

Digital Delay Kit Instructions

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Parts Checklist for Digital Delay Kit

Resistors:

NOTE: All 1% metal film resistors will have a brown stripe at one end.

- 2 1k resistors (brown/black/black/brown)
- 2 4.7k resistors (yellow/purple/black/brown)
- 7 10k resistors (brown/black/black/red)
- 2 12k resistors (brown/red/black/red)
- 2 15k resistors (brown/green/black/red)
- 1 22k resistor (red/red/black/red)
- 1 100k resistor (brown/black/black/orange)
- 1 330k resistor (orange/orange/black/orange)
- 1 511k resistor (green/brown/brown/orange)
- 2 1M resistor (brown/black/black/yellow)

Capacitors

- 1 4.7pF ceramic disc capacitor (small round orange)
- 1 100pF ceramic disc capacitor (small round orange)
- 2 .0027uf film capacitors (272k)
- 2 .01uf film capacitors (103k)
- 1 .027uf film capacitor (273k)
- 3 .082uf film capacitors (823k)
- 3 .1uf film capacitors
- 5 1uf aluminum electrolytic caps
- 3 47uF aluminum electrolytic caps
- 1 100uf aluminum electrolytic cap

Semi-Conductors:

- 1 pt2399 IC
- 1 16 pin socket
- 1 TL072 op amp
- 1 5v Regulator (looks like a transistor)

Hardware:

- 1 Stereo 1/4" jack
- 1 Mono 1/4" jack (2 extra for the FX loop mod)
- 2 100k potentiometer (blend & repeats)
- 1 50k potentiometer (delay time)
- 1 3PDT footswitch
- 1 DPDT toggles switch (with FX loop mod kit only)

- 1 Red LED
- 1 Chromed bezel with rubber stopper
- 1 AC adaptor jack
- 3 Black knobs
- 2 Self-adhesive circuit board stand-offs
- 1 Battery snap
- 4 Self-adhesive rubber feet
- Multi-colored hook up wire**

Painting Tips & Applying Graphics

Finishing your enclosure is optional. You will still have a great sounding pedal whether you do or do not. If you want a nice professional looking “boutique” pedal you might want to consider giving it a coat or 2 of paint and maybe some decals. If you decide not to, skip the section on finishing your pedal. You can always go back and finish your pedal afterwards if you change your mind. You’ll just have to take everything apart. If you want to finish your pedal I strongly suggest that you do this step first before you move on to populating the circuit board. This way you can give the paint time to cure to the metal while you work on the circuit board. In my opinion, finishing your enclosure is the most difficult part. Making a professional looking pedal is not an easy task. If you are very concerned with the way the paint job of your pedal turns out, I suggest you practice on some scrap material first.

Preparing the Surface

Any metal surface that you want to paint must be scored to give the paint something to stick to, or in other words scuffed up with some fine emery cloth (the black sand paper). Nothing too difficult here. Just grab some emery cloth and start rubbing. It doesn’t take much. Just enough so that the entire surface is good and scratched up. Don’t push too hard or you will make deep scratches that will show up through the paint.

TIP: A cool looking finish that is very easy to do is the brushed aluminum look. Since you have to sand the enclosure anyways, you may as well try it out and see if you like it. Cover just your fingertip with the emery cloth. Make series of small concentric circular strokes along the length of the enclosure surface and then back the other way only slightly overlapping the first path of circular strokes. If you like the looks of this, move on to the “decals” section. If not, continue on. After you’ve finished sanding the enclosure you must wash it with soapy water to get off all the aluminum dust that is stuck to the oils that are left by your hands. If you don’t do this the paint will peel off. Your painting surface is prepped and ready to go. From here on out, try not to touch it with your bare hands till the final coat of paint has dried and cured.

Color Coat

This is entirely up to you. Solid color, 2 tone fade, swirls. It just depends on your painting skills. I find that it is best to use a very light “dusting” for each coat and apply several coats every 30 seconds until the substrate no longer is visible. I do this because even if you use the same brand of paint, the runniness changes from color to color. You don’t want to apply too many coats if you are going to apply a final clear coat because the solvents in the clear coat will eat the underlying paint if it is too thick. The type of paint to use is also up to you, but I recommend something that is intended for outdoor use as it tends to be a little more durable. I prefer enamel based spray paints. An auto parts store is going to have a good selections of paints that would work well for a pedal. Keep in mind that different brands of spray paint have different instructions depending upon what type of solvents are used so read the directions. When your color coat has dried enough so that you can touch it, you can bake the enclosure in the oven to speed up the drying process. 150F-200F for 2-3 hours. Someone emailed me and asked me to mention Hammerite or sometimes called Hammertone paint. This stuff is hands down the best paint for the average DIYer. It is the most durable, chip resistant, scratch resistant, paint that you can get in a spray can. And it looks pretty cool too!. It usually comes in earthy or metal tones. It's a textural effect paint. It's designed to look like metal that was beaten with a ball hammer.

Once you have a nice color coat it’s time to decide on the graphics (if any). Graphics can be anything from just labeling your knobs “volume”, “fuzz”, “boost”, ect. to giving your pedal a name, a logo, or anything you want. There are many different ways to add graphics to your pedal. The best method of course is silk screening, but that will probably cost you more than the pedal itself if you don’t already have the tools and supplies. More feasible methods include hand painting, inkjet water-soak decals, and just writing on it with a permanent marker. If you want to use permanent marker and you also want to add a clear coat, you should do the marker last as the solvents in the clear coat will

make the marker run. If you want to hand paint your graphics, I would definitely recommend adding a clear coat because they tend to chip very easily. I personally prefer inkjet water slide decals. These are decals that are about as thin as the skin of an onion that you print off your computer with whatever desktop publishing software inspires you the most. They have a paper backing to them. When you are ready to use them you must first spray them with a clear coat and let dry. Then cut them out, soak them in warm water for about 15-30 seconds (depending on the size of the decal), then slide them off the paper backing and stick them on your pedal. I find this to be the most economical way to get professional looking results. You might be able to find some decal stock at a nice hobby store (one that has RC planes and model trains) Much like hand painting your graphics, you will need to add a clear coat if you are going to use water slide decals because they will rub off quite easily.

