

# How To Modify Effect Pedals, for MAXIMUM TONE!



Designed for the absolute electronics beginner in mind  
Written by Brian Wampler

<http://www.guitartone.net>

<http://www.indyguitarist.com>

<http://www.howtoplayguitar.net/>

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# Introduction

Some of you know me, others new to the diy community don't. I've been lucky enough to get to know many of you well enough to call you a friend – and at the end of the day, that's what's important to me – sharing my knowledge and my passion – stompbox modding – and it's truly rewarding. This Harmony Central.com review pretty much sums it all up for me:

**Price Paid:** US \$35 bucks for pedal, about 5 bucks for additional parts used

**Ease of Use:** 10

As easy as any 3 knob overdrive/distortion pedal to get a sound out of. Volume, tone and drive. If you can't figure it out, you probably need help putting your shoes on.

**Sound Quality:** 10

I've been changing my setup quite a bit these days. There are a number of things that I use right now, but I try to keep it constant for a few months until I get bored. I recently acquired 2 Parker Flys (I'm a professional musician with a good income, so I require good gear). One is a P-38 that I modded with some Planet Waves tuners and a JB Jr. in the neck, a Duckbucker in the middle and a JB humbucker in the bridge. I'll end up changing the Duckbucker, it's a little bit weak and it gets in the way of my picking because I have to raise it quite far. The other Parker fly is a Fly Mojo which is about half of the weight! I just acquired 2 different amps as well. One is a Fender Hot Rod Deville 2X12 and the other is a Fender Acoustisonic SFX (amazing amp!). Mostly what I play through is either a Tech 21 Trademark 60 (which is great when you don't need an assload of volume and it's practical), a modded Fender Bassman head into a Carvin 2X12 (the tweed one) or a Fender Silver Face Twin (with some great Fender/JBL speakers). I have other guitars, but mostly I'm using the Parkers right now. I used the Y-cable for the Parker and ran the piezo side straight into the Acousticonic and the effects chain that I use for the electric is as follows: Looper Micro A/B >> Nobels ODR-1 >> Indyguitarist SD-1 Fullclone Fulldrive >> Barber Electronics Direct Drive >> either an Ibanez SC10 or Boss CE-2 >> Korg Dynamic Echo >> Hot Rod Deville. I've been doing a lot of rehearsals for an short upcoming tour (cover music, blah!!). Before I got the Parkers and the Fenders, I got the SD-1 from an eBay auction pretty cheap, maybe 35 bucks or so. I decided that I would buy it only to have it modded from one of the soundclips from Brian's website. I got the parts from Smallbear ([www.smallbearelec.com](http://www.smallbearelec.com)) and purchased the DIY kit from Brian's site. It took me about 45 minutes to mod (I'm not the best at modding, but I can get by fairly well). Right after I modded it, I headed down to the basement to try it out. I got the Parker P-38 and the pedal and ran it into my Tech 21 amp. I got the sweetest, thickest sound ever from this thing! I dorked with it for about an hour just because the sound was so pleasant while my soldering iron roasted upstairs. I then took an SD-1 that I got modded from Analog Man and A/B'ed the two of them. NO COMPARISION!!!!!! Don't get me wrong, Analog Man's pedal has a pretty good tone, but even when you turn up the volume all the way, it's barely at unity gain (the same volume as the clean sound). Indy's mod added so much warmth, had a cleaner drive and and the volume was a vast improvement. Indy's pedal at 11 o' clock on the volume was still louder than Analog Man's at full. The tone is much better as well. Much more sweet

bottom end and no harsh high end at all. Full bodied, sweet and plenty of gain and volume to spare. The next day, I took it to my first rehearsal with a rock/funk band that I play with. The bassist is a dabbler in guitar and drums and has an SD-1 as well. Well, we played through some tunes and he just freaked out. He went over to look at my pedalboard and just said, 'Jeez, what the hell is giving you THAT tone?!?' I let him check it out and he handed me his SD-1 to mod. So I modded that one and same super sweet tone! The following week I went to some more rehearsals (for the touring band) and had the most heavenly sweet sustaining sound. This pedal ended up replacing my TS-9 on the board, I'm selling my Analog Man modded SD-1 (which I swore that I would NEVER do!) and have yet to stomp on the Barber Direct Drive. The Parker through the 2 amps with the SD-1 and a touch of echo is a sound that I could only dream about if I could have dreams this beautiful. It reacts to your touch very well, is extremely dynamic and cleans up great with the volume knob giving you a multitude of useful tones along the way. Definitely not weak or leaving me saying 'It's nice, but.....' Perfect!!

**Reliability:** N/A

Well, Brian never touched this pedal, so if it screws up it was either Boss or me (probably me!). But I did an extremely clean and solid solder job, so I'm not worried in the least. Can't rate Indy on this one! I will get another and keep it as a backup just because if it were stolen, I would probably cry like a baby for a long time.

**Customer Support:** 10

Brian is a god!! He replies to every email of mine, is courteous and very, very cool! I respect the guy wholeheartedly. I found out about him from the Harmony Central forums. He got a lot of flak for being a bit confident in his craft and some people got offended by that. You know, he is a great person who LOVES guitar, electronics and has so much ideas and knowledge to share with other guitar players. Eventually, I realized that I was wasting time reading forums about how 'players' were I GAS for new gear, drooling over pedals that were painted this way or that and whining about getting the next new thing. In other words, non-musicians (not all of them) that were only interested in gear and not music. Brian can easily cater to the MUSICIANS; who cares about the posers? In my book, the modders do us a great service (Analog Man, Keeley, Tone Jam, Indyguitarist, and so on) and they are all different. What I like about Brian is that he plays his own clips (if he didn't like it, he would never present it to you just for profit), is TOTALLY stoked about guitar and offers his secrets. I could go on. First class in my book!

**Overall Rating:** 10

This cheap ass pedal became my reason to enjoy playing and thinking about music again after being in rut for about 3 years. Wow!! Now I'm stoked, my playing has gone to a new level in the last 2 weeks and I'm hungry to play again. I have about 60 pedals and have bought enough gear to try to keep myself interested, but it took this thing to make me interested. I play a lot of rock (old, new) in cover bands, original funk/fusion, Eric Johnson music, lots of straight ahead, country, damn it you name it, I'm a prostitute but that's how I make my living. Like I stated, I make quite a generous amount and my gear is like a carpenter's tools; it has to be consistently reliable and basically the best that you have to do the job perfectly. I've been playing about 20 years now. I am thinking about getting another and modding just because it is so cheap and having a backup. Not because of reliability but getting stolen. I would be crushed and could not wait even a day to have one again. I'm done buying gear now (except picks and strings). You can absolutely not go wrong with such a great innovation from Indyguitarist!!!

**Submitted by** [tonepoet](#) at 09/23/2004 23:50

That said, let's dive into the third revision of the Indyguitarist / Guitartone.net "Diy How-to Guide!"

Tools and Items you'll need to purchase first



You will need to have/purchase a few basic items first in order to start correctly, but keep in mind that all of these things are “one-time” purchases and should last you a very long time. These items listed below are the exact ones that I used to get started and are all found at your local Radio Shack, or you can buy them from [Indyguitarist.com](http://Indyguitarist.com).

- First, I must assume that you have access to or plan on purchasing: needle-nose pliers, wire cutters, and a drill (if installing larger led's).
- 25-30 Watt soldering iron (look for one with a grounded tip, a good feature to have)
- 60/40 rosin core solder
- De-soldering braid
- black felt tip marker (sharpie's work great)

**Go to [www.radioshack.com](http://www.radioshack.com) to buy these products.**

If you already have needle-nose pliers, wire cutters, and a drill, you may want to start out with this:

### 5-Piece Basic Soldering Set

**\$7.99**

Catalog #: **64-2802**



- Includes everything you need for basic soldering jobs in one package
- Comes with a 30-watt soldering iron
- Iron safety stand
- Rosin core solder
- Soldering helper
- Heat sink
- Plus easy-to-follow beginner's soldering instructions

If you don't have much in the way of tools, you would probably want to get this, unless you can borrow a few of the basic tools.



11-Piece Soldering Tool Set

**\$19.99**

Brand: **RadioShack**

Catalog #: **64-2803**

- 30-watt pencil iron
- Safety stand
- Rosin core solder
- Solder helper
- 5-1/2" longnose pliers
- 5-1/4" diagonal cutter
- 5-3/4" and 4-1/4" regular screwdrivers
- 4-1/2 Phillips screwdriver
- Heat sink
- Carrying case





If you have a few extra dollars to spend, you may want to think about getting a workstation like one of these:

I recommend using a soldering station like one of these, if you are going to be modifying more than one or two pedals.



