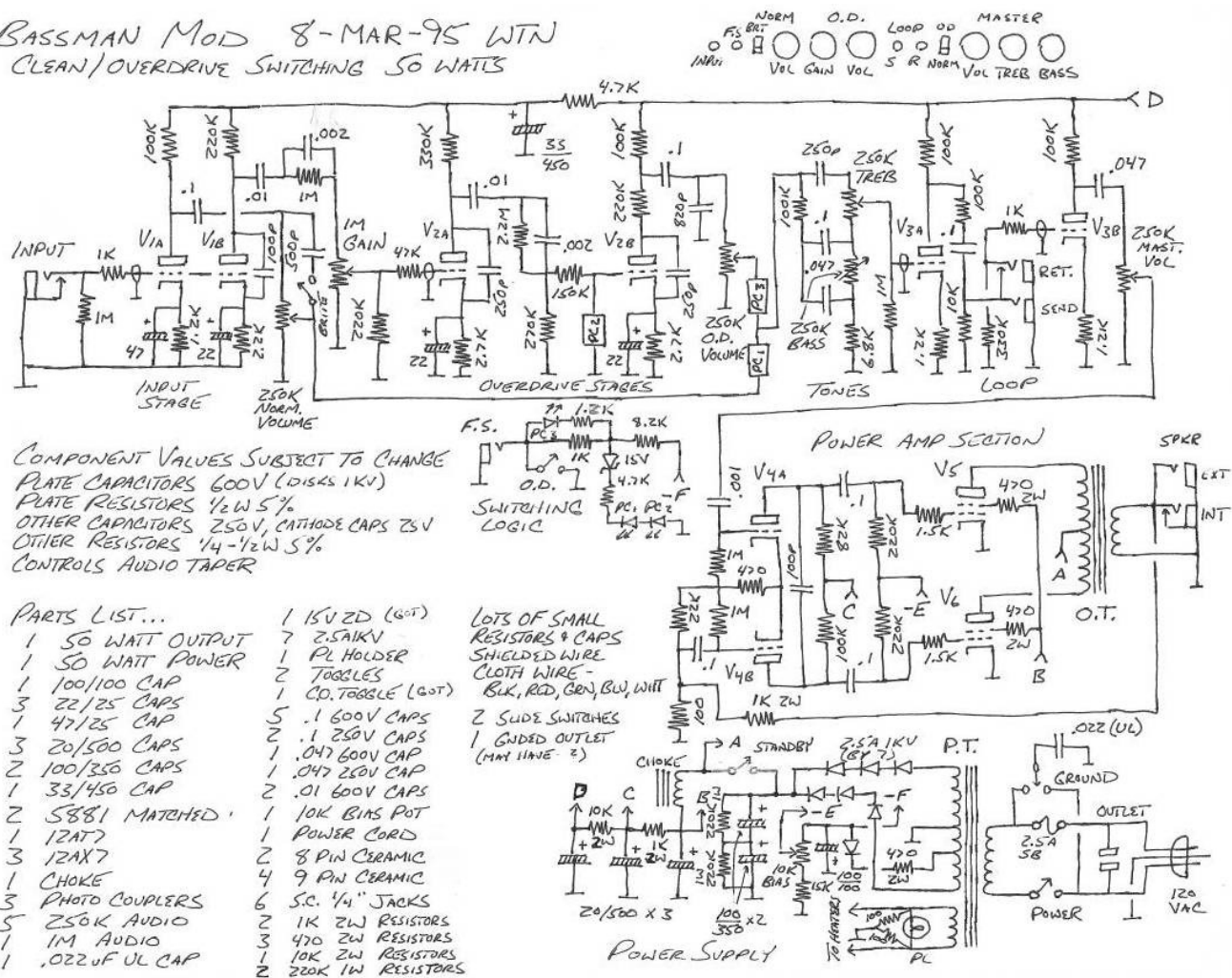


This was a complete rebuild, used a resist pen to draw a foil pattern on a piece of copper-clad and etched it. The parts were mounted on the surface of the board (no holes) standing up by their legs. The design is fairly typical with a low-compensated gain and a thick pull-switch to bypass the high-boost network and boost everything. The effects loop is fairly high impedance and driven from the normal and dirty volumes, LED's absorb the extra voltage when the volumes are cranked.



