Mattson kit general build notes

So, You want to build a kit...

Building a project from a kit can be fun and rewarding. It also helps provide a feeling of accomplishment as well as sheer terror, frustration and disappointment if it's not done correctly.... At that point, the cost savings and good feelings are basically moot.

I recommend that you have a good soldering iron, some good solder that you've worked with before and previous soldering experience before building a kit.

Some kits require more skill than others. If you don't feel comfortable building a particular kit, purchase a completed unit or get your buddy with experience to build it for you.... Don't forget to bring their favorite beverage when you pick it up the next day.....

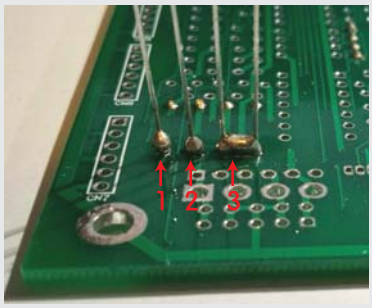
Follow the provided instructions. Pay attention to part values and any parts that require specific orientations. Placing wrong value parts or, placing them backward, won't make the circuit work better, if at all. Sometimes, it will smoke or catch fire. It's probably best to just do it correctly and avoid all the fun stuff.

The best soldering iron is one with a small, chisel tip and adjustable temperature control. A solder pencil can run too hot and damage components and/or ruin the circuit board traces.

I prefer a thin solder wire. It makes it easier to get into tight spots and control the amount of solder used. I like 60mm diameter or, 0.025 inch. For leaded solder, a 63/37 alloy minimizes the "plastic state" time when cooling. going from a liquid to a solid faster. That minimizes the possibility of cold solder joints. Use an iron temperature of 700F/370C for leaded solder.
If you use a lead-free solder, use an iron temperature of 725F/385C.

Keep your iron tip clean. With leaded solder, clean it often with a damp sponge or a cleaning mesh. Also, clean it before putting it in the iron holder. Leaded solder flux will blacken and get on the circuit board.
The procedure is different for lead-free solder. The iron tip will oxidize if the tip isn't kept "wet" with solder and eventually won't melt the solder (reduced heat transfer) Clean the iron tip just before use, melt a little solder on the tip immediately and leave a ball of solder on iron tip while the iron is in the iron holder.

Clipping leads. After you have completed soldering components to the circuit board, you will have to clip the excess component leads. I suggest a wedge cut wire cutter rather than a flush cut wire cutter. The lower wedge will generally ride up the solder cone and clip the lead at the top of the cone. I've seen people trim with flush cut wire cutters that trim the wire off at the solder pad level, cutting off the solder at the same time. A solder joint requires a connection between the entire solder pad and a small part of the component lead. If there is no connection, it's like turning off a switch. Please leave a small volcano above the solder pad.



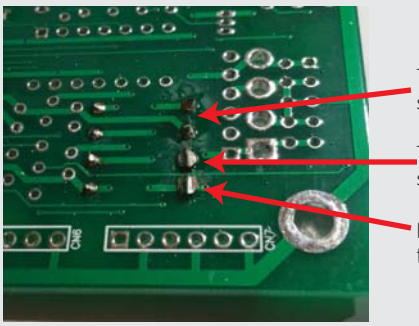
Please wear safety glasses. flying leads can ruin your day. I manipulate my wire cutters with my fingers and palm, leaving my thumb free to put over the lead end before clipping.

Soldering examples of what not to do

1: **The Persian prayer temple job:** Not heating the solder pad and component lead simultaneously results in a solder blob on the component lead just above the solder pad. It won't work. Reheat the solder blob and the solder pad until the solder flows on the pad.

2: **The big ole solder blob.** Don't worry about it unless it's touching another pad. You can fix it later.

3: **The bridge.** This is the big ole solder blob on steroids. It connects two pads that shouldn't be connected. Use a solder braid or solder vacuum to remove the excess solder.

