Power Supply Assembly Instructions

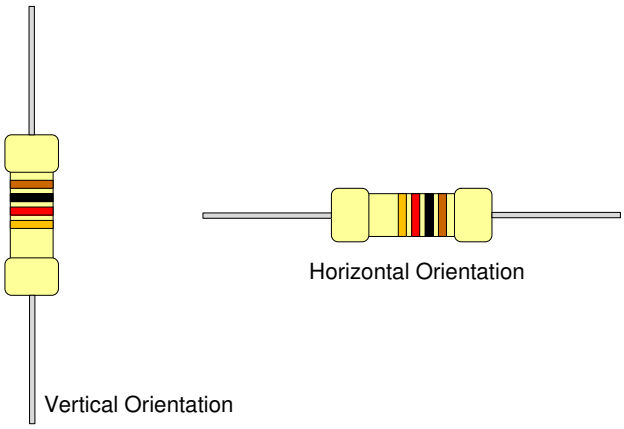
Read This Before You Begin

1. Hold the PCB by the edges and avoid touching the PCB pads with your fingers until you are ready to assemble. Dirt and oils from your hands can make soldering difficult resulting in weak joints.

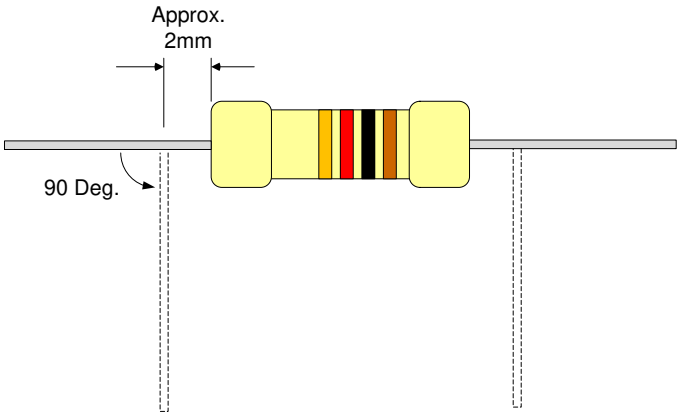
2. Before you begin soldering, lightly wipe both sides of the board with a micro-fiber cloth to remove any contaminants that may have ended up on the board during packaging. Avoid dragging the cloth across the board edges.

3. **Soldering fixed resistors**

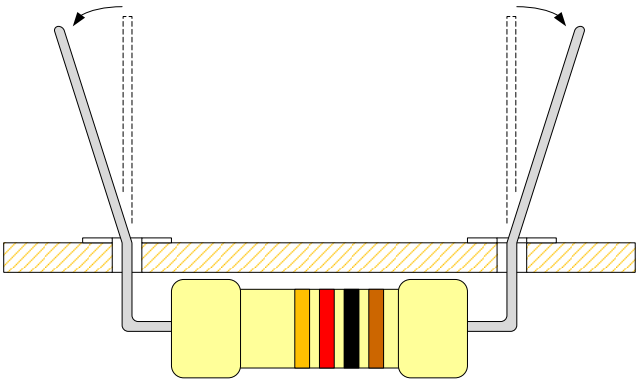
   A. Although it's not absolutely required, the project will look nicer and part values are easier to read if resistor color codes are oriented the same direction for horizontal and vertical orientations as indicated in the illustration below. It's your choice which direction to use as long as you are consistent.



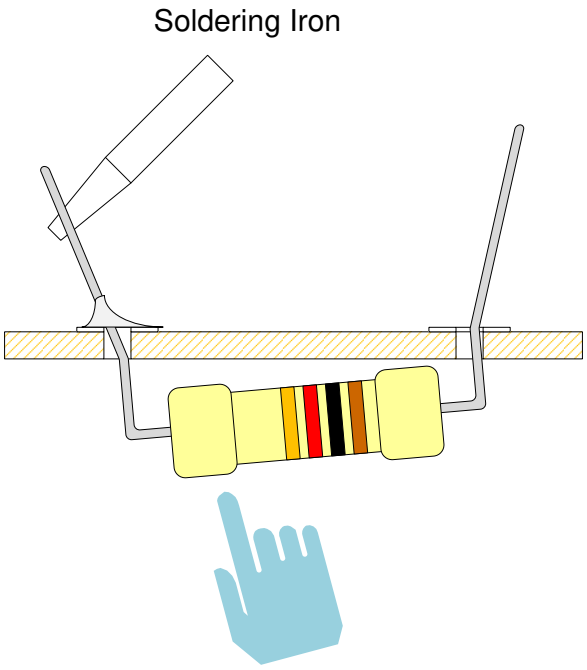
   B. Bend fixed resistor leads approximately 2mm from the resistor body at a 90 degree angle. You want the fixed resistor lead spacing to be just slightly longer than the PCB hole spacing so the resistor stays in place when fully seated against the board. This will make leads easier to solder.