Catalog #: **64-2078** and Catalog #: **64-2184**



If you are going to be modifying more than one or two pedals, you may want to pickup some extra supplies:

Catalog #: **64-005**



Catalog #: **64-2090**



Or, a bit higher quality tools:

Catalog #: **64-2951**

Catalog #: **64-2980**



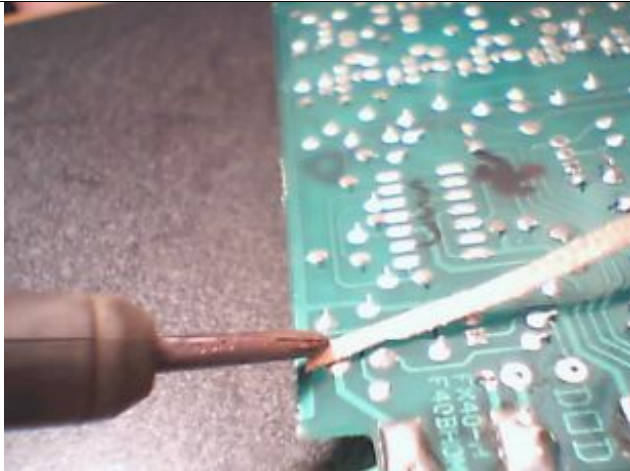
# How To Desolder



## How To Desolder

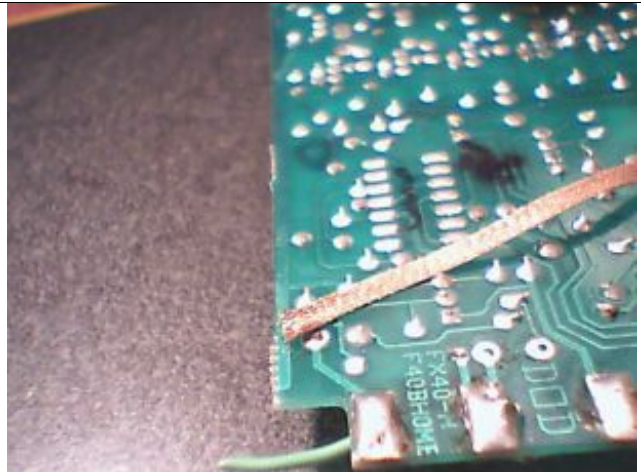
De-soldering is required when electronic components need to be removed from a circuit.

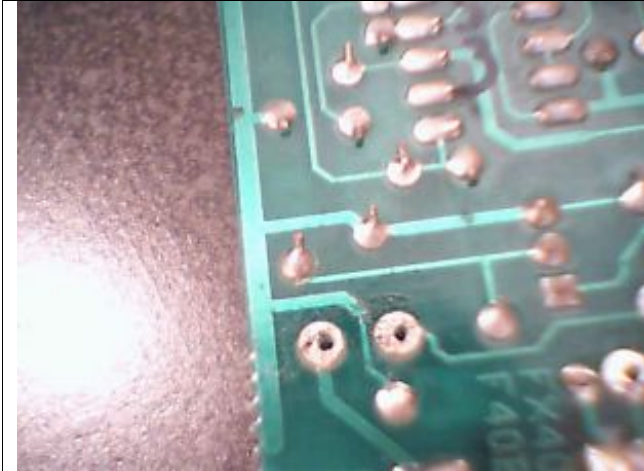
A proper desoldering technique can soon be acquired with practice – all you need to do is buy some scrap boards to have a go with, and desolder to your heart's content!



Select a suitable width of braid, and **press it down** onto the COLD joint using the hot tip of the iron.

**(Right)** Molten solder is drawn up by capillary action into the braid. Care not to overheat, or 'drag whiskers' of solder over the board, nor let the braid solidify on the joint!





The component may drop out of the board after desoldering. Sometimes, it may need persuading with pliers, however.

Here is a close-up shot of both joints, now desoldered and ready for the replacement part to be fitted.

# How To Solder

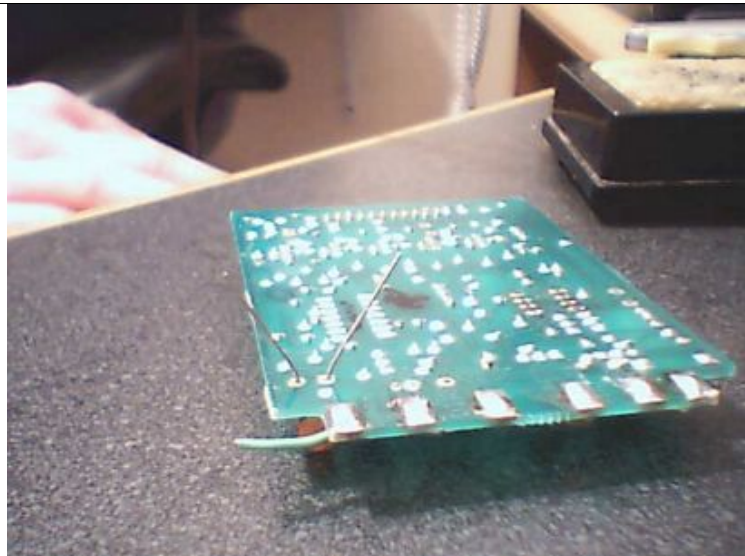


## How To Solder

Soldering is a delicate manual skill that only comes with practice. Bad soldering technique can be a cause of major disappointment which damages your confidence. It needn't be like that: soldering is really easy to learn, and like learning to ride a bike, once mastered is never forgotten!

If you're a beginner, our advice is that it's best to practice your soldering technique using some clean, new parts. Also practice desoldering.

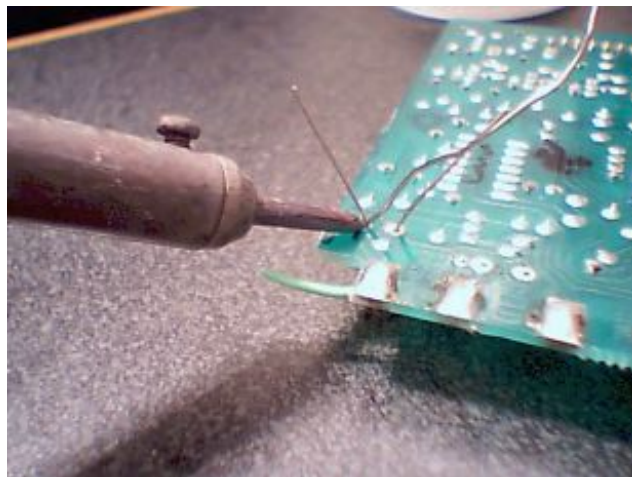
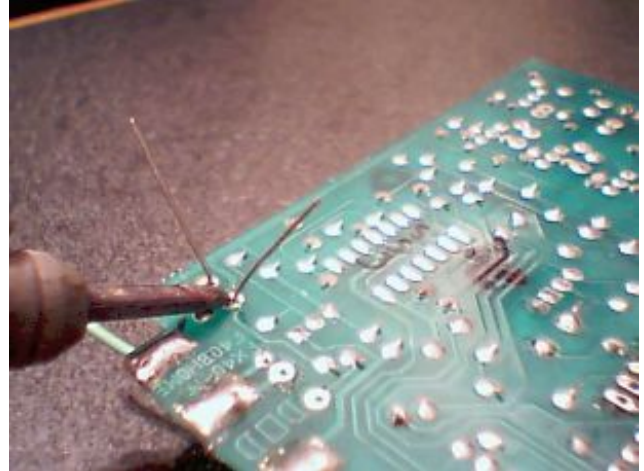
Clean the iron "bit" (tip) using a damp sponge. Iron shown is quite a fancy iron (not needed necessarily).



Insert components and spread them apart a little so that the part is held in place.