### 3/8/95 - Theoretical Fender Bassman Overdrive/Switching/Loop Rebuild

BASSMAN MOD 8-MAR-95 WTN  
CLEAN/OVERDRIVE SWITCHING 50 WATTS



This amp was never made but it's a pretty cool design, fairly simple but provides the essentials. It should work pretty much as drawn but I see one potential mistake, the channel switching draws a variable amount of current from the bias supply which will vary its voltage. If actually attempting to make this thing the 470 ohm 2 watt in the bias supply should be changed to 100 ohm 2 watt (flameproof) or something similar to reduce the amount of variance, might have to reduce the 15K on the bias pot to 12K or so if the bias won't go low enough from the increased voltage. Pretty much the same old stuff except the clean/dirty split is at the input rather than after the 1st stage so more gain can be used and to avoid distorting the clean channel, the low-cut on the low-compensated gain control includes a resistor to provide a limit to the cut, and the channel switching network gets two photocell switching "phases" out of a single footswitch by using a zener diode. The reason for the parts list is I had a stripped chassis I was going to do the mod on. What actually got built is on the next page.

SO WAIT BASSMAN MOD DESIGNED BY TERRY NEWTON

MAY 28, 1995  
(FINAL AS OF)  
JUNE 29 SEPT 29

CHASSIS IS TOTALLY STOCK METAL - NO EXTRA HOLES. SN A28415

CREDITS: FENDER FOR TONES AND POWER (AND A GREAT AMP TO REUSE!)  
MAD MUSICAL SUPPLY FOR GREAT PARTS  
RCA FOR TUBE - 470 NG US ABOUT TUBES

TUBES...  
V1 - 12AX7 LO NOISE  
V2 - 12AX7 LO NOISE  
V3 - 12AX7 ALL PRE'S CHINESE  
V4 - 12AT7  
V5 - 5881 R.I.  
V6 - 5881 R.I.

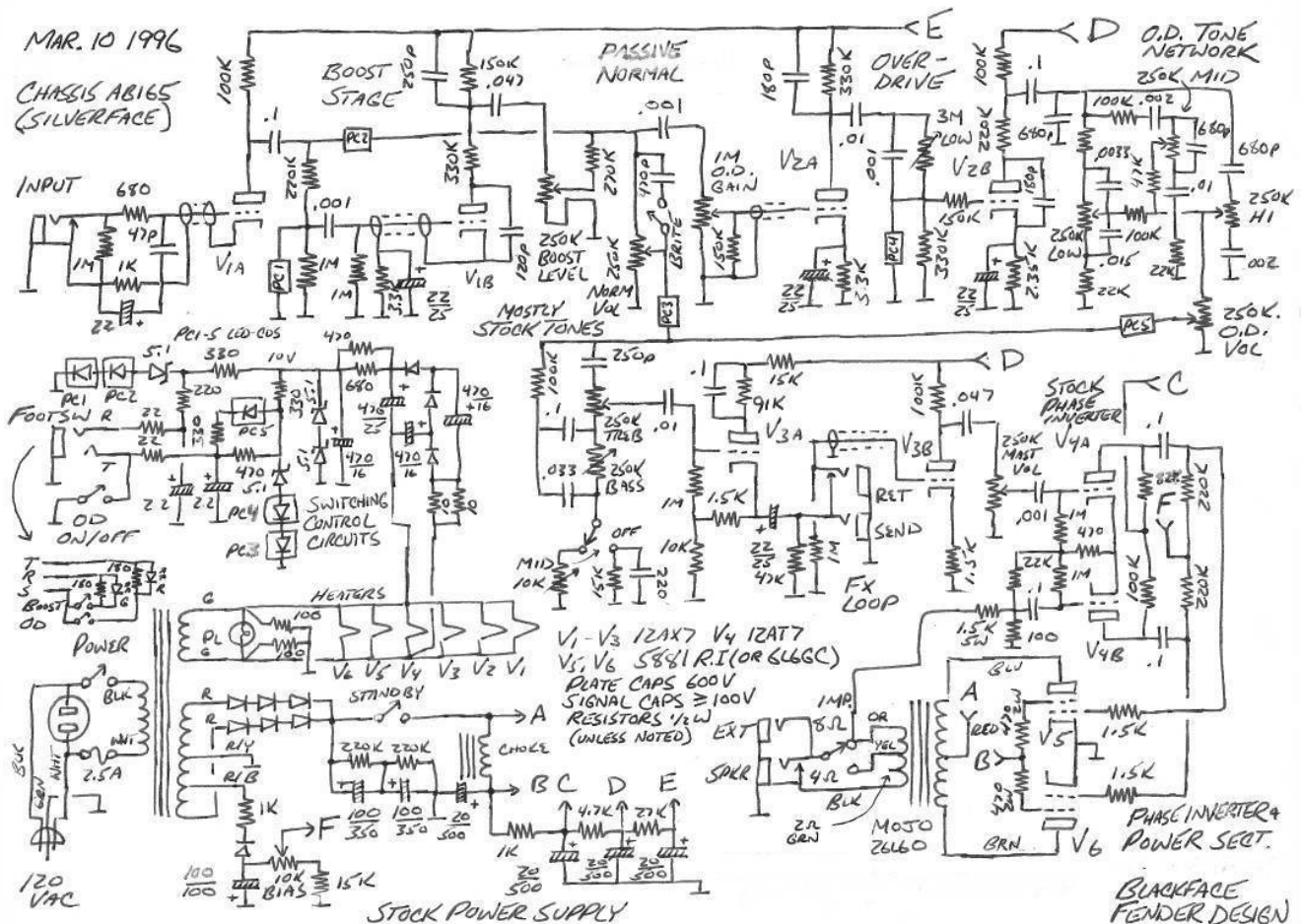
NOTES... (UNLESS OTHERWISE NOTED)  
ALL DIODES IN 4007 ZENERS IN SZ31BCT (5.1V)  
PLATE RESISTORS 1/2W  
OTHER RESISTORS 1/4 - 1/2W TW - TWISTED  
CONTROLS - AUDIO TAPER CTS/FENDER  
PHOTOCELLS - VACTEC 5C1 (NUMBERED 1-5)  
DISK CAPS USUALLY 1KV (ESP. PLATE)  
COUPLING CAPS USUALLY 600V  
OTHER SIGNAL CAPS AT LEAST 100V  
B.P. CATHODE CAPS 25V  
NON-STANDARD VALUES FROM MULTIPLES  
(USE CLOSEST STANDARD WHEN DUPLICATING)