Clear Coat

There's not much difference between applying your clear coat and your color coat. Use light "dusting" coats. Read the instructions for that particular brand of paint. Once again I prefer enamel based spray paint, but acrylic is fine. The biggest difference between the clear coat and color coat is that you CANNOT bake the clear coat if you have water-soak decals underneath. You must wait for it to air dry. If you bake it, it will get bubbles in it. If you didn't use water slide decals between your color coat and your clear coat then it's OK to bake it.

Be Creative

The advise above is just my 2 cents. None of this is written in stone. There are plenty of other ways to apply a paintjob and there are lots of other things you can do besides painting. I've seen some people who used an Iron-On Tee shirt transfer with graphics they printed out. I've also seen people slap a sticker right on the top of the enclosure with all the graphics on it and holes cut out for the knobs and switch. Of course it really helps if you are proficient with Photoshop or some other type of graphic design software, but the point is that there really are no limitations on what you can do to decorate your pedal.

Soldering Tips

For most first time DIY'er, soldering is the scariest part. This is probably because the boutique pedal builders make it seem like they are artEEsts who had to study under a master builder for years before they could solder properly...And if you don't know how to solder "perfectly", your pedal won't turn out right or just won't sound as good. This is rubbish. You can make perfect solder joints on your very first attempt. The only thing practice will improve is the appearance of your solder joints. Your first attempt at soldering may/probably won't look pretty, but if you follow these simple rules your pedal will sound fantastic.

1. Take your time! Think about what it is you are doing before you solder. Little things like turning your entire project just a little so that you get at it with your iron at a comfortable angle rather than having to contort your wrist or pushing wires out of your way so you don't burn them.

2. Keep the tip of your iron sharp, clean, and tinned. Irons are like pencils...the tips wear down after a while. You will need to sharpen it with a file from time to time. Or if you have a brand new iron, but the tip does not have a fine point, you can file it down. Crud will build up on your iron too. You need to keep a damp sponge near by while you work so you can wipe it off. Keeping your tip tinned will help the solder not to stick to your iron. Radio Shack sells tip tinning and cleaning compound. Good stuff.

3. Ventilation In case you don't know already, soldering gives off lead fumes. Avoid breathing them. Keep a fan near by if you've got one to suck up the fumes.

4. Apply Solder to the Joint, not the iron. You want to use the iron to heat up the area that you are actually apply solder to. Of course, you want to keep your iron right against the object you are soldering, so solder will naturally (and should) get on the iron. However, if you apply your solder to the joint first, when it melts, you will know that it is good and hot and will stick to that surface.

5. Wait to see the solder "flux" You need to understand that molten solder behaves just like water. It has surface tension. Think of it as like trying to wash a greasy pan without soap. Solder by itself does not want to stick to metal. If you try to wash a greasy pan without soap you will just spread the grease around. Just like water needs soap to break the surface tension and remove the grease, solder needs flux to help it stick to a metal surface. I highly recommend that you use rosin core solder. It already has flux inside of it. Most solder you buy these days will be rosin core solder, but if you are using plain solder you will need to use flux.

So when you are soldering, sometimes the solder will "flux" right away and sometimes you need to hold your iron to it for a few seconds to heat up the flux and help it flow. You will notice this most when you are soldering the larger components like the jacks and switches because they take longer to heat up. You will see that when you apply solder to them, the solder will form a bead. The joint is just hot enough to melt the solder, but not hot enough for the solder to bond. It may appear that you have made a nice joint, but if you let it cool and then tug on the wire, it will pop off. You need to hold your iron to the joint until you see the bead "break" and the solder flow freely within the solder lug of the jack or switch and even into the strands of the wire. Then you know you have a solid joint.

When you are soldering the components to the circuit board, this will not be much of a problem because the solder eyelets on the board and component leads are all pre-tinned...the solder wants to stick to these parts. Also, they are much smaller and will heat up very quickly.

6. Use as little solder as possible The less solder you use, the neater your work will look. But more importantly, the less like you are to have some stray solder short out on you or accidentally connect to something it shouldn't. This is particularly important when solder the circuit board. Yes, the traces are covered in a solder mask, so solder cannot stick to them. But if you have a huge blob of solder, you can connect one of the solder pads to another. Some of the more complicated projects have very tight spaces on the board and you need to take your time and make sure you don't get any accidental connections. If you do, it's not a big deal. Just use some desoldering braid and clean it up or try to use your iron to drag the stray solder back to where it should be. Don't be scared...lots of parts and a tight

work space doesn't make the soldering anymore difficult. It just means you have to be more careful.

Tools & Supplies you will need

You will need a **Soldering Iron** and **Solder**.

Your soldering iron should be the "pencil" type between 15watts and 45watts. 25 - 35watts is probably the best for this application. More than 45watts can be a bit too much. It may damage some of the components. Especially germanium transistors. Do not use the "gun" type soldering irons. They are too powerful. IMHO, if you don't already have a soldering iron, Radio Shack soldering irons are the most bang for the buck. They work just as well as the more expensive brands like Weller, but will only cost you about \$8.