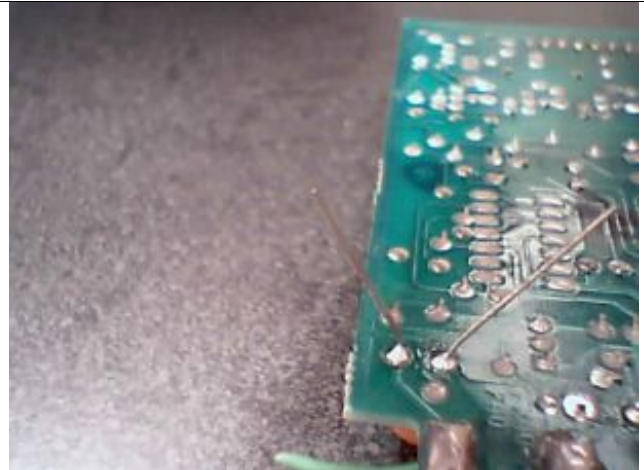


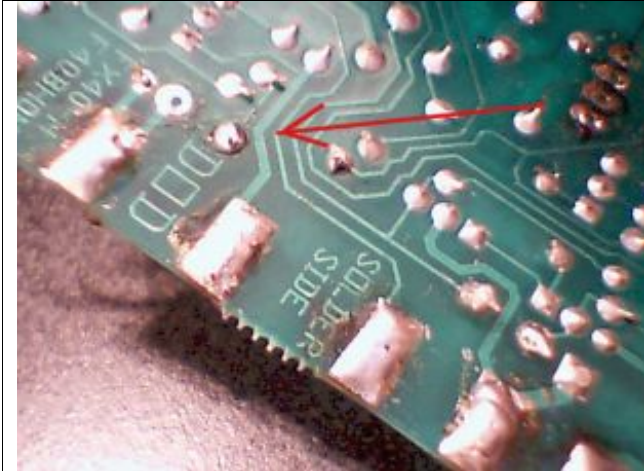
Apply a clean iron tip to the copper and the lead, in order to heat *both* items at the same time.



Continue heating and apply a little bit of solder...don't use too much! If you do, you run the risk of soldering two solder pads together that aren't supposed to be joined or soldered together. Remove the iron and allow the solder joint to cool naturally (just takes a second or two)

It only takes a second or two to make the perfect joint, which should be nice and shiny.





An example of a "dry" joint – the solder failed to flow, and instead beaded to form globs of solder around the wire.

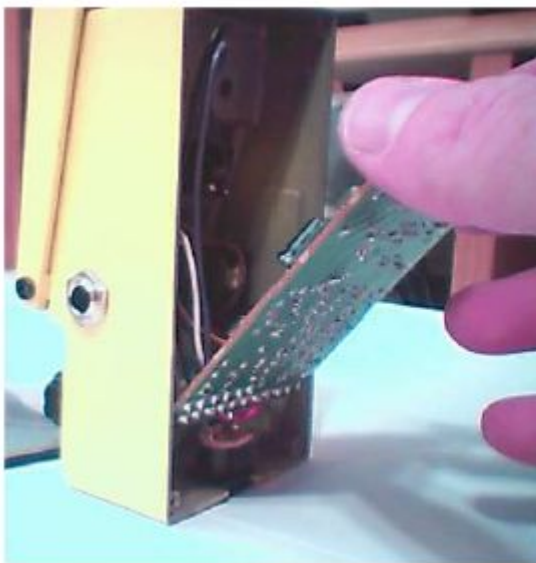
# How To Modify Guitar Pedals





For this demonstration, I'll use the sd-1...but by following the directions in this book, you'll be able to modify nearly any pedal!

The first thing you'll need to do is unscrew the four screws on the bottom of the pedal.  
Put the screws, the clear plastic and the bottom plate into a small tray or bowl of some sort so you can avoid losing any parts.  
For other odd shaped pedals (such as the visual sound), please use this guide with the specific guide for those pedals (included).



Lift up gently on the circuit board. This is what the inside of the sd-1 will look like.



When working with guitar pedals, or any other electronic equipment, its advisable to `discharge the capacitors', which means you are bleeding off any stored electricity inside the pedal.

Simply use a screwdriver with a rubber/plastic handle, and touch the solder pads and the pedal case at the same time. Nothing will happen visually that you can see, but if this were a higher voltage piece of equipment like a guitar amp, you would see a huge spark and hear a loud POP!

All you are doing here is running a little bitty tiny bit of electricity to ground (which on a pedal, is ultimately the case).

**DO NOT USE THE SOLDERING IRON TO DO THIS—you will end up messing up the solder joints.**

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**Sd-1 cuervo mod**

Location	Mod value	What it effects
c2	.047 uf	
c3	.047 uf, for more bass, use .15 uf	.047 .15
c10	1 uf	
c6	remove	
d6	1n4001	
d4	1n4003	
Blue on/off led		

Carefully look over your mod sheet – locate the first change to be made. You can actually start wherever you want, but its generally good habit to start from the top.

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TIP: On any circuit board, you will see letters and numbers generally (which will be referenced on the mod sheet.)

If you aren't sure what kind of part it is, here's a tip:

D= DIODE

C= CAPACITOR

R= RESISTOR

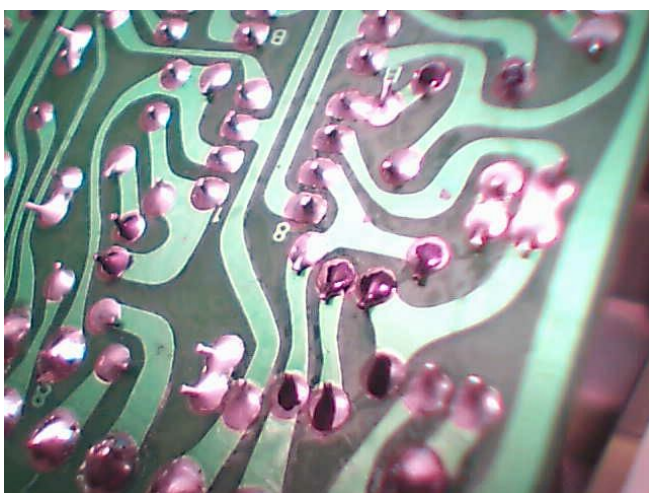
IC = IC CHIP ( ALSO CALLED OP-AMP)

Q= TRANSISTOR ( I HAVE NO IDEA WHY "T" DOESN'T = TRANSISTOR!)

Locate the part numbers on the pedal's circuit board and the mod sheet. Begin marking the solder joints with a black felt tip marker (ANY color will do actually!)







TIP: If you mark the wrong capacitor, don't worry about it – you can leave it alone, or what I sometimes do, is reheat the solder joint just slightly, which will remove the marker. Leaving it won't hurt anything, it just might confuse you if you have a lot of markings on your pedal!

When done marking the solder pads, it will look something like this (of course, depending on the specific changes YOUR pedal requires!)



To remove the current component that will be replaced, you will need your de-soldering braid and solder iron.

I highly recommend sticking in a good cd in your cd player to 'get your groove on'.

My personal fave's: either misc jazz, Robert Randolph and the family

Band, Gov't Mule, or if I'm in a downright corn-pickin' mood (I actually do live next to cornfields), I might throw in some Hank Jr.

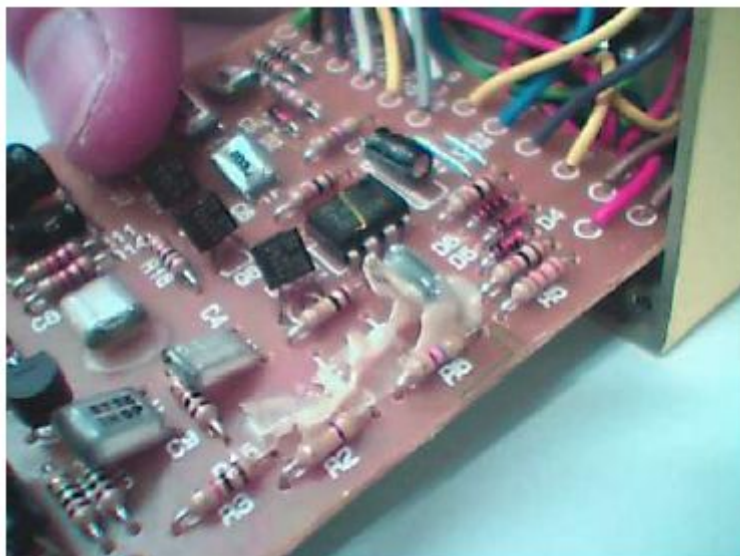
Before each time you use the soldering iron to replace a component, I like to touch the side of the pedal case with the soldering iron to discharge static electricity. Static electricity won't hurt you, but it could possibly mess up the transistors or the ic chip, though in all actuality, not likely.