MODIFIED BASSMAN

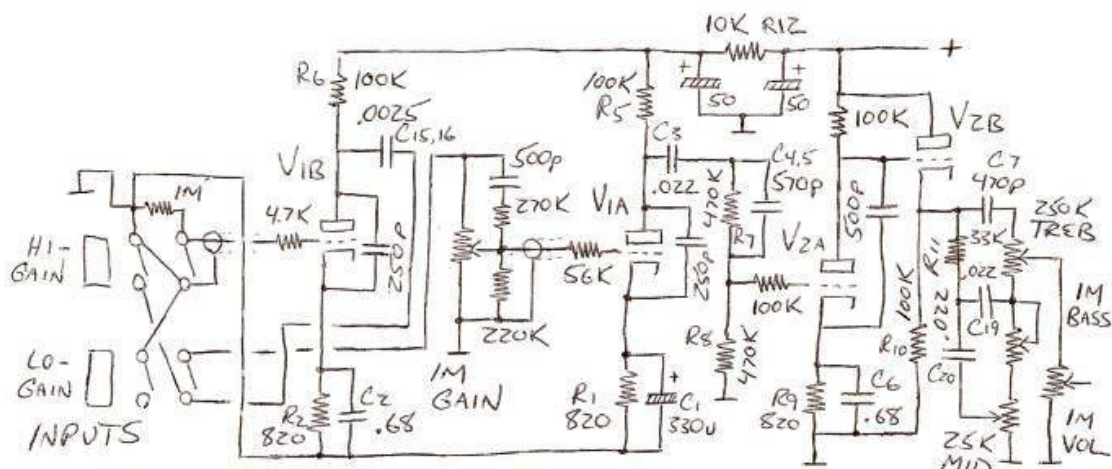
MAR. 10 1996

CHASSIS AB165  
(SILVERFACE)



This is along the same line of thinking as the 5/28/95 mod but this time I drilled holes and used knobs for the tweaks to provide a boost level, a pre-clip EQ adjustment and low/mid/high tone adjustment controls post-clip (and didn't have to do post-mod tweaks). The unlabeled resistor attached to the post-clip low control is probably 100K. The loop uses a cathode-follower buffer off of the main tones to drive the effects send with a low source impedance. The photocell switching network uses the zener trick but gets its voltage from the heater supply rather than the bias supply. The mid control has a switch on it so when clicked "off" it inserts a fixed mid boost for "loud" playing.