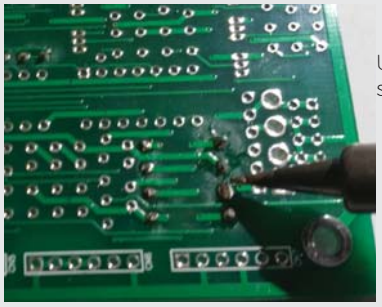


Fixing them

This shows the bridge with the excess solder removed and enough solder to make a good solder joint.

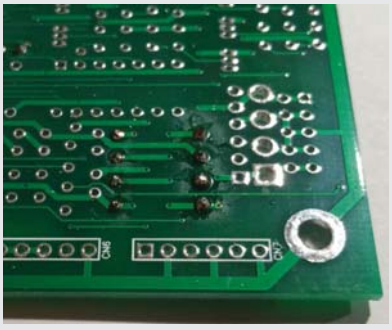
The excess solder on the solder blobs was trimmed off using wire cutters creating a chisel shape.

It also shows the prayer temple reheated, which converted it into a big ole solder blob and trimmed to a chisel shape.



Using the solder iron, heat up the chisel shaped solder joints to reflow the solder.

Fixed



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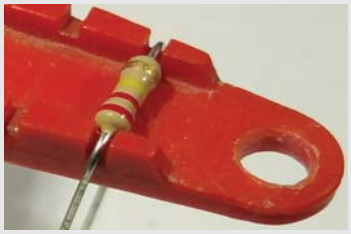
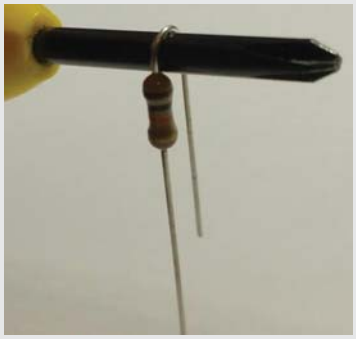


Resistor, diode lead spacing

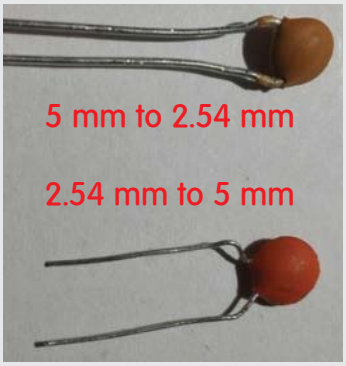
The majority of diode and resistor lead spacing on Mattson kits is 0.4 inches. If you have a bending jig, use the .4 slot.



End mounted resistors

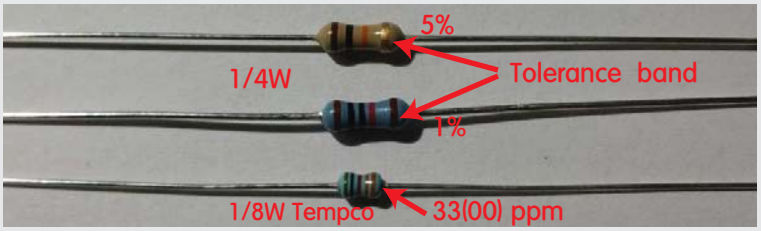
On advanced circuit boards with a large component count, we mount the resistors on one end and bend the other lead 180 degrees in order to fit a smaller lead spacing pattern.

I like to use a small screwdriver shaft or ball point pen cartidge as a bending jig. I like nice, curved leads. It keeps stress off of the lead/body junction of the resistor and gives good test lead points for measurements. (It also looks better)



Capacitor lead spacing

The majority of capacitor lead spacings on the circuit boards are 0.1 inch or, 2.54mm.
Occasionally, component sources are out of stock and a capacitor will be supplied with a larger or smaller lead spacing.
Bending the leads closer or, spreading the apart to fit the pad spacing is acceptable and won't change the circuit operation.
The critical part is verifying the capaicitor value.