Place the face of your de-soldering braid on the solder pad on the circuit board. Apply your hot solder iron to it, for just a few seconds –if it doesn't soak it all up, pull the iron away, wait about 3 seconds, and try it again with a clean/new piece of desolder braid. You will see the soldering braid 'suck up' the solder.

Now, Change the first component on the list. Then, of course, cut the legs off after you solder it (like you do after each component is installed).

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NOTE: On some boss pedals, you will see a bit of yellow epoxy – be careful,



and use a needle nose pliers to remove whatever you need to remove to get the part in!

Now, the most important time saver: **TEST THE PEDAL AFTER EACH CHANGE!!**

Let me say that again: **TEST THE PEDAL**

**AFTER EACH CHANGE!!**

Why test the pedal? That way, if you DID mess up, you know that it has something to do with that last part you installed. If you contact me about a problem, be prepared: the first question I'll ask is "Did you test the pedal after each change?" If you say no, I can't be of much help to you!

No need to put the back cover on, just plug it into your guitar and amp and make sure everything is going as it should.

If you don't hear any sound, or it makes a funny sound, then you know something is not right.

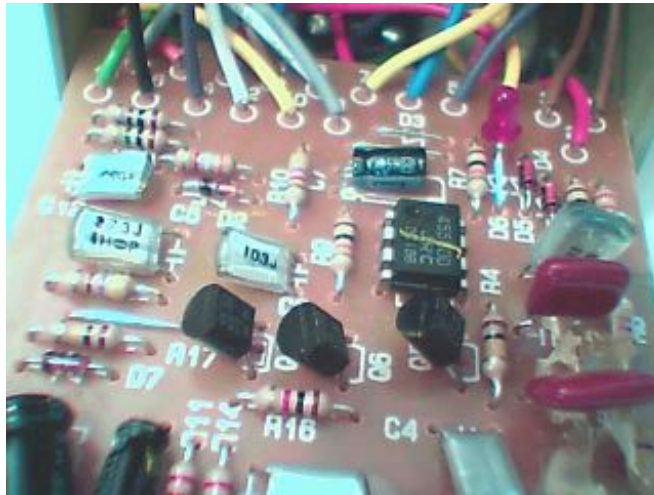
~First jiggle the pedal a little bit to make sure nothing is grounding out against the case (since the cover and circuit board is now loose).

~If that doesn't fix it, make sure the orientation of part is correct (as in electrolytic caps, tantalum caps, diodes, and leds – see 'chart' included with this kit). ~Double-check the solder joints to make sure they are done properly—use of a magnifying glass makes it a ton easier!

~Make sure that the component you installed doesn't have its legs touching any other component's legs or against the case or anything that might cause it to ground out.

~If your still having problems, simply remove the part and try it again.

**99.9% of the time it is an incorrectly soldered joint.**



Continue replacing parts on the circuit board, by going down the list. Check the pedal after each component is installed.

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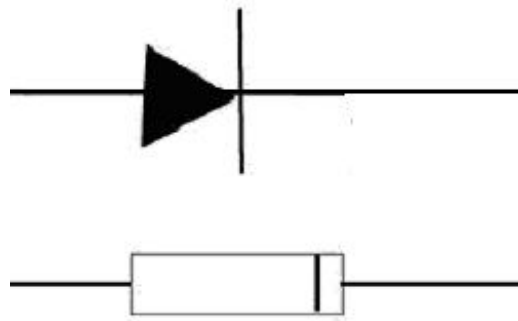
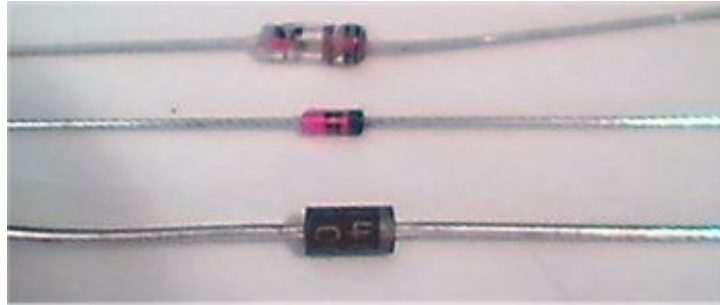
Resistors and capacitors (except electrolytic and tantalum capacitors) do not need to be orientated any certain way, there is no positive or negative side of them.

When replacing electrolytic and tantalum capacitors, diodes, LED's (which are a diode that give off light), all need to be orientated correctly.

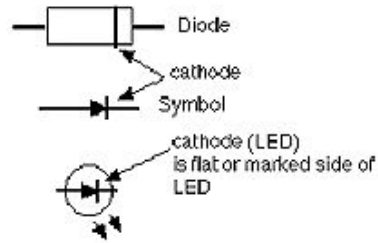
See the Component chart (elsewhere in this book) to get a better understanding of how to know if a component will need orientated or not.

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When changing diodes, make **ABSOLUTELY** sure you put them in correctly! If you don't, the pedal will not work when on. Here is how you would orientate them:

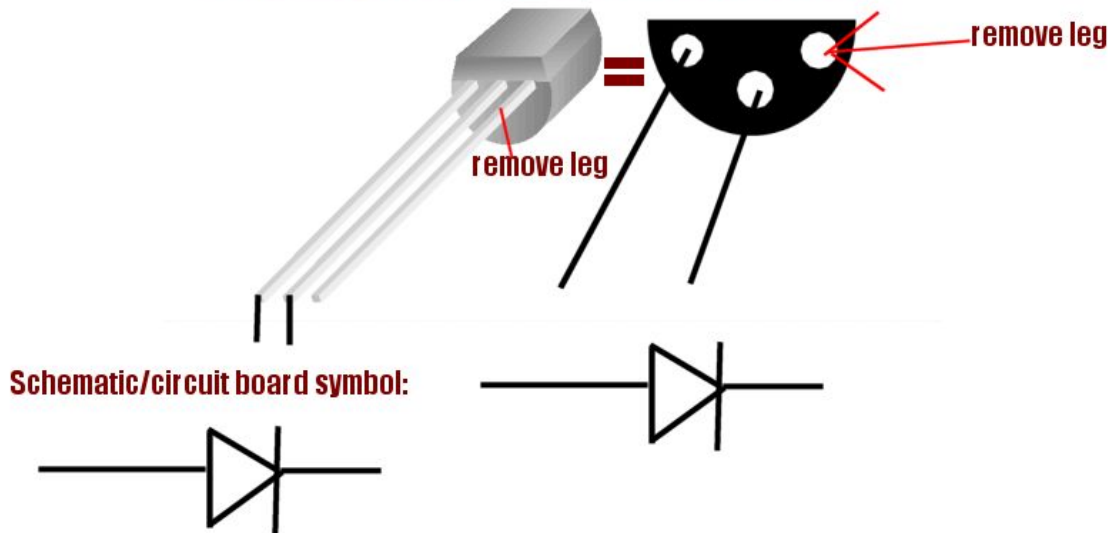


Symbols for Diodes (note orientation on the circuit board, you'll need to orientate the new diode you replace the same direction.)



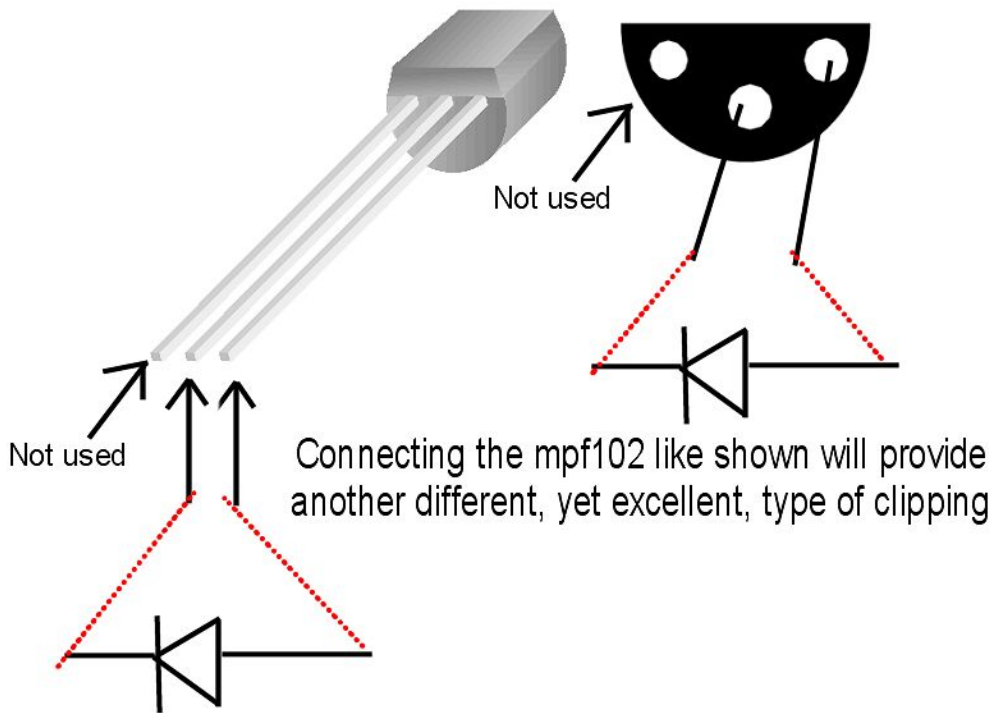
Some mods call for transistors to be used in place of diodes. This is because in some circuits, the transistors sound better. They also have a built in diode, and a little bit of capacitance and/or resistance, which gives them a unique tone, which is pleasing to the ear.