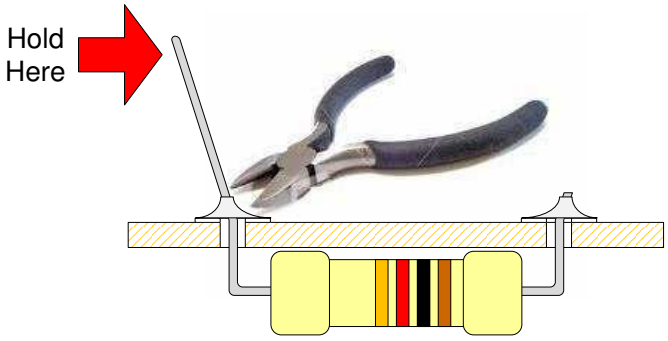
C. If the resistor is loose and tends to fall out when you turn the board over to solder, bend the leads out a 30 degree angle so that the resistor is trapped against the PCB.



D. Solder one resistor lead to the PCB first, then check that the resistor is fully seated against the board. If the resistor is fully seated, solder the other lead. If it isn't, push lightly against the resistor body while applying the soldering iron to the soldered resistor lead so that the solder melts and the resistors seats against the board. Then solder the remaining lead. <u>Be careful not to burn your finger as the resistor will get hot while soldering.</u>

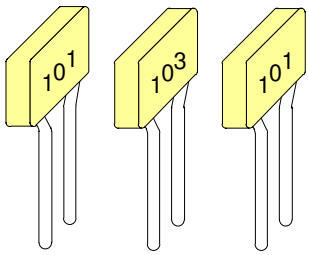


E. Clip the resistor leads flush with wire cutters using one hand while holding the lead being cut with the other hand. This will prevent sharp wire bits from flying around the room and becoming an eye hazard.

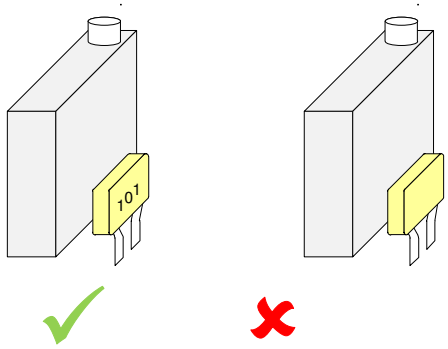


4. Soldering Multi-Layer Ceramic Capacitors (MLCC)

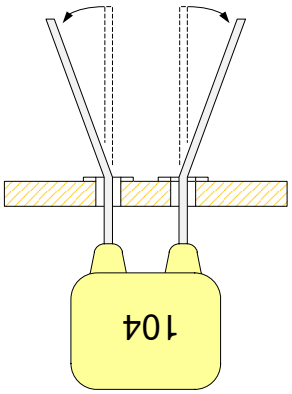
A. Although it's not absolutely required, the project will look nicer and parts are easier to read if capacitor values face the same direction for horizontal and vertical orientations as indicated in the illustration below. MLC capacitors do not have a polarity so it's your choice which direction you install them.



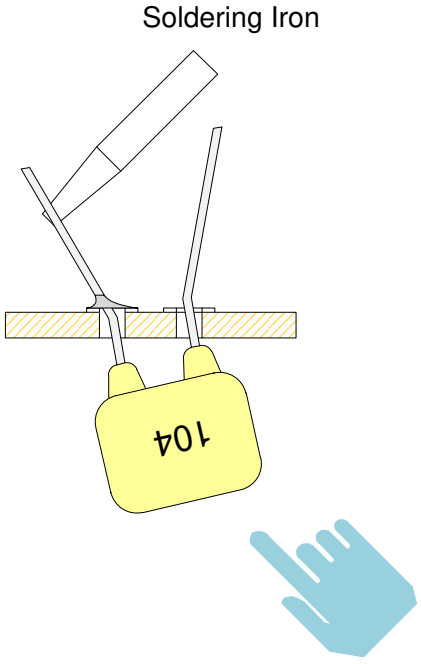
B. The exception to the suggestion above is when an MLC capacitor is close to a variable resistor, transistor, or other component that obscures one side of the capacitor. Try to orient the capacitor so that the capacitor value can be seen.