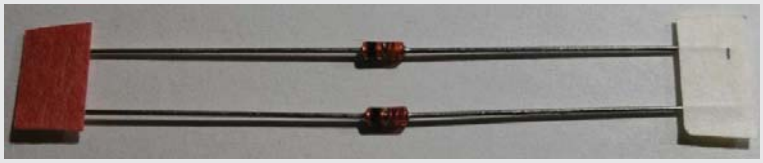


Resistors

Resistors slow down current. Learn the color code. Also, there's not a good standard for color band shades. So, red and orange may be hard to tell which is which. Same with Black, Brown, Violet. Make sure you have a meter to check if in doubt.
Putting a particular value in the wrong spot will cause the circuit to not work correctly.

Diodes

Diodes are cool. They're the one-way valve of the electronics world.
If they're installed backward, they won't work correctly.



Zener diodes

Zener diodes look like normal diodes and will act like a diode when forward biased. They're real crappy for blocking current. They leak. But, they hold a voltage level well that way. Because they suck, they're used for voltage regulation and references.
Don't mix them up with a normal diode.

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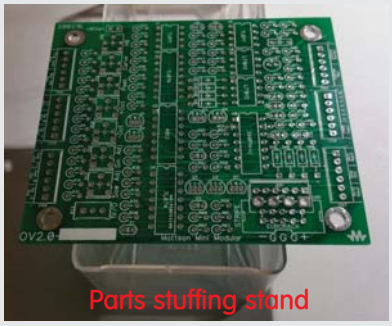
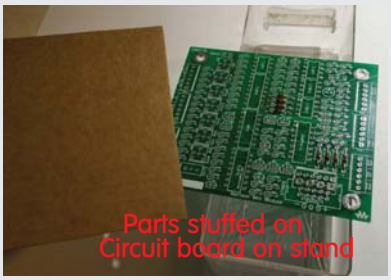


Construction stand

It helps during constuction to have a stand to elevate the circuit board while inserting components.
A stand will allow the component leads to extend through the pads to allow the component to seat properly.

I use an empty plastic parts drawer. the sides are thin enough to not interfere with the parts and elevates the circuit board nicely.

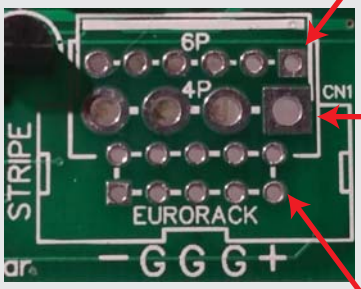
Flipping the circuit board



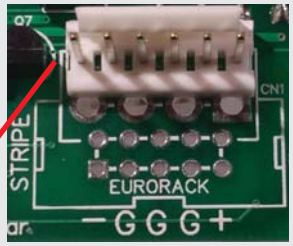
After a number of parts have been inserted into the circuit board, the board will have to be flipped without spilling the parts you worked so hard to place correctly. I cut a piece of cardboard the size of the circuit board, place it over the parts and turn it over while laying it on the work bench.
The build sequence instructions start with the lowest profile components and work to the higher profile parts.

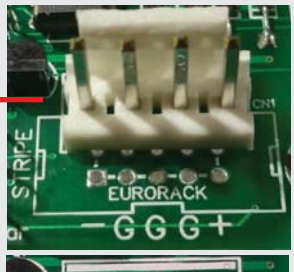
Power options

Choose your power!



Multi-connector power pad





The kits can work on any of the current power "standards".
The only difference in operation is that as the supplied power voltage gets lower, oscillators and clocks will cycle faster.
It's like bouncing a ping pong ball between the paddle and the table. The closer to the table the paddle gets, the ball bounces faster between the paddle and the table.
Think of the paddle as the supply voltage, the table as ground and the ball as the produced cycling waveform.

We've created a power pad that will accept a 6-pin, +/- 15V connector (Dotcom, MMM), 4-pin +/-15V power (most 5U) and the 10-pin +/-12V power connector. (Eurorack).

The polarities are clearly marked. Eurorack uses the power ribbon stripe on the -12V side of the connector. The header is keyed and the stripe location marked.