## MPF-102 TRANSISTOR USED AS DIODE



Another way of connecting the mpf102:

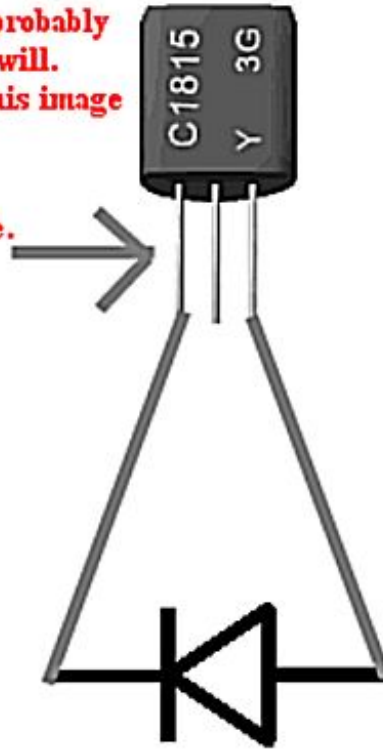
### MPF-102 TRANSISTOR USED AS DIODE



# BS170

(Writing on face of transistor probably will not say the same as yours will. Simply ignore the writing on this image example).

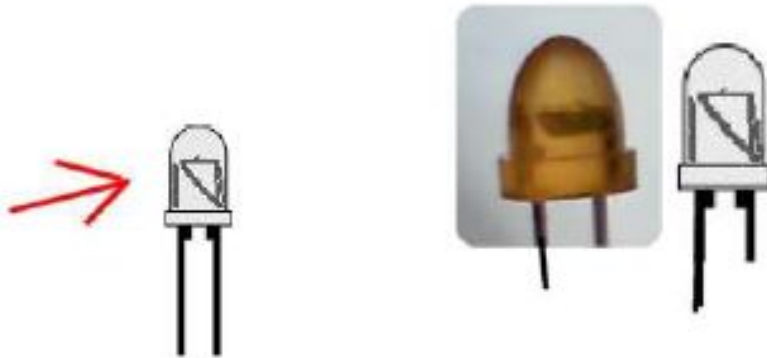
Connect this transistor like shown here. Other leg is not used, can be cut off.



Lastly, you might want to change the LED on/off indicator. Unscrew the screw and pull out the mini circuit board gently with your needle nose pliers.







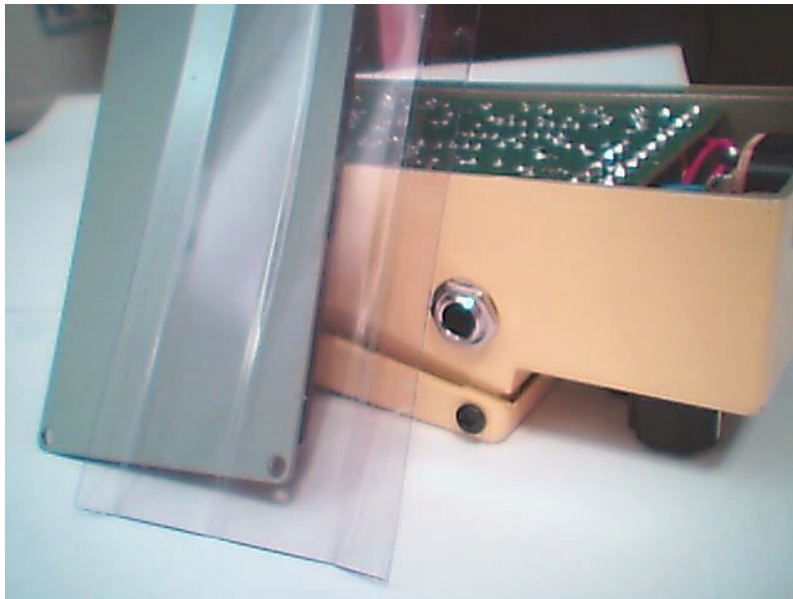
Make sure you mark the orientation of the led. I always mark this side, but you can mark either side, it doesn't matter. What DOES matter is that whichever way the stock led is orientated, the new led must be orientated the same way. If its not, the led simply won't work. If in doubt, touch your new LED on their solder pads, with the pedal plugged in, and on. If it lights up, your good, If it doesn't, turn the led around.

If you use a 3mm led like I do, you won't have to drill the case, if you use a 5 mm led, you will have to drill.  
First find a drill bit that is just barely larger than the led.



Drill VERY carefully, and slowly. You don't want to go fast and go through quickly and risk hitting something inside (yes, I did learn the hard way! 😊 )

Blow the metal debris out (a can of compressed air helps, but not absolutely necessary).



Test everything once again before you put the cover back on.  
Your Done! Plug it in and play!

# How to Modify Danolectro Pedals

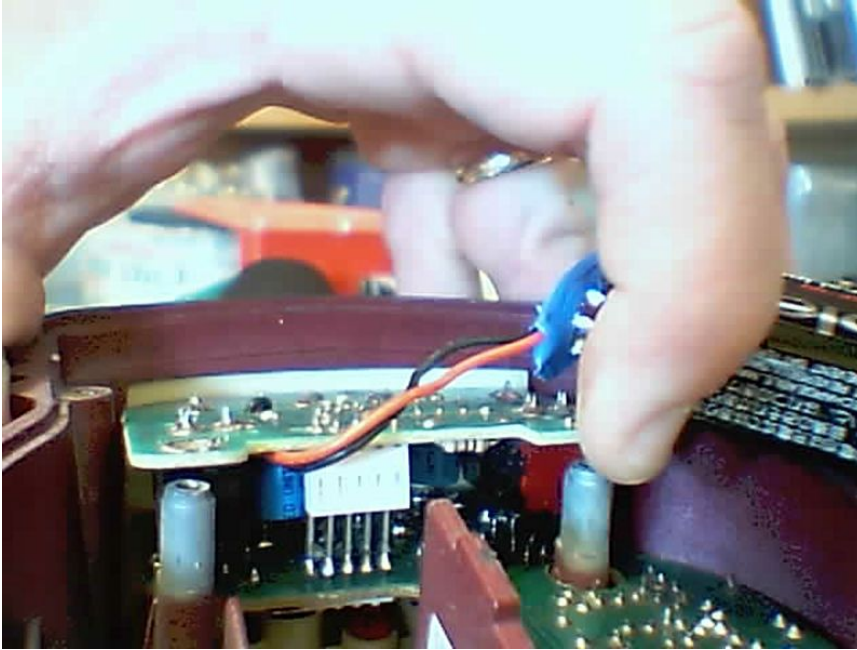


The Dano Pedals are a bit different, so I'll detail a few differences in getting them open here. Mainly, the main difference is that you'll need to take the knobs off, and the removal of the circuitboard (shown here over the next few pages).