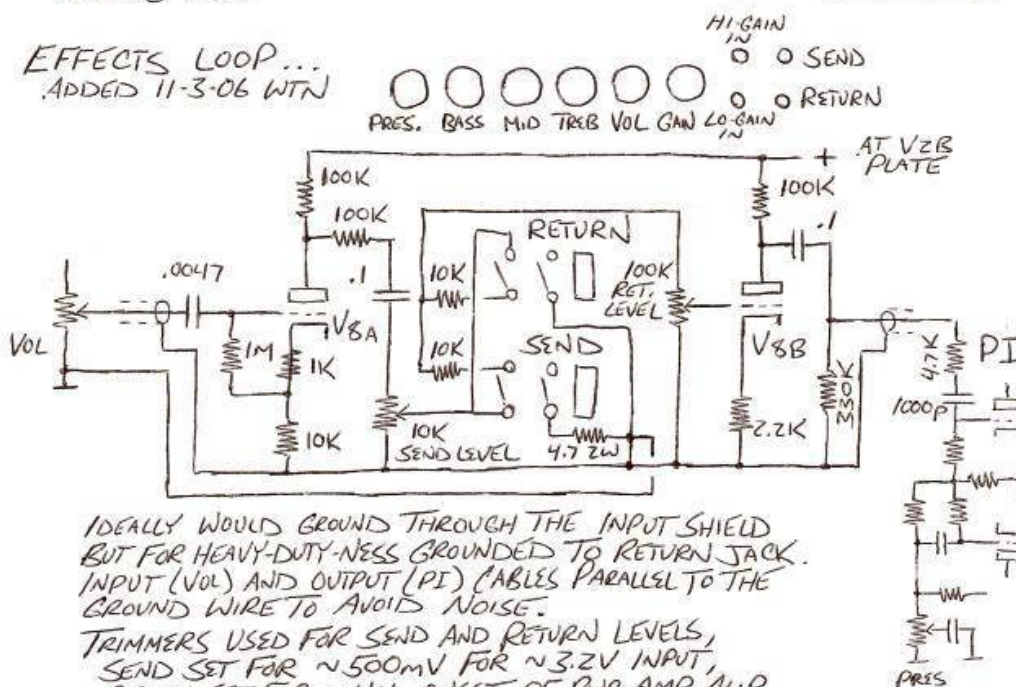
## 11/3/06 - Marshall Overdrive/Loop Mod



R/C #'S FROM 1959SLP-60-00 BOARD,  
R3, R4, R22, R23, C17, C18, C21 REMOVED  
C8 (PI INPUT) CHANGED TO 1000pF,  
4.7K INSERTED WHERE C21 WAS, TO SERIES WITH C8  
SUPER LEAD 100W REISSUE, #931115904  
11-2-06 WTN

MOSTLY A "STOCK" MOD  
USING EXISTING VALUES,  
REARRANGED FOR GAIN  
WITH R/C'S ON THE  
TUBES TO STABILIZE.