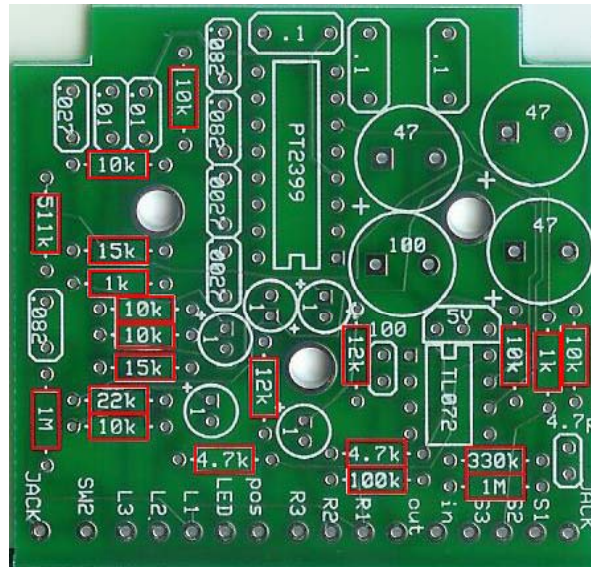
The solder should be **light-duty rosin-core lead solder**. The smallest spool you can find will be more than enough for several pedals. Do not get silver bead solder and make sure you get "rosin-core". Plain lead solder requires flux in order to stick. The rosin-core solder just makes things a whole lot easier.

You will definitely need a pair of small **wire clippers**. A pair of wire **24AWG strippers** is also a big help, but not necessary. You can strip the wires with your clippers, but it's more work. **Needle nose pliers** come in very handy too, but not necessary.

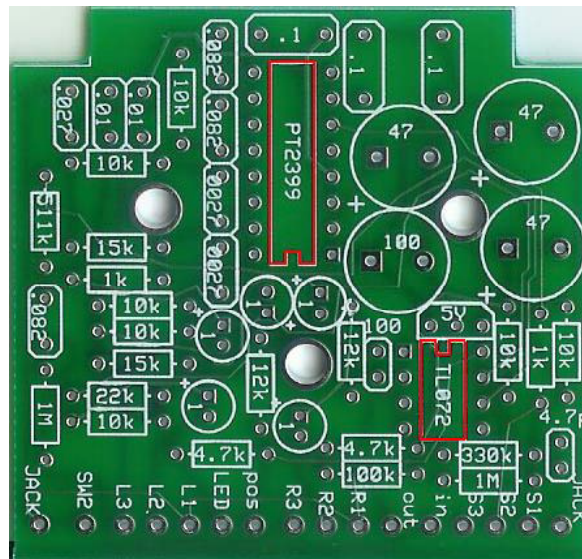
You will also need a **1/2" wrench** for the jacks, **14mm wrench** for the footswitch and AC jack, and a **10mm** for the potentiometers and LED bezel. If you don't have these, a crescent wrench will work or even a pair of pliers, but they might scratch your enclosure.

You will also need a medium **Phillips screwdriver** to close the enclosure, and a **very small flat head** to tighten the knobs. Some people complain that the screws that come with the kits that have the smaller BUD (MXR) enclosures do not fit. These are the screws that the manufacturer sends with the enclosures. They do fit. You just need to use the proper screwdriver and give it a little elbow grease. DO NOT try to drill the holes out and make them bigger.

Populating the circuit board



Step 1: Add all of the resistors. You will be tempted to rush this by inserting them all into the board and then soldering, but you will have much better results if you do each resistor one at a time.