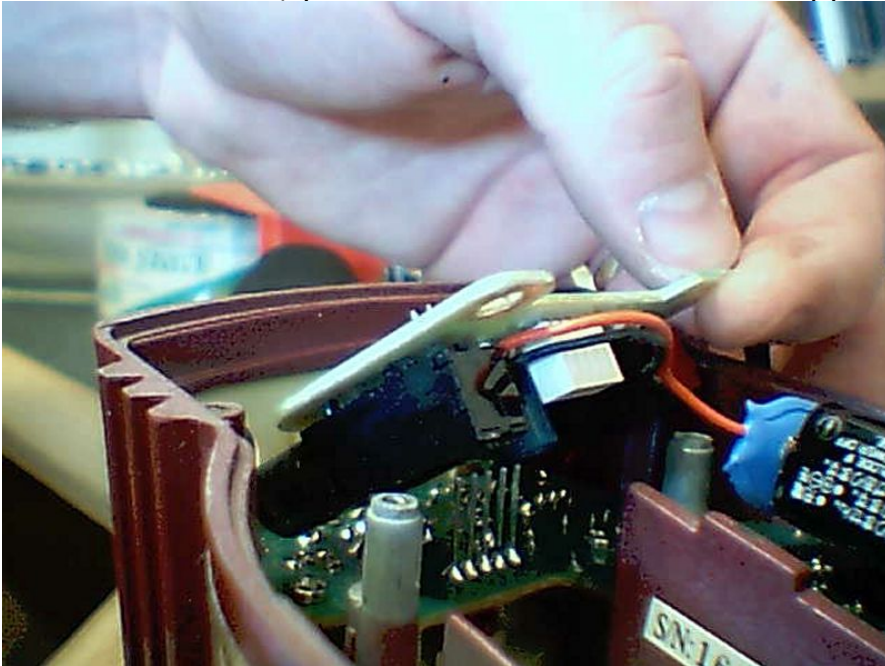
First, unscrew the back screws, and all the screws in the circuitboard. Put in a safe place. Pull the knobs off of the front. If you use pliers, be careful—they can scratch the knobs if they move around on the plastic.



Next, gently pull the first, smaller circuit board off of the pins



At the same time, pull the board in the direction opposite of the jacks.



Push gently on the knobs to pull the 2<sup>nd</sup> circuitboard out.

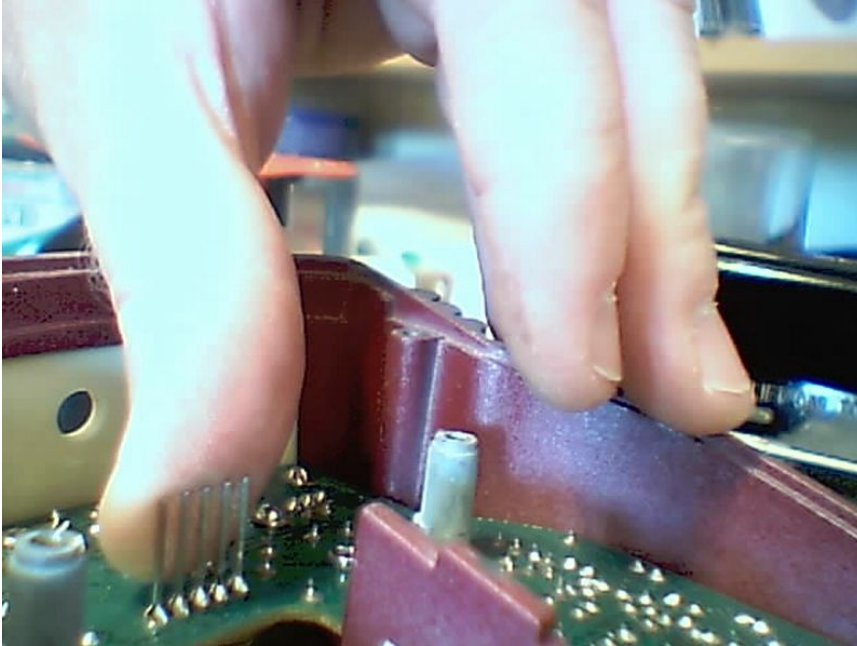


Now, follow the same directions and procedures as you would with any other guitar pedal, as detailed in the previous chapters.

When re-assembling, reverse directions.



When installing 2<sup>nd</sup> circuitboard, gently push the pins out with your finger, and insert the jacks first, then set the circuit board down on the pins.



# All about Components

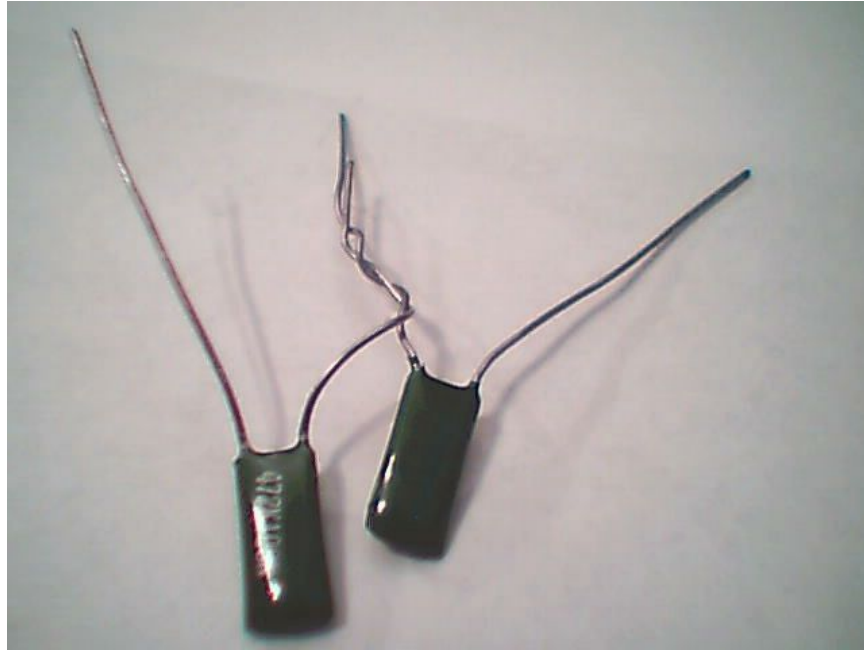


To connect a cap with a diode, it will look like this (below). Note that connection is a parallel connection.



Different types of connections will provide different results!

Caps in series

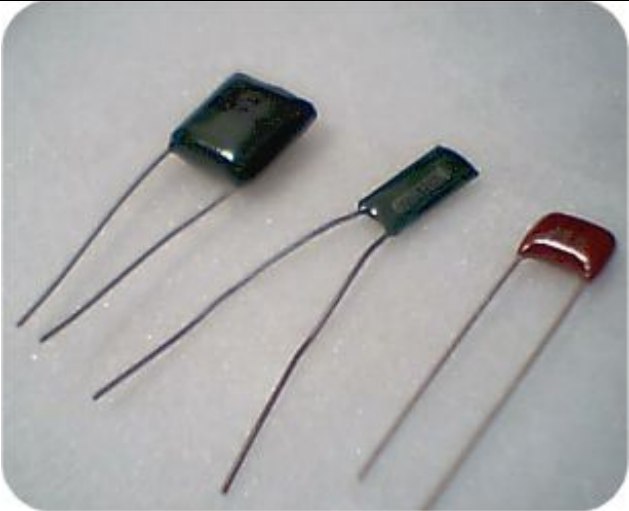


Caps in parallel

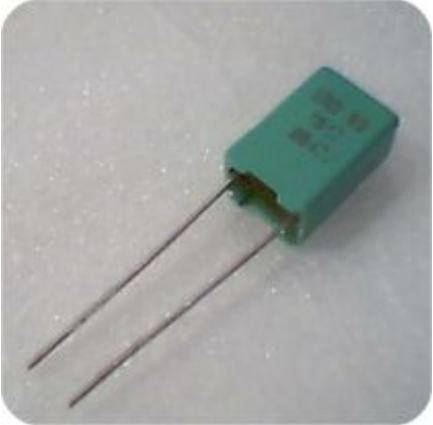


# Component chart





Film caps



Box caps



Ceramic caps



## Tantalum cap

**NOTE:** The positive side is marked on tantalums, whereas the negative side is marked on electrolytics. When swapping them out for one another, make sure you orientate them correctly, or you'll risk messing the pedal up.



Two different styles of electrolytic caps



LED'S  
(light  
emitting  
diodes) –  
when used in  
place of a  
clipping  
diode, they  
may or may  
not light up,  
depending on  
which circuit  
the pedal is  
composed of.

Note about picture on  
left with the lighted  
Led: If you do this,  
make sure you use  
an old battery, not  
one with full power,  
or you will burn the  
led out, and render it  
useless.