EFFECTS LOOP...  
ADDED 11-3-06 WTN



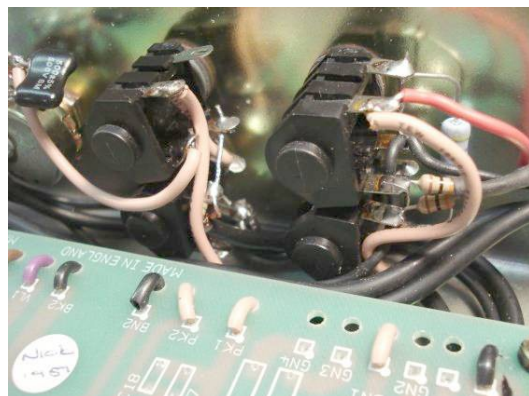
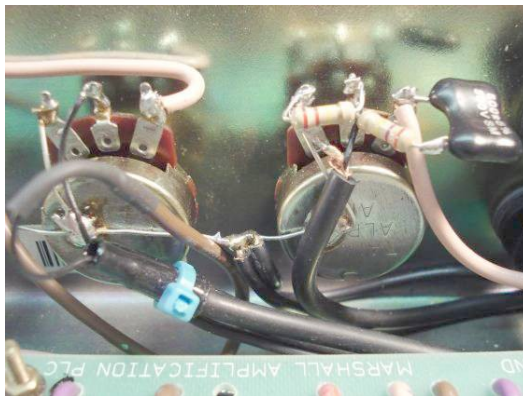
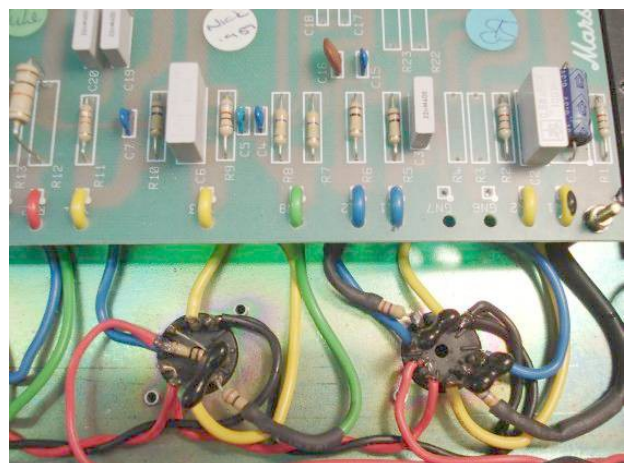
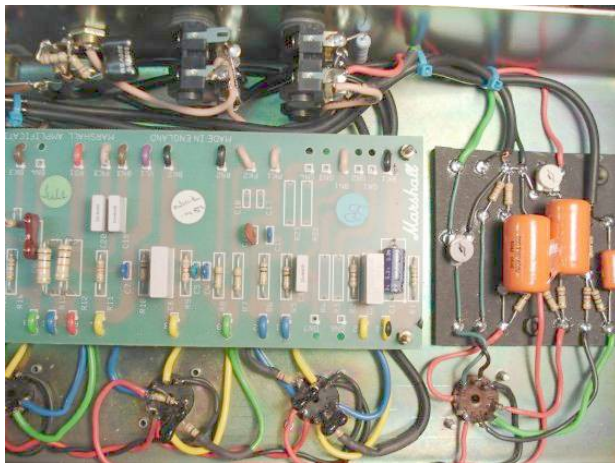
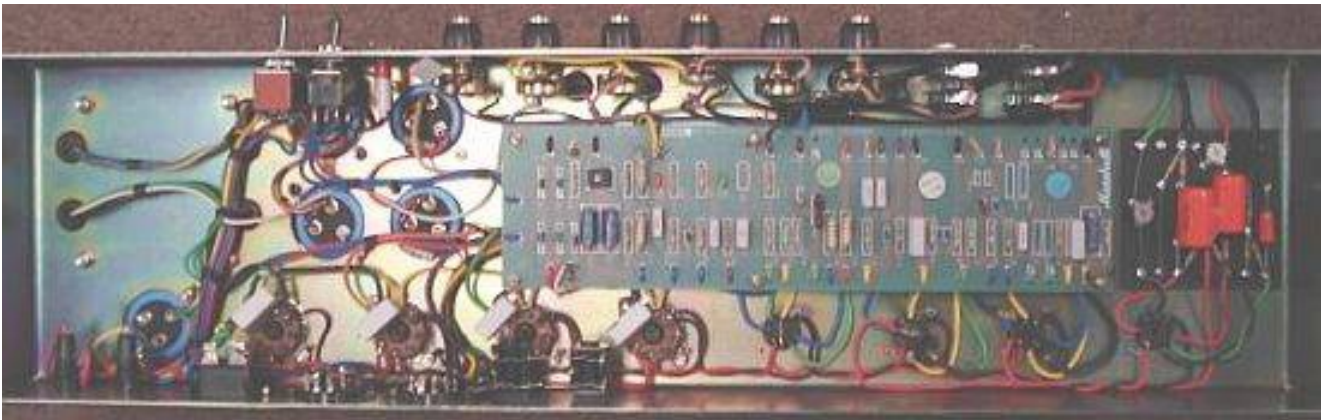
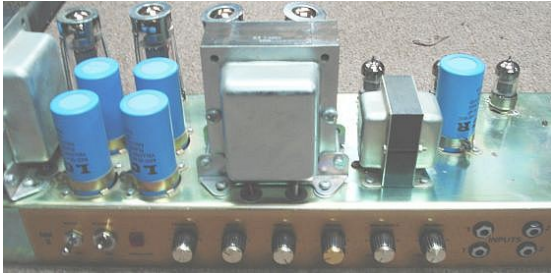
IDEALLY WOULD GROUND THROUGH THE INPUT SHIELD  
BUT FOR HEAVY-DUTY-NESS GROUNDED TO RETURN JACK.  
INPUT (VOL) AND OUTPUT (PI) CABLES PARALLEL TO THE  
GROUND WIRE TO AVOID NOISE.