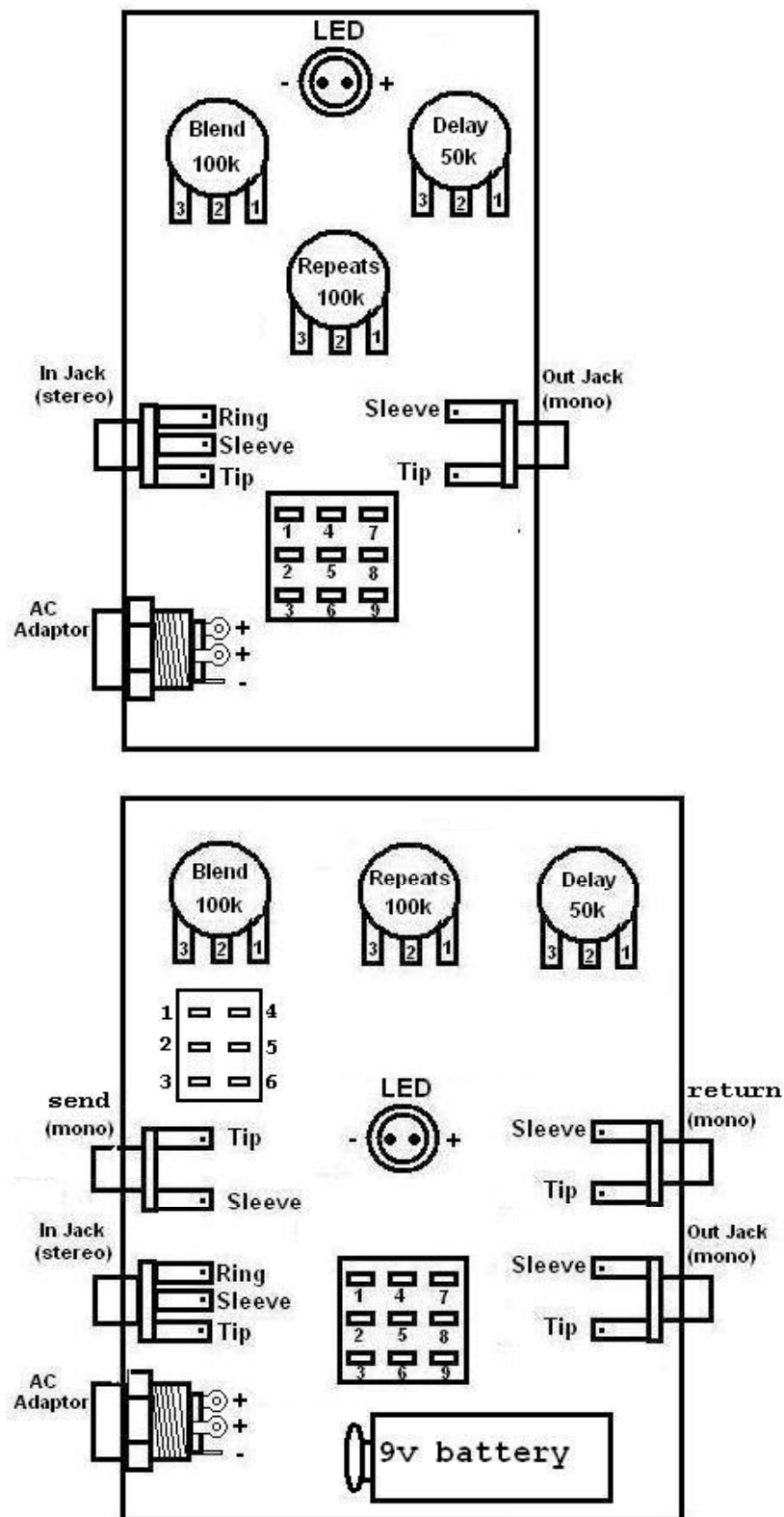


Step 2: Add the TL072 and the SOCKET for the PT2399 (do not solder the PT2399)

Step 4: Add the 5v voltage regulator. It will look like a plain transistor. Insert it into the board so that the flat side matches the flat side printed on the circuit board layout and the

Step 6: Add the larger 100uf and 47uf electrolytic caps. These are also polarized.

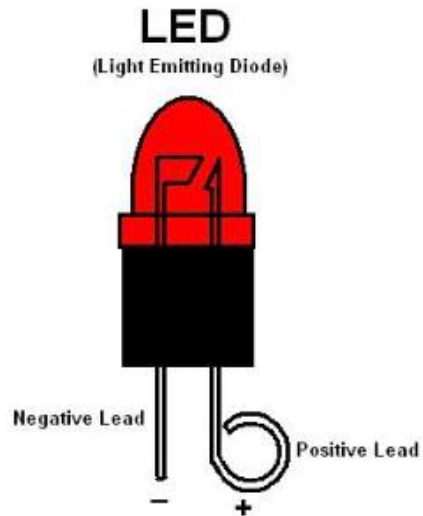
Assembling the Enclosure



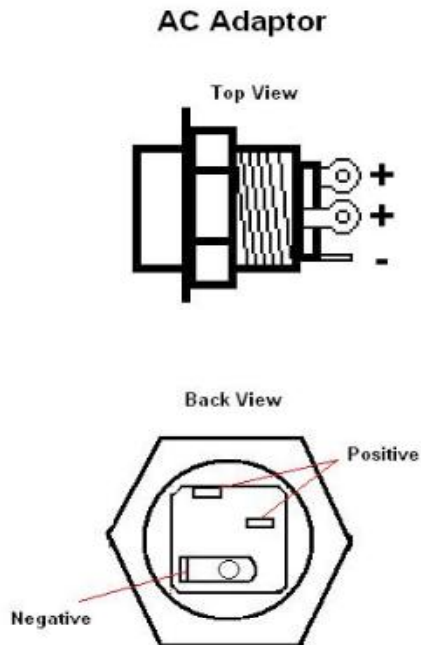
These instructions will serve for both the Base Digital Delay Kit and the FX Loop Delay Kit. Most of the steps will be the same for both, but the diagram for the FX Loop Kit will be used. When there is a step that is different for the Base Kit, the Base Kit diagram will be used

1. Install the jacks first. If you are looking down inside the enclosure, the mono jack goes on the right side and the stereo jack goes on the left. Place the washer on the outside of the enclosure. Use a 1/2" wrench to tighten.
2. Install the AC adaptor jack. The bolt goes on the inside. Use a 3/4" or 14mm wrench to tighten.
3. Install the bezel. The washer and bolt go on the inside. Use a 10mm wrench to tighten.
4. Install the potentiometers so that the solder lugs are pointing down towards the footswitch side of the enclosure. Use a 10mm wrench to tighten but only snug. Do not over tighten the pots.
5. Install the footswitch. The first bolt and metal washer go inside. The plastic washer and second bolt go on the outside. It does not matter which side you designate as the "leading edge" of the footswitch as long as you orientate it so that the flat sides of the solder lugs are aligned in horizontal rows, not vertical columns. Use a 14mm wrench to tighten.
6. For FX loop kit only: Install the toggle switch. Use a pair of pliers to tighten. You can orientate this to have the switch flip up and down or side to side, but we'll use up and down here.