Led orientation when using it in place of a standard clipping diode

**notice different leg lengths!**

**Also, notice that all of these**

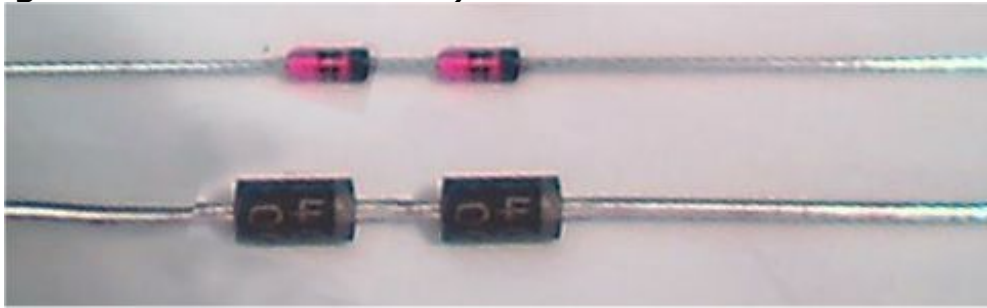
**led's are pointing in the direction**

**of the circuitboard schematic image**



**Capacitors Left to right:  
electrolytic, film, film**

Diodes connected in Series (notice how they are going the same direction)



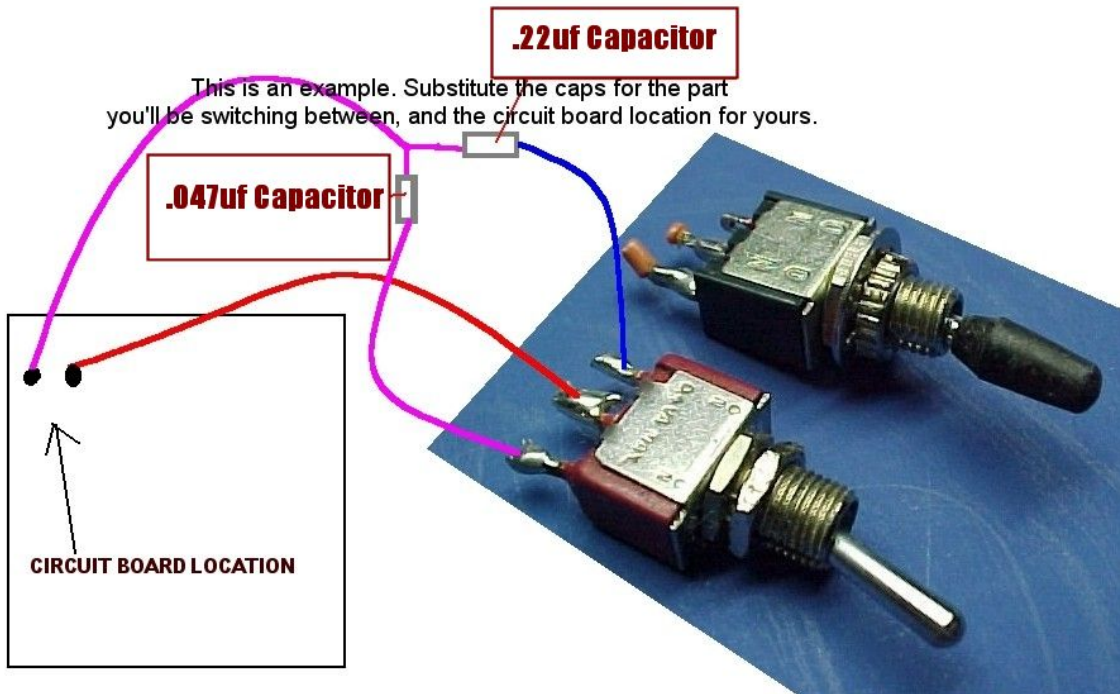
Diodes connected in Parallel (notice how they are pointing opposite directions)



# Installing pots and switches



**THIS IS AN EXAMPLE-REFER TO YOUR MOD SHEET TO KNOWWHAT COMPONENTS TO USE**



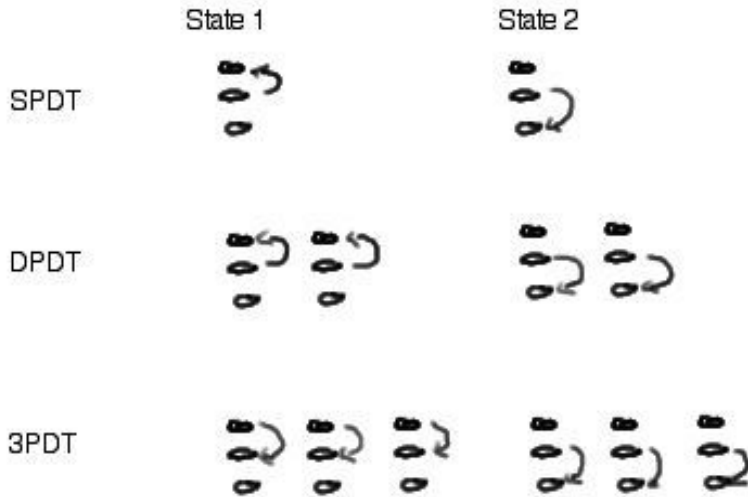
When connecting a switch to your pedal, you will hook it up as shown above. The above switch is a spdt, which means 'single pull, double throw'.

The above diagram is an example – simply substitute the capacitors for whatever part you are wanting to change.

To learn all you ever wanted to know about switches, check out the picture below, it is from <http://www.diystompboxes.com/sboxforum/viewtopic.php?t=970> – it is explained very well there.

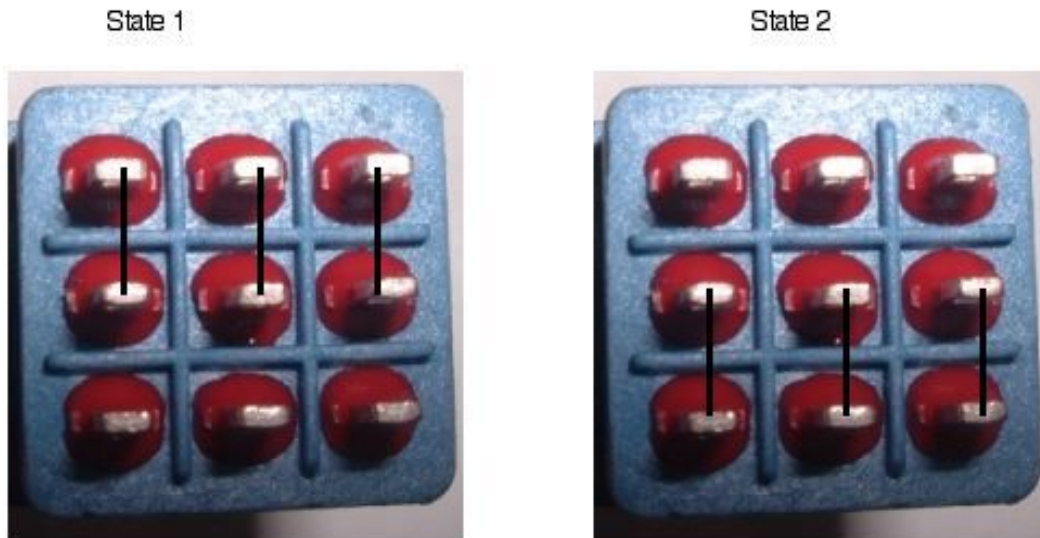
SPDT vs. DPDT vs. 3PDT - Aron Nelson 10/03

The switches we use for our pedals are relatively simple. There are only two states; press it once and the "middle" and outside lugs connect. Press it again, the middle and other outside lug connect.