TRIMMERS USED FOR SEND AND RETURN LEVELS,  
SEND SET FOR ~500mV FOR ~3.2V INPUT,  
RETURN SET FOR ~4V, ONSET OF PWR AMP CLIP

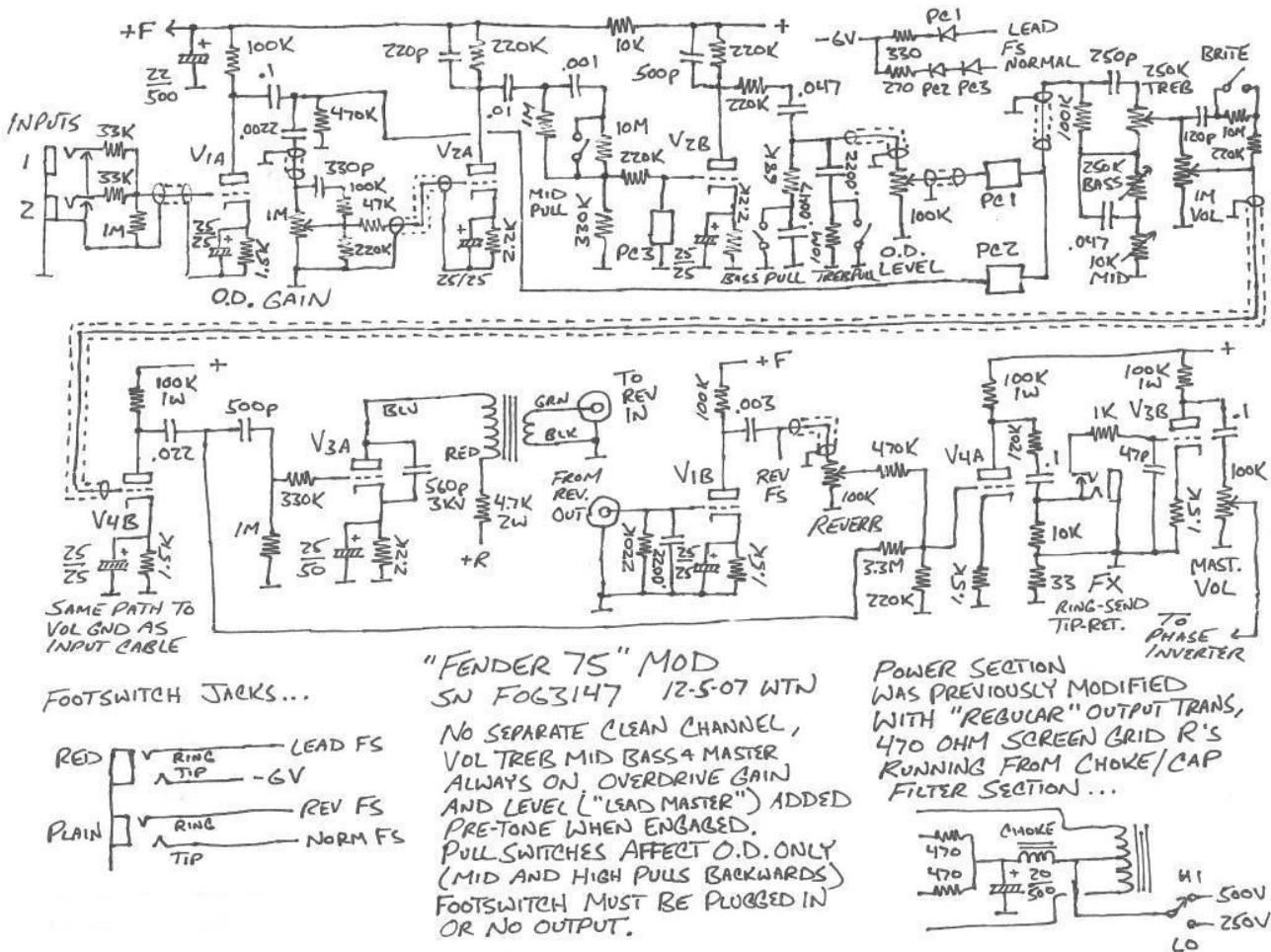
NOTE - BOTH SEND AND RETURN HAVE TO BE USED  
TO BREAK THE SIGNAL PATH, SEND BY ITSELF IS A LINE OUT,  
RETURN BY ITSELF MIXES WITH THE PREAMP SIGNAL.