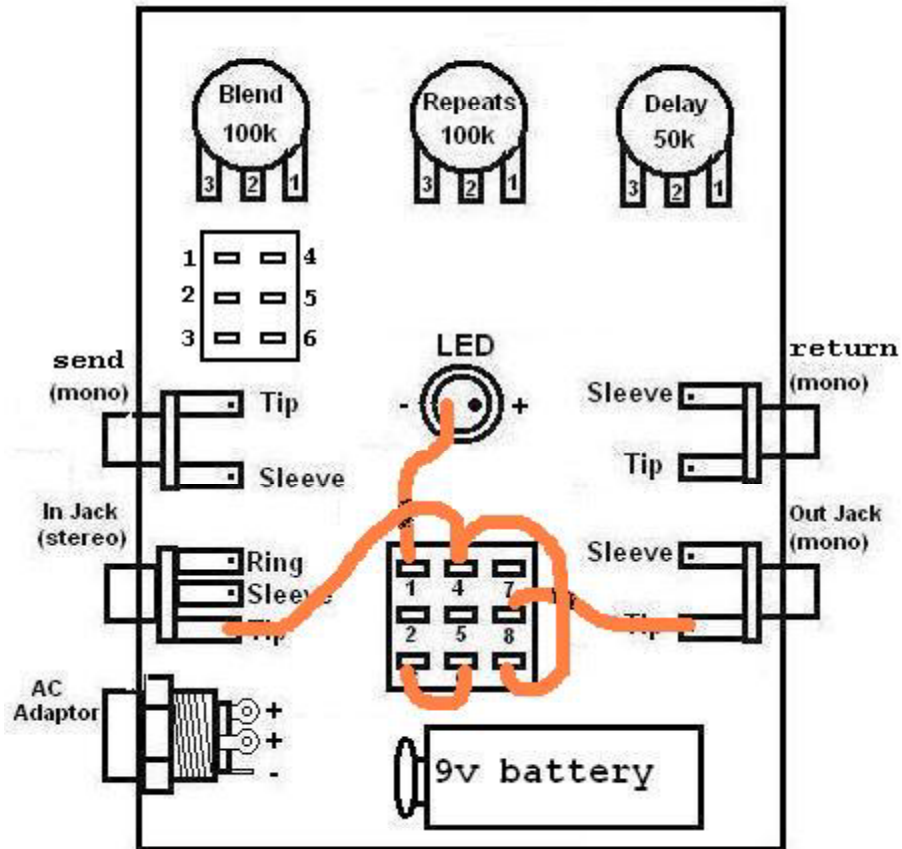
Wiring



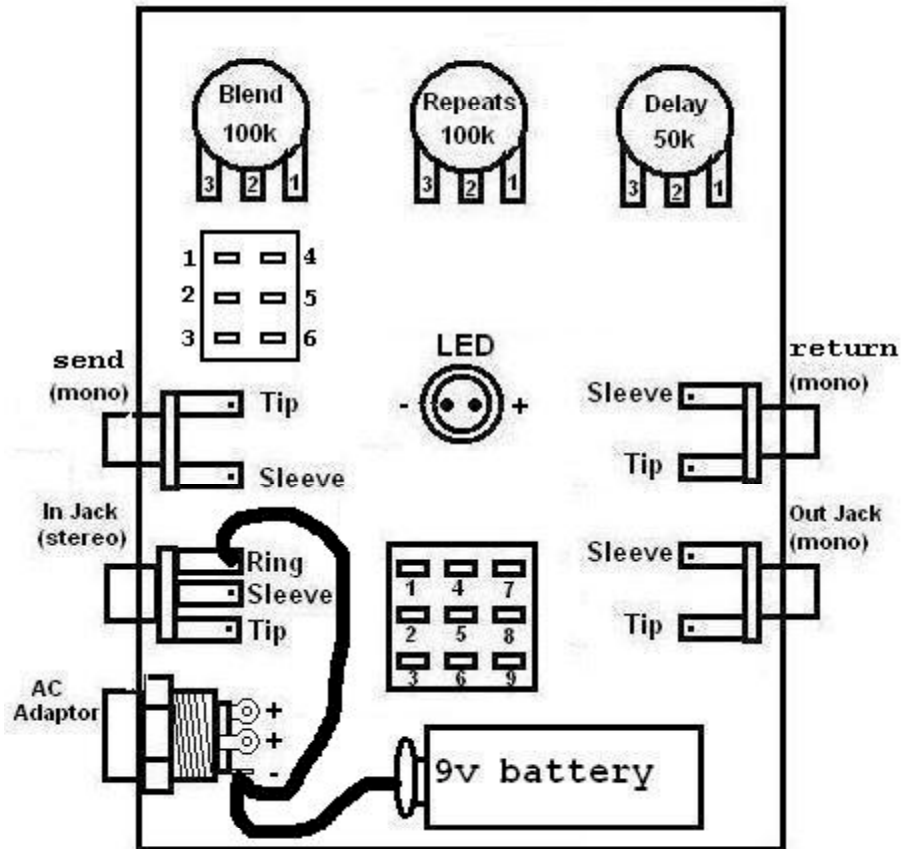
On most polarized components such as an LED the positive lead will be longer than the negative. You will need to make solder lugs for your LED by bending the leads into circles (needle-nose pliers work well for this). Insert the leads into the rubber bezel cork before you do this. You will need to clip the leads so that they are not too long, but don't make them so short that they touch the bezel when you insert the LED and cork into the bezel. Be sure to keep track of which newly formed lug is positive and negative once the leads are clipped. If you forget you can tell them apart by the flag shaped filament that is connected to the negative lead.



This is a “disconnect” ac adaptor jack. That means that when you have a battery connected and you plug in the adaptor, it will disconnect the battery. That is why there are 2 positive terminals. They are both connected when there is no plug in the jack, but when the plug is inserted only one of the terminals (the uppermost terminal in the “back view”) is connected to the sleeve of the adaptor. The advantage of this is that you can leave batteries in your pedals as a back up power source if you are a “working” musician and they will stay fresh even when you have the input jack plugged in as long as you keep the adaptor plugged in.