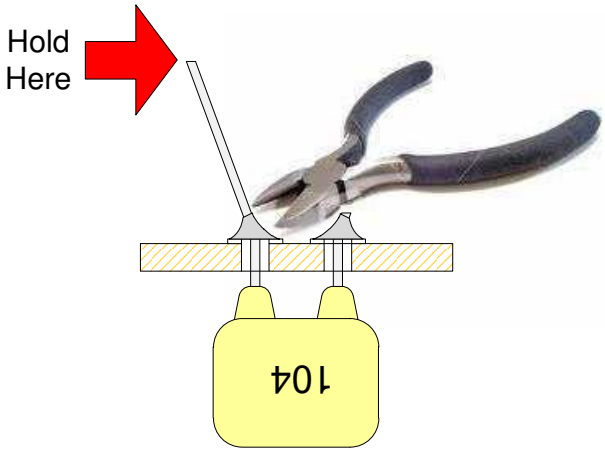
C. Insert the MLC capacitor into the circuit board and bend the leads out a 30 degree angle so that the capacitor is trapped against the PCB. Leave the coated portion of the leads above the circuit board.



D. Solder one capacitor lead to the PCB first, then check that the capacitor is properly seated on the board. If the capacitor is properly seated, solder the other lead. If it isn't, push lightly against the capacitor body while applying the soldering iron to the soldered capacitor lead so that the solder melts and the capacitor seats properly on the board. Then solder the remaining lead. <u>Be careful not to burn your finger as the capacitor will get hot while soldering.</u>

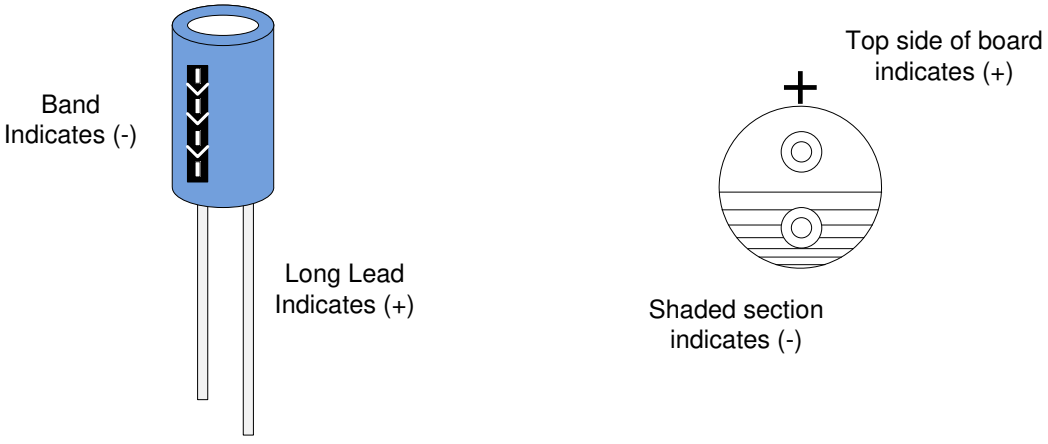


E. Clip the capacitor leads flush with wire cutters using one hand while holding the lead being cut with the other hand. This will prevent sharp wire bits from flying around the room and becoming an eye hazard.