This is one of my neatest-looking mods, has a few extra parts hanging off controls and tube sockets but not too bad, almost could be mistaken for stock until I wired the effects loop on a piece of fiberboard with eyelets. Photos on the next page.





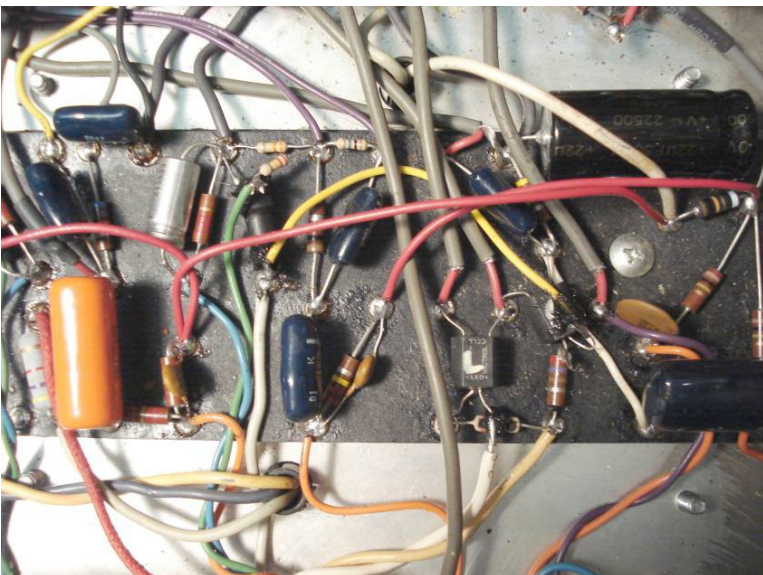
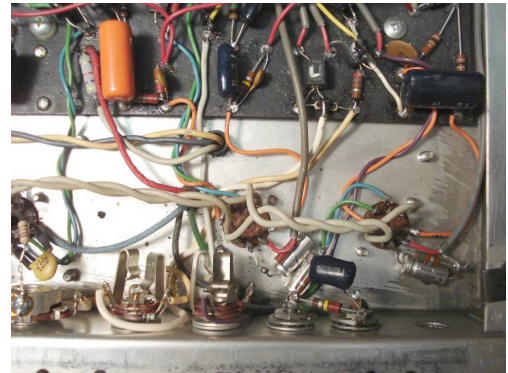
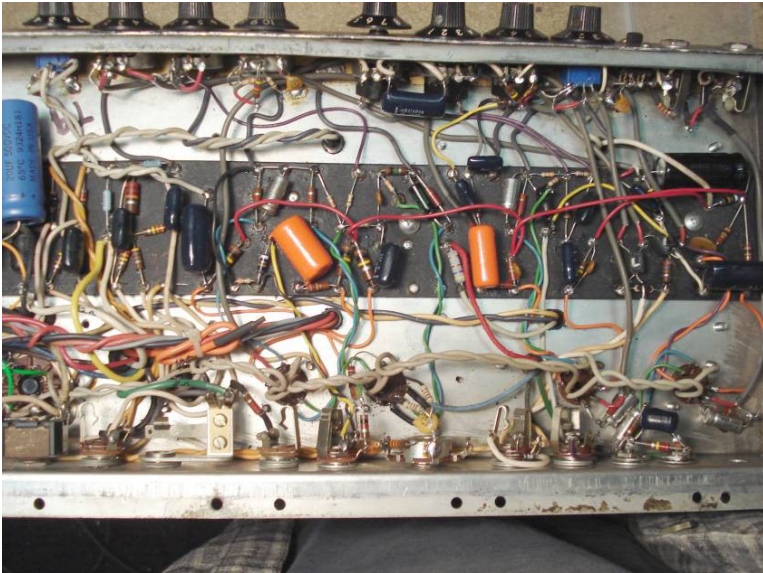
## 12/5/07 - Fender 75 Overdrive/Switching/Loop Mod



The owner of the 3/16/92 mod gave a friend of ours an old ragged out Fender 75 on the condition he took it to me to get it souped up... ok sure! Only I forgot how. One of the main reasons I'm making this document is to preserve old information, got through the mod, amp came out fine but afterwards I found my old mod notes and scanned them in so the info will be there when I need it.