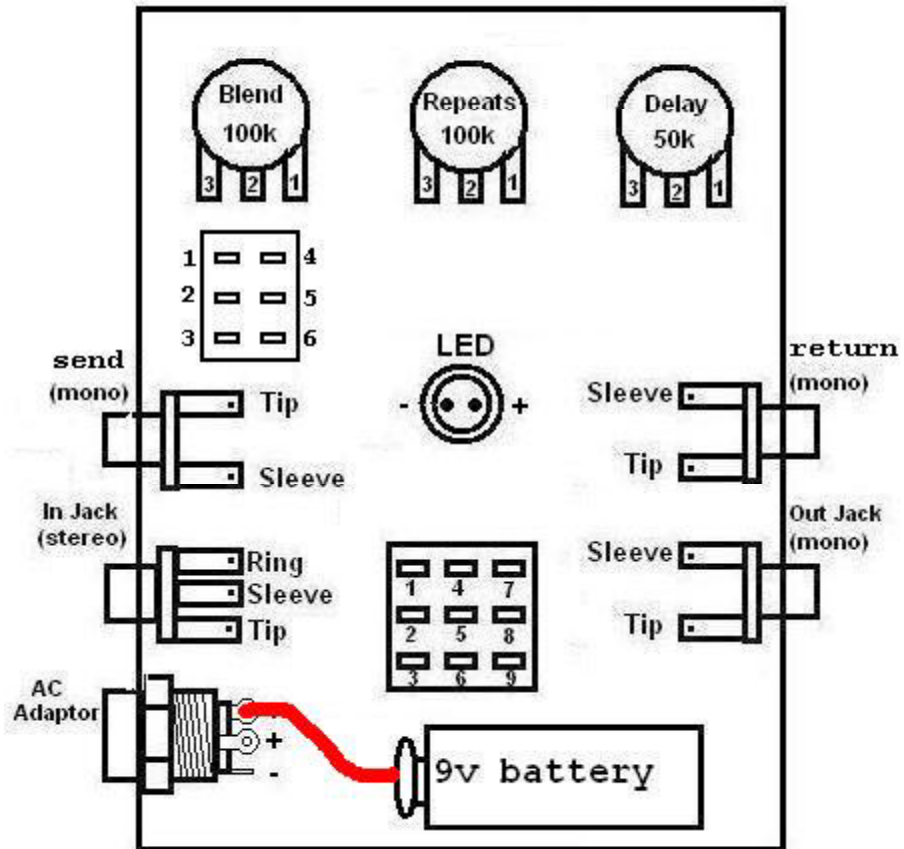


- Step 1: Jumper lug3 to lug 6
- Step 2: Jumper lug 9 to lug 4
- Step 3: Connect lug 4 to the tip of the in jack
- Step 4: Connect lug 8 to the tip of the out jack
- Step 5: Connect lug 1 to the negative terminal of the LED

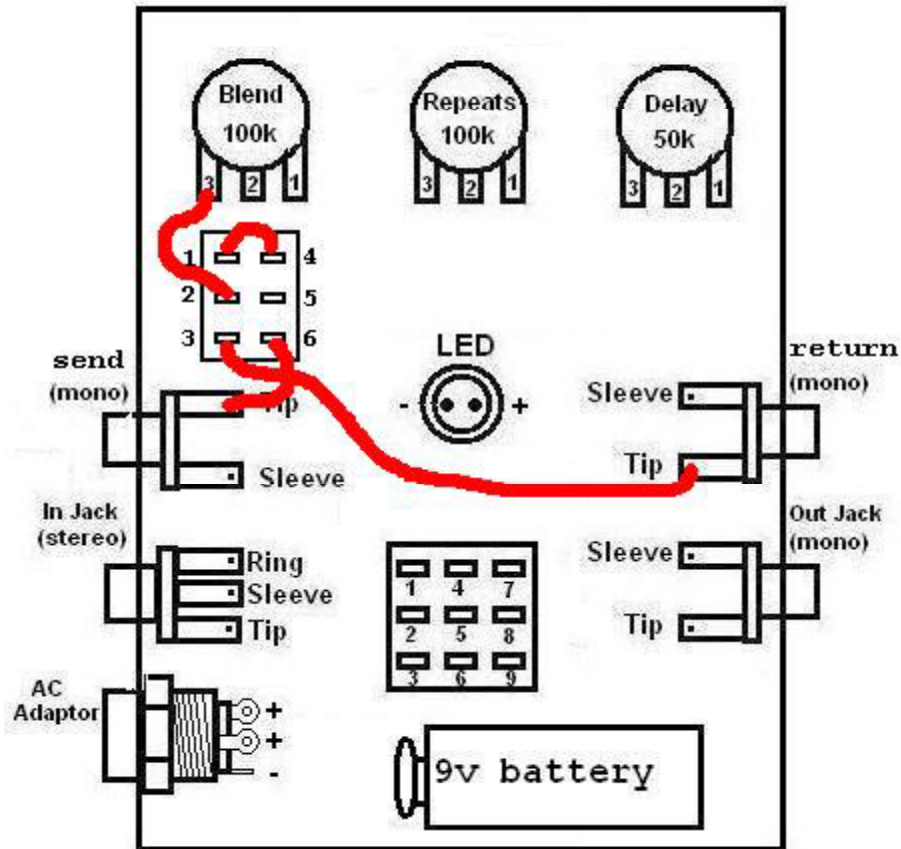


Step 6: Connect the black battery snap wire to the negative terminal of the ac adaptor jack

Step 7: Connect the negative terminal of the AC adaptor jack to the ring of the in jack



Step 8: Connect the red battery snap wire to the positive “battery” terminal of the ac adaptor jack