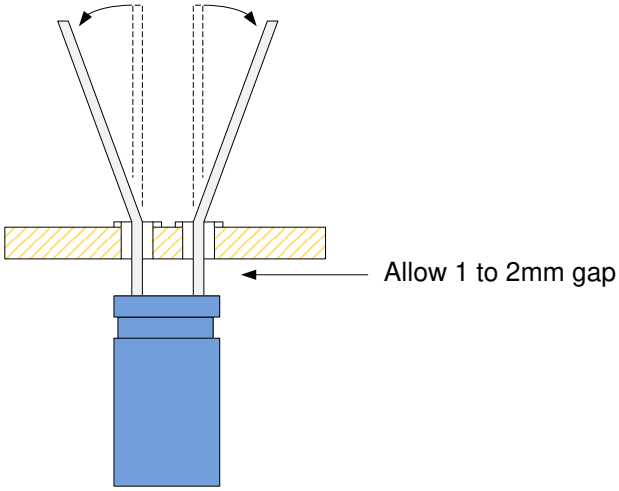


5. Soldering Electrolytic Capacitors

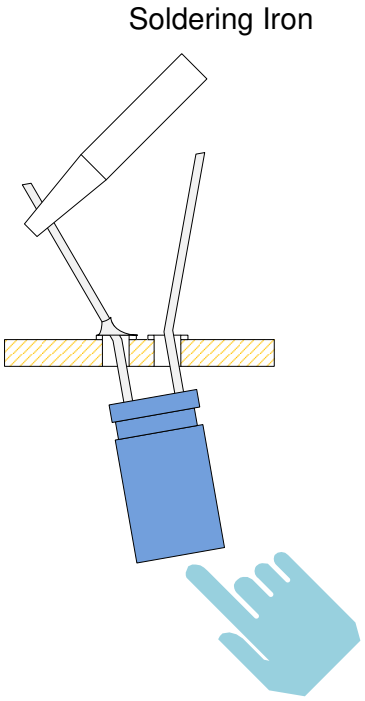
A. Electrolytic capacitors have a polarity that must be observed or the device can self-destruct when power is applied. New capacitors are shipped with one lead longer than the other. The long lead indicates the positive (+) terminal of the capacitor. The capacitor will also have a band on its body that indicates the negative (-) lead. The PCB will denote which lead goes into which hole. The component side of the board will denote the part value and a (+) polarity marking near the hole where the (+) lead on the capacitor will go. <u>Check and double-check capacitor polarity before soldering</u>.



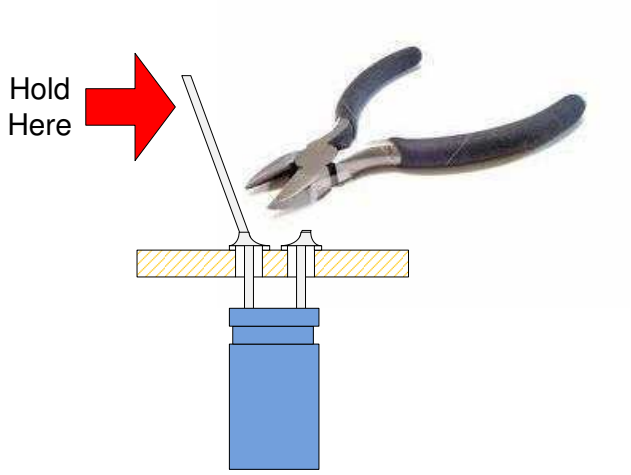
B. Insert the electrolytic capacitor into the circuit board and bend the leads out a 30 degree angle so that the capacitor is trapped against the PCB. Leave 1 to 2mm of lead length above the circuit board. This reduces the possibility of stress related seal failure at the component leads that could result in electrolyte leakage and capacitor failure later on.



C. Solder one capacitor lead to the PCB first, then check that the capacitor is properly seated on the board. If the capacitor is properly seated, solder the other lead. If it isn't, push lightly against the capacitor body while applying the soldering iron to the soldered capacitor lead so that the solder melts and the capacitor seats properly on board. Then solder the remaining lead.

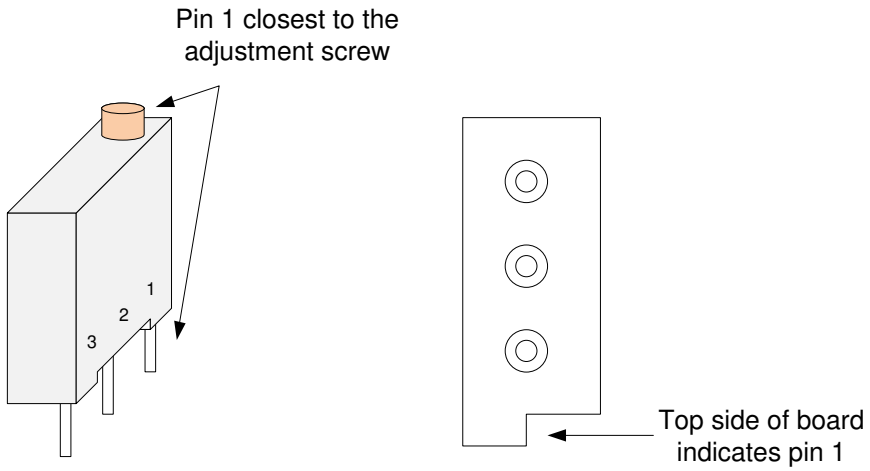


D. Clip the capacitor leads flush with wire cutters using one hand while holding the lead being cut with the other hand. This will prevent sharp wire bits from flying around the room and becoming an eye hazard.