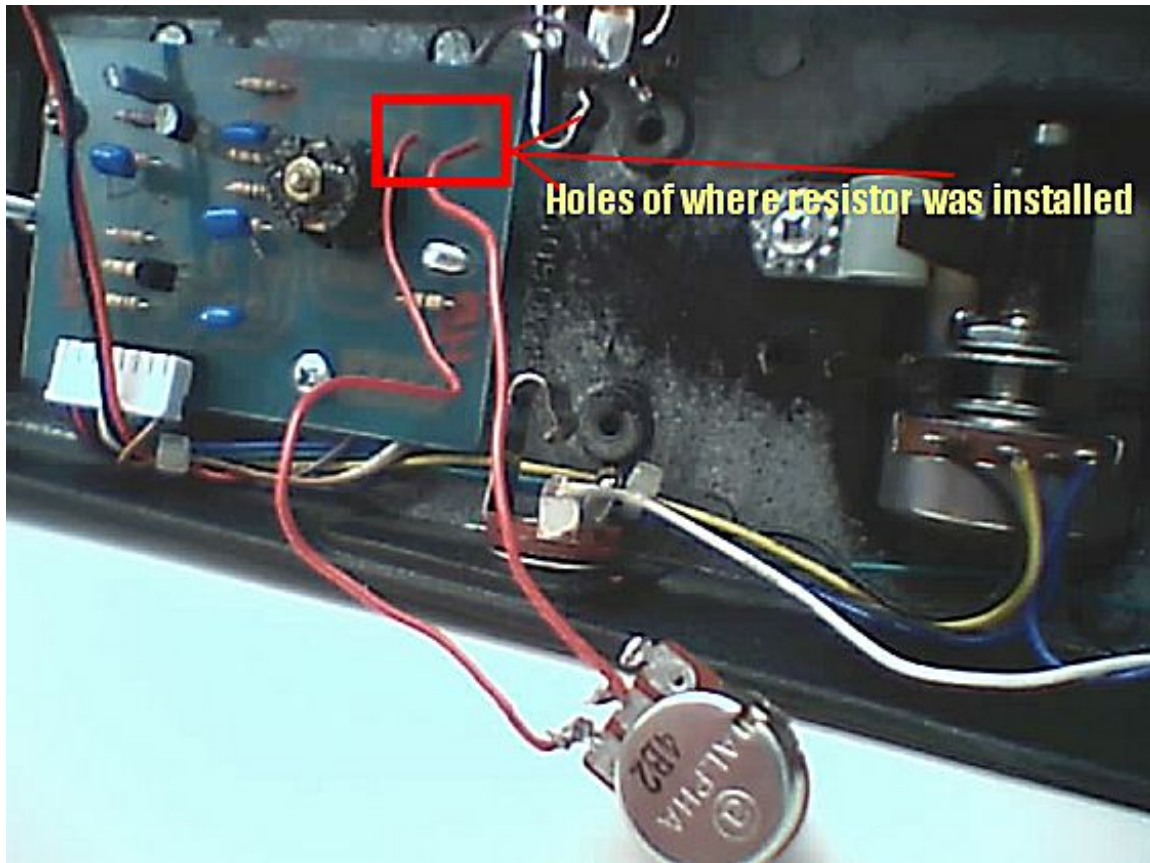
As you can see, the only difference between an SPDT and DPDT and 3PDT is the number of lug sets.

In one state, the top two lugs connect. In the other state, the bottom two lugs connect. You can also think of it as top+middle and bottom+middle.

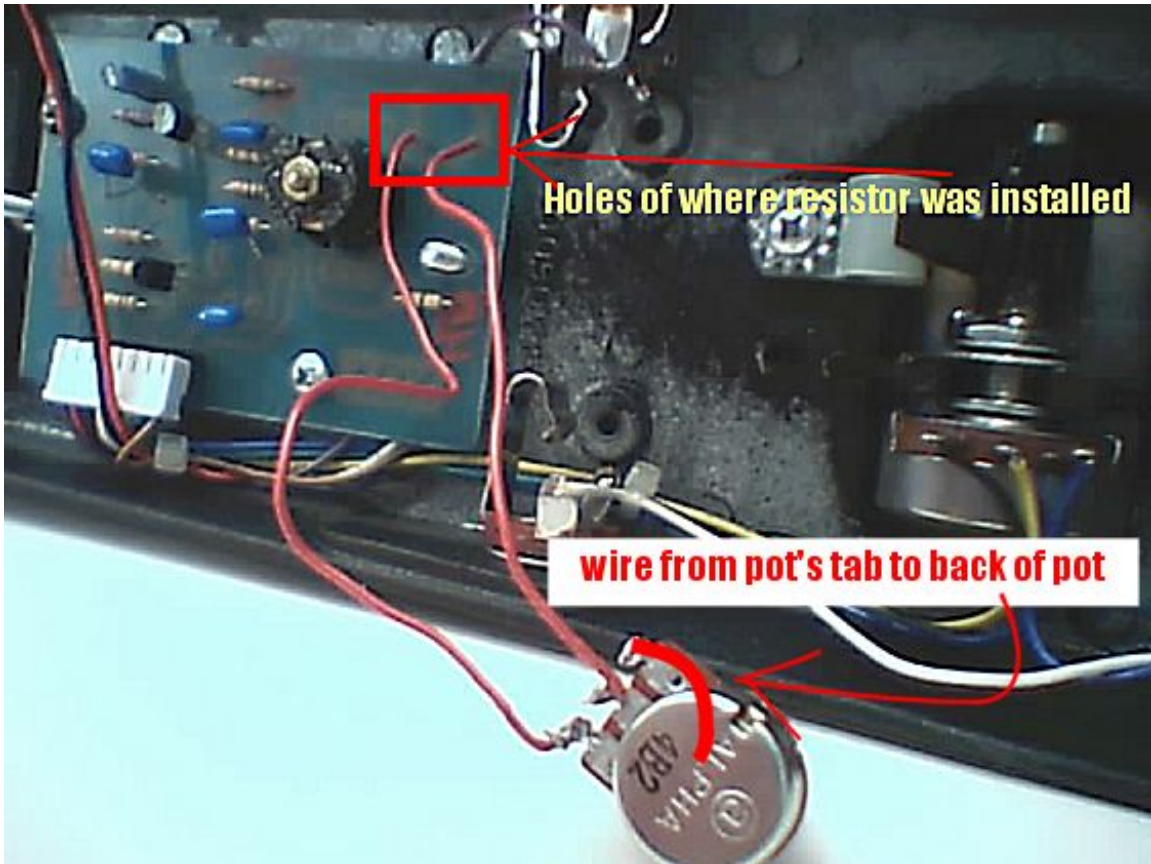


# Installing a Pot in place of a Resistor

To install a pot (potentiometer) in place of a resistor, connect as shown.



There may be a little bit of resistance (resistor value) when the pot is turned at lowest point. If you do not want any value (for example, you want the same effect as if the resistor is completely removed, and no jumper of any sort in its place), connect a wire to the back of the pot, as shown in the next picture, which will connect to ground (see next picture)



**Holes of where resistor was installed**

**wire from pot's tab to back of pot**

# Capacitor Codes

Large capacitors have their values printed on them in plain terms, such as 100 uF (some on the web use 'mf'). We use the letter u as a substitute for the Greek letter micron, so "100 uF" represents 100 micro-farads.

Small capacitors often use a 3-digit code to indicate their value. This code is similar to the resistor color code scheme, except that it uses digits instead of colored stripes. The first two characters are the 1st and 2nd significant digits, and the third digit is a multiplier. Values are expressed in pico-farads.

Examples of some of the more common caps we use:

Writing On Capacitor	Value of Capacitor
103	.01.uF
223	.022uF
473	.047uF
104	.1uF
224	.22uF
474	.47uF
105	1 uF
102	.0001 uF/1000 pf
101	100 pf
100	10 pf

If there are only 2 digits printed on a small disc capacitor, this is likely to be the value written directly in picofarads, such as "47" = 47 pF. Letters are used to indicate tolerances. For example, a cap marked 102J has a nominal value of 1000 pF/ .0001uF and a +/- 5% tolerance. It can have an actual capacitance as low as 950 or as high as 1050 pF.

## **Another common question I get quite a bit is 'how many volts do the caps/resistors/led's/etc need to be'?**

The main difference as far as we are concerned is size. As long as the part is rated 18 volts or more, you will be totally safe with nearly any guitar pedal circuit, and all the pedals that we have mods for.



## How to read the parts list

Pedal Mod

Location	Mod value	
C1	.1 uf	
C2	.1 uf	
C3	.1 uf	
C6	<u>remove</u>	
D6	Germanium	
D5	1n4001	
D4	<u>led</u>	
Blue led		



### These are the parts you need.

Note: c= capacitor, d= diode, r = resistor (under location)  
voltages do not matter. The smaller the voltage, the smaller  
the size of the component.

Notice the circuit board location.

If it starts with a C, it is a cap.

If it starts with an R, it is a resistor

If it starts with a D, it is a diode

If it starts with a Q, it is a transistor

Also, uf/mf, nf, and pf are all values of capacitors.

Uf is pronounced microfarad, which is why some write mf. Nf is pronounced Ninofarad, pf is pronounced picofarad.