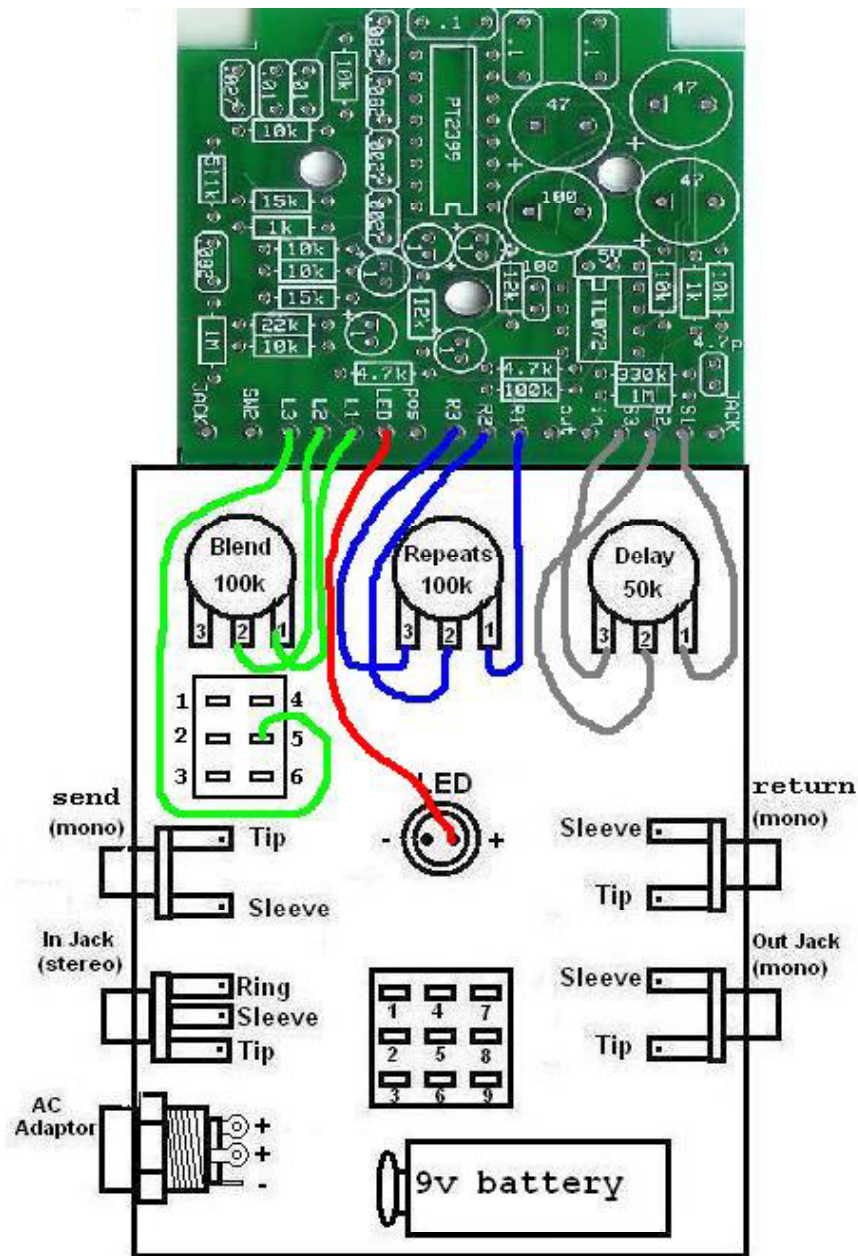


Step 9a: (FOR FX LOOP KIT ONLY) connect Lug 3 of the 100k blend pot to lug 2 of the toggle switch.

Step 9b: Connect lug 3 of the toggle switch to the tip of the return jack.

Step 9c: Connect lug 6 of the toggle switch to the tip of the send jack.

Step 9d: Jumper Lugs 1 and 4 of the toggle switch.

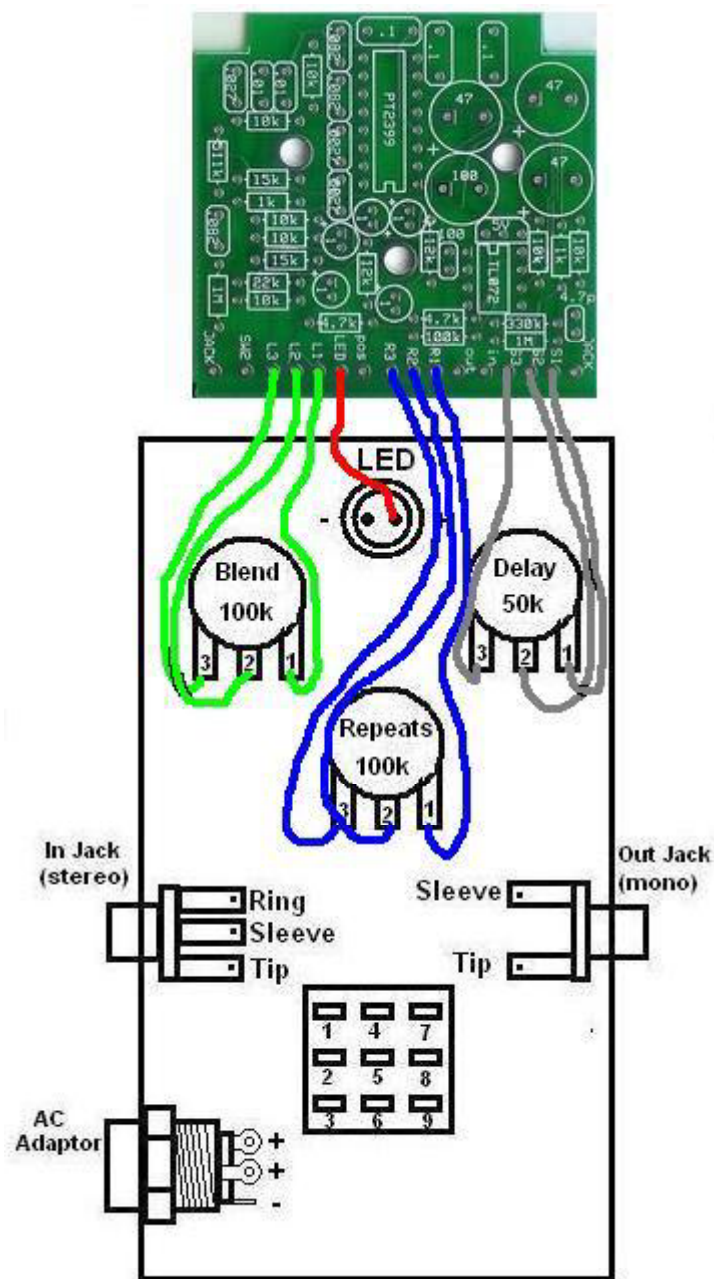


Step 10: Connect the red wire from the “LED” eyelet to the positive terminal of the LED.