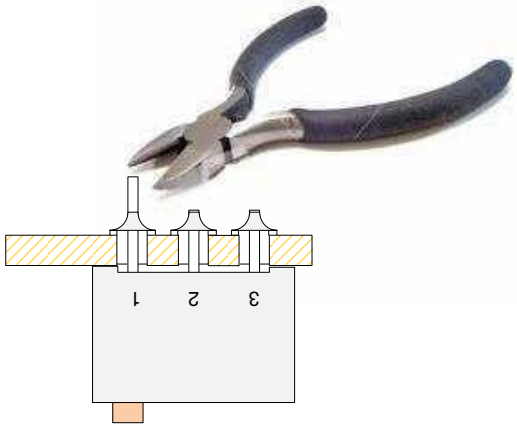


6. Soldering 20-Turn Trimmer Potentiometers

A. Potentiometers are 3-terminal devices composed of a resistive element and a wiper element. On most potentiometers, terminals 1 and 3 are used for the fixed resistor element and terminal 2 is used for the wiper element. In order for the circuit to work properly, potentiometers must be installed onto the PCB correctly. Pin 1 on the potentiometer can be found nearest the adjustment screw and is labeled on the body of the potentiometer. A square pad on the PCB denotes where potentiometer pin 1 is to be inserted.

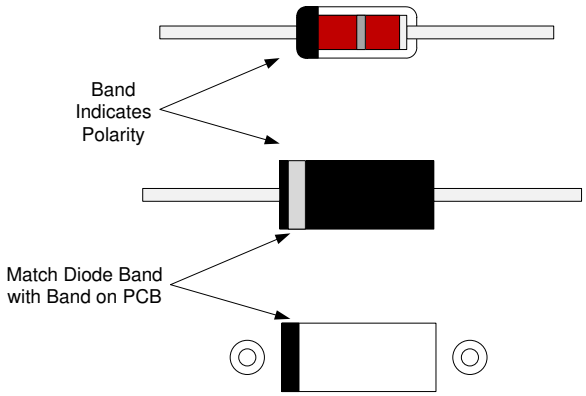


B. The 20-Turn potentiometers will fit flush with the PCB and are soldered in using the same process for a resistor or capacitor. Trim the leads flush with the solder joint.

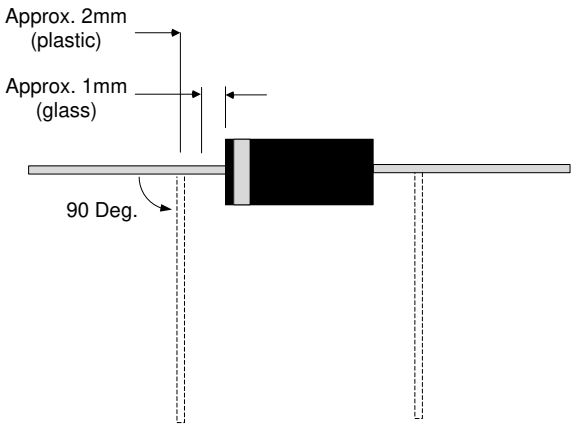


7. Soldering Diodes

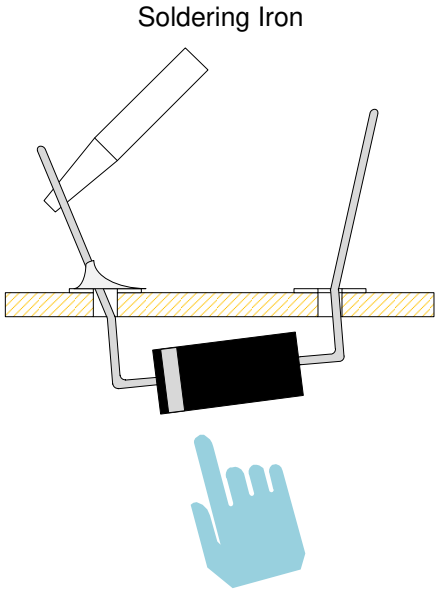
A. Diodes are 2-Terminal devices that allow current to flow in only one direction. They must be installed correctly on the PCB or the circuit will not work and the diode could possibly self-destruct. Diode polarity is always marked with a black or silver band at one end.