This 75 mod has a cleaner clean than the previous, very similar to a regular Fender Reverb signal path. I didn't have a 10pF handy to put across the 3.3 meg in the reverb circuit, it came out a tiny bit darker as a result (its dark-sounding speaker with a square magnet doesn't help). All of the pulls are assigned to various overdrive tweaks. Unlike the previous 75 mod this one doesn't have a separate clean channel, the overdrive functions as if it were connected in front of an otherwise clean amp. The bright switch affects the overdrive too, the treble pull adds quite a bit of high-cut to make settings like that work. It cleans up very nicely when the guitar volume is backed off but it does need to be dialed in right. Assigning the tube sections is a tricky aspect, this time around I paired of the input and reverb pickup, gain and clip, tone pickup and reverb mix, and reverb drive and effects return (the 12AT7). Works. Many of the components were chosen from the parts left over from taking apart the preamp so some of the values were chosen somewhat arbitrarily (then again I couldn't remember previous values so might as well... guesses came out "close enough" to think I'd better leave it alone). Photo-coupler PC3 was salvaged from a PolyTone amp. Got lucky, no feedback chirp when switching. Photos on the next page.





## And finally...

This is documentation for the mods I've done, preserved before the paperwork turns to dust and I no longer can recall the details (which for some details already is the case). I don't represent that my overdrive designs are best for everyone, or that they're anything at all, this is just history. It is funny though how over time amps evolved to sound more like my designs than not. Some amps have always pretty much got it "right". For some. Others just aren't into preamp distortion and won't be happy no matter how carefully all the parameters are tweaked. Some like the tone of tones before the clip stage, particularly at high volume. A few amp designs have made that work quite well but they still tend to sound not so great at lower volumes unless a graphic EQ is used - and that is probably the best architecture of all, tones before and after the clip stage. Just never had enough knob positions to provide more than one or two pre-clip tones, it was the post-clip tone my customers were concerned with. We'd just get the pre-clip tone close enough so compensated gain controls and the guitar's volume and tone can do that job without requiring a slew of knobs that often don't do much when turned.

Then there's the issue of intellectual property rights, patents and all that nasty money-grubbing stuff. Some may think I'm nuts for publishing my "secrets" but I counter with the following points...

1) Most (if not all) of "my" design details are obvious to those skilled in the art. Low notes take over high notes, obviously the lows have to be reduced. Happens more at high gain settings, obviously more lows have to be rolled off as the gain goes up. Tones don't adjust clip harmonics, obviously they need to be placed afterwards, then they do. Can't get the treble over "1", obviously needs additional filtering. That makes it sound dark, obviously the highs need boosting pre-clip to make up for that.

2) There is little profit in doing mods. It's at best a break-even thing. Let's see... spend 2 hours resoldering a typical "inexpensive" amp that otherwise sounds fine, customer pays roughly \$100 labor, I make about \$25 an hour for as long as I can keep working on viable repairs (dogs ensure I average less). Spend 3 days building a mod amp, customer pays roughly \$350 labor, I make about \$10 an hour and nothing on after-tweaks. Needless to say I don't do many mods these days, but I still enjoy doing them because it's an opportunity to create new tone.

3) I almost unknowingly violated a patent with my "super" champ design... one detail different and I would have. The reason I didn't do it in the way that would have violated is I wasn't going for "mosfet" sound and considered that an artifact that should be corrected. I see many patented designs that are chock-full of other people's circuits or are just plain obvious. The recent trend of patenting software is very disturbing, it is now difficult to write any significant computer program without unknowingly violating something... everything from progress bars to the "is not" operator is patented, companies exist just to file/buy junk patents then go after other companies who were doing it that way all along. Patents should be limited to true inventions, not stringing together a bunch of obvious stuff.

Contact Information (updated 1/4/11, my shop moved down the road):

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The Amp Doctor  
11117 Lebanon Rd  
Mount Juliet, TN 37122  
(615) 847-9687 (I'm typically there Thursdays, subject to change)  
Or contact Superior Music at (615) 758-4743