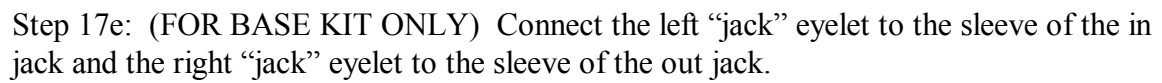
Step 11: Connect the gray wires to the 50K delay pot. Connect the “S3” eyelet to lug3 of the delay pot. Connect “S2” to lug 2 and “S1” to lug 1

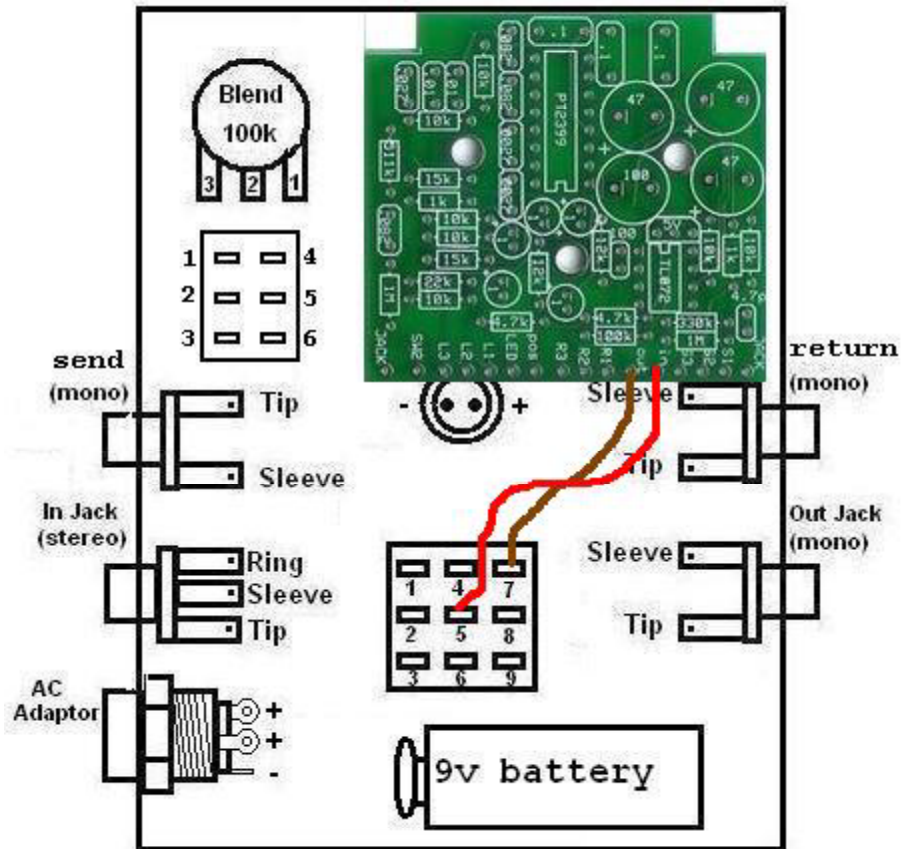
Step 12: Connect the blue wires to the 100K repeats pot. Connect the “R3” eyelet to lug3 of the repeats pot. Connect “R2” to lug 2 and “R1” to lug 1.

Step 13a: (FOR FX LOOP KIT ONLY) Connect the green wires from the “L1” and “L2” eyelets to their respective lugs on the 100k blend pot as you did in steps 11 and 12. Connect the “L3” eyelet to lug5 of the toggle switch.



Step 13b: (FOR BASE KIT ONLY) Connect the green wires to the 100K blend pot. Connect the "L3" eyelet to lug3 of the blend pot. Connect "L2" to lug 2 and "L1" to lug 1





Step 18: Connect the brown wire from the “out” eyelet to lug 7 of the footswitch.

Step 19: Connect the white wire from the “in” eyelet to lug 5 of the footswitch. NOTE wire is shown in red in the diagram above for better visibility.

Finishing up & Troubleshooting

1. Test the pedal to make sure it works.
2. Remove the paper backings on the standoffs and mount them to the back of their pots.
3. Put the cover on and screw it down.
4. Apply the rubber feet.
5. Turn on your amp and rock out.

Is your pedal working? Here's a few common mistakes:

1. **No sound at all in either the bypass or on position.** If you aren't getting sound in bypass then you did not wire your footswitch correctly. Getting the bypass to work is the first thing you need to worry about.
2. **Bypass works and the LED lights up when "on", but there's no sound.** You either have a problem with the wiring from the in to the out of the circuit board and foot switch. The green wire is the in and the brown wire is the out. Or you have a problem with something on the circuit board.
3. **Bypass works, but there's sound when on and the LED does not come on.** You probably aren't getting any power to the circuit. Check all the black and red wires.

If none of this helps, and you can't seem to figure out the problem, I always find that it is best to just set the pedal aside for a day or 2 and then come back to it with a fresh pair of eyes. Then the problem usually jumps right out at you....usually.

If you still can't get it working, start a thread on the BYOC forum and ask for help.