B. Bend leads approximately 1mm-2mm from the diode body at a 90 degree angle. You want the diode lead spacing to be just slightly longer than the PCB hole spacing so the diode stays in place when fully seated against the board. This will make leads easier to solder. Use caution when bending leads on glass body diodes as they are easily damaged.



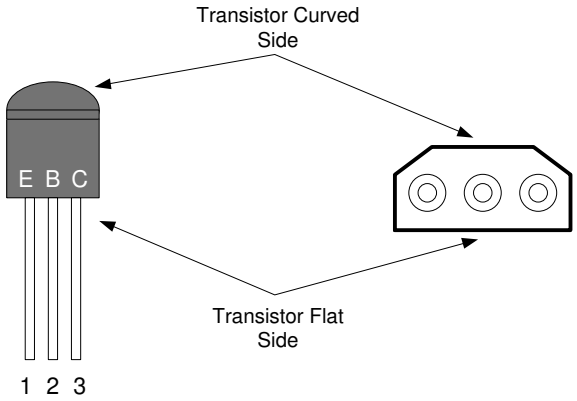
C. Solder one diode lead to the PCB first, then check that the diode is fully seated against the board. If the diode is fully seated, solder the other lead. If it isn't, push lightly against the diode body while applying the soldering iron to the soldered diode lead so that the solder melts and the diode seats against the board. Then solder the remaining lead. <u>Be careful not to burn your finger as the resistor will get hot while soldering.</u>



D. Clip the diode leads flush with wire cutters using one hand while holding the lead being cut with the other hand. This will prevent sharp wire bits from flying around the room and becoming an eye hazard.

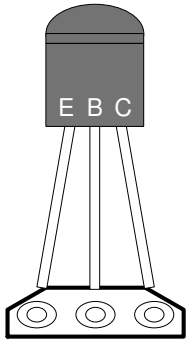
8. Soldering Small Transistors

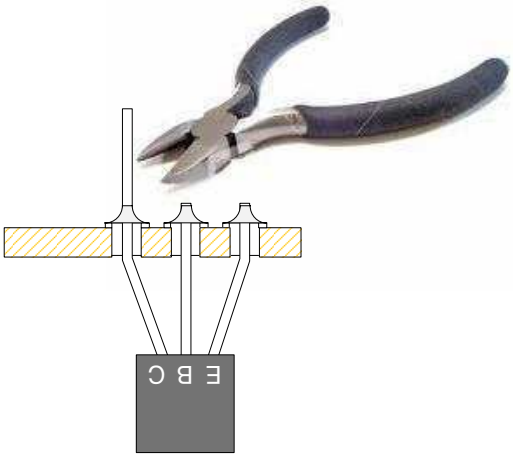
A. Transistors are 3-Terminal devices that must be installed correctly on the PCB or they can self-destruct when power is applied. The transistors used in this project are plastic TO-92 case style with the following standard pin-out:



Transistor outline on component side of board indicates proper transistor orientation

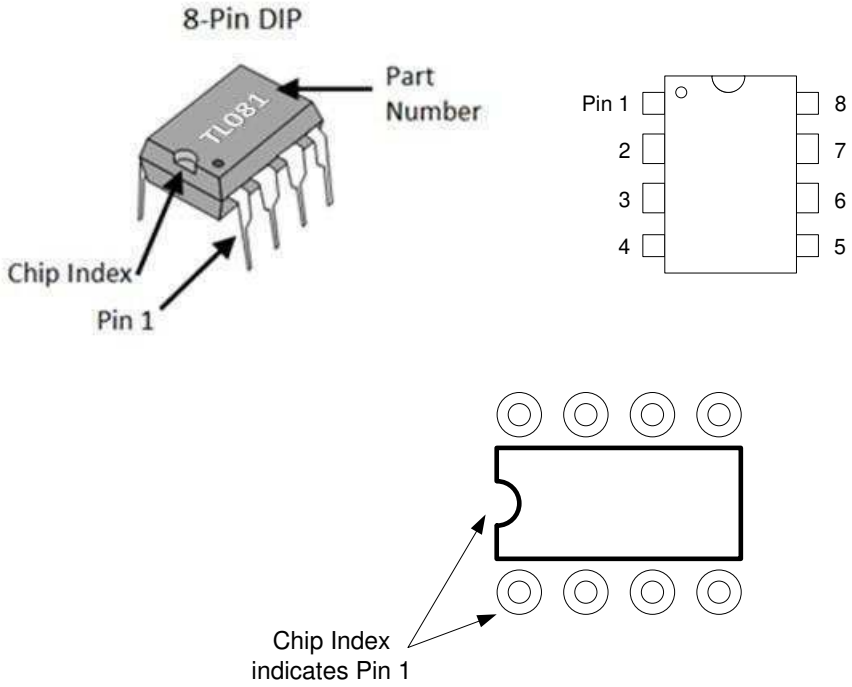
B. Orient the transistor according to the silkscreen diagram on the component side of the board. Allow about 6mm space between the PCB and the bottom of the transistor. The transistor PCB pads are spaced wider than they are at the transistor case to make soldering easier. Simply spreads leads 1 and 3 apart and insert into the holes in the PCB. Transistors are soldered in using the same process for a resistor or capacitor. Trim the leads flush with the solder joint.



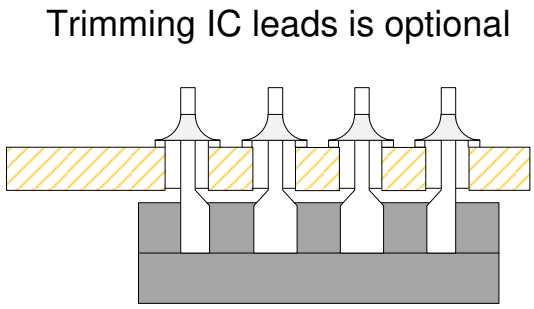


9. Soldering Integrated Circuits

A. Integrated circuits take many different forms, but the most common through-hole IC packages are the 8-pin DIP, 14-pin DIP, and the 16-pin DIP. Integrated circuits have an index mark that indicates where Pin-1 of the IC can be located. The index mark can be a dot, an embossed circle, or a notch near pin one of the IC. ICs must be installed correctly on the PCB or they can self-destruct when power is applied.

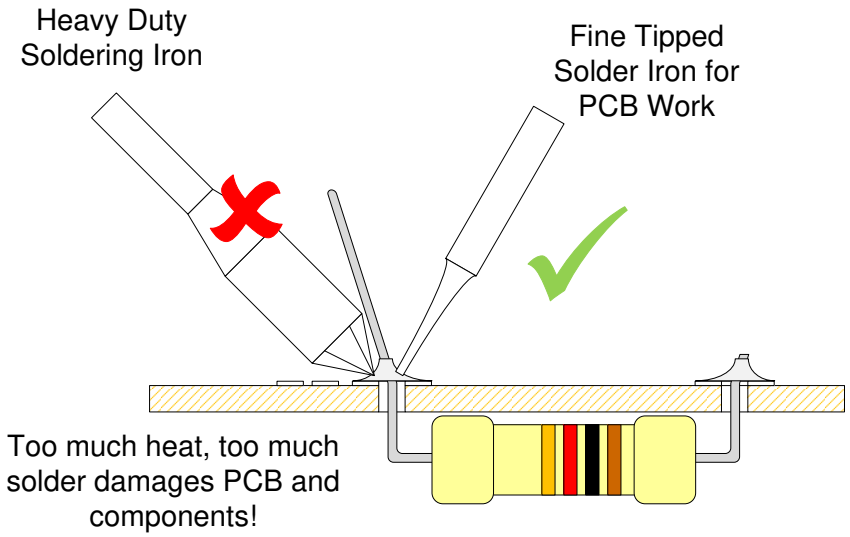


B. Orient the IC according to the silkscreen diagram on the component side of the board. Align the IC pins with their hole in the PCB and carefully press the IC all the way down. Check carefully while inserting the IC that a pin doesn't get folded up under the IC body. Verify that all pins are sticking up through the trace side of the PCB. Bend Pin 1 and Pin 5 outward slightly to make sure the IC remains in place while soldering, then solder all remaining pins in sequence. It is usually not necessary to trim the IC leads.



10. General Soldering Tips

A. A fine-tipped soldering iron and .8mm diameter rosin core solder are recommended.



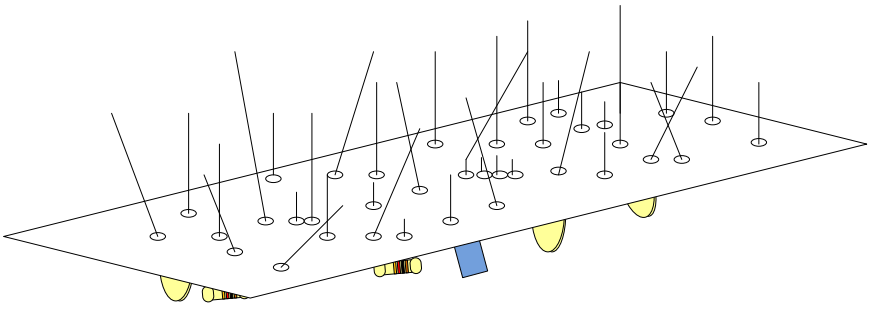
B. A brightly lit workspace with plenty of room for the PCB, soldering station, parts, and schematic (printed or on a laptop) is strongly recommended.

C. A 3X or 5X optical lens is recommended to closely inspect parts and connections after the PCB is completed.

D. The light blue body and small size of 1/4W 1% resistors makes it difficult to distinguish the individual colors of the 5-band color code. The kit includes a color code card for reference, but it is highly recommended that you verify the resistor value with an Ohm Meter before soldering the part in place.

E. Regularly clean the soldering iron tip with a wire sponge (recommended), wet synthetic sponge, or wet paper towel. Try to keep the soldering iron tip bright and clean with no solder blobs or flux dross adhering to it while soldering components on the PCB.

F. Insert no more than 3 or 4 parts on the board at one time. It is very difficult and frustrating to maneuver the soldering iron for the best position while keeping all the parts from falling out.

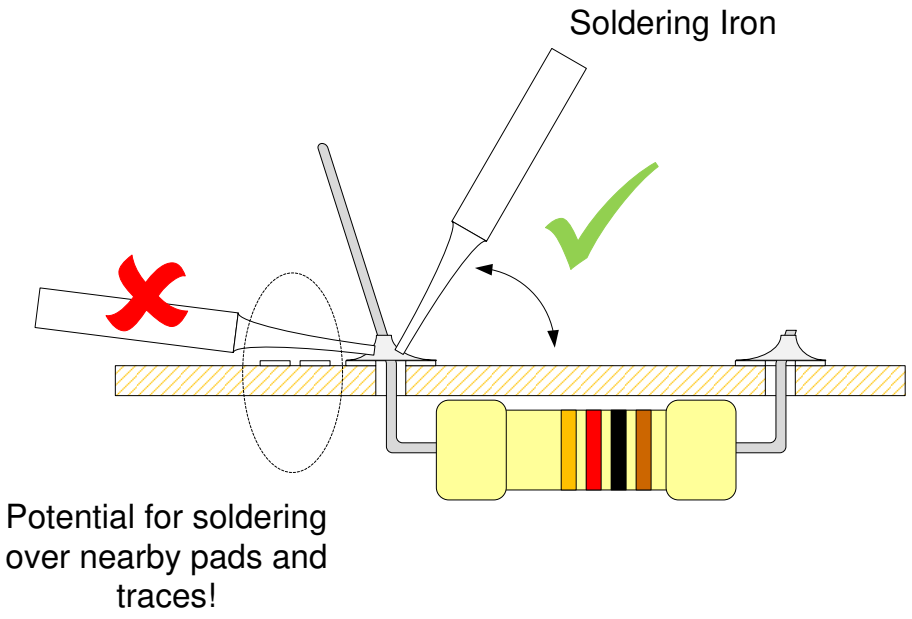


Does not look like a fun job.

G. Solder the parts that lay closest to the board first (glass diodes, resistors) and then move up to the larger components. Below is a suggested IC's, small capacitors, then transistors, and finally potentiometers, large capacitors, and power transistors. This allows the board to rest mostly flat while soldering making the job much easier.

H. For each part type (resistors, capacitors, etc.) start with the lowest part numbers first and work your way up. This helps avoid missing a part and having to go back and solder it in later. It also helps avoid soldering a part in the wrong position.

I. Keep the soldering tip at a high angle to the PCB when soldering parts on the board. This helps avoid unwanted solder bridges to nearby pads.



J. Before applying the soldering iron, look for a location to place the tip that is farthest way from other pads if possible. This helps avoid unwanted solder bridge to nearby pads.

K. Take a break every 30 minutes. Soldering is hard work. Your hand will be steadier and your eyes more focused if you rest for 5 minutes between assembly steps.

L. Don't try doing PCB work on an empty stomach or without any sleep. Get something to eat and drink, then do the work. Get a good night's sleep and then do the work. Your hand will be steadier, your eyes more focused, and your mind more relaxed and less prone to frustration or panic.

Work slowly and carefully. Check and double-check before applying the iron.