Metal Detector

version 1.2

Build Instructions

FOUR BIT INDUSTRIES.COM

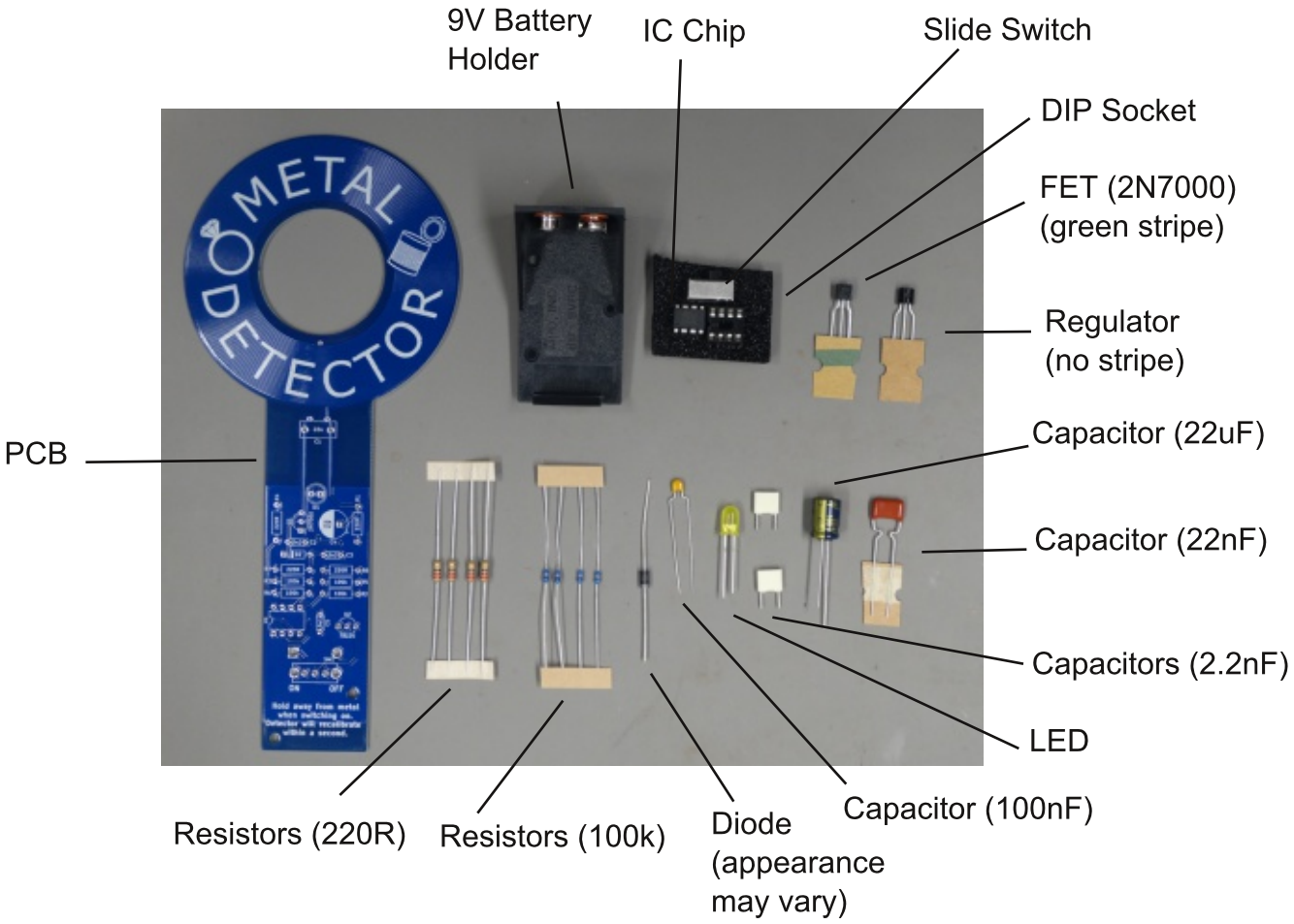
Thank you for purchasing our metal detector kit. The instructions below will show you the proper placement of all parts into the PCB. Be sure to follow the directions closely as many parts are polarized and will not work if inserted backwards.

If you've never soldered before, consider taking a class at your local hackerspace! We have found a good introductory video from curiousinventor.com on youtube at https://youtu.be/IpkkfK937mU or by following the QR code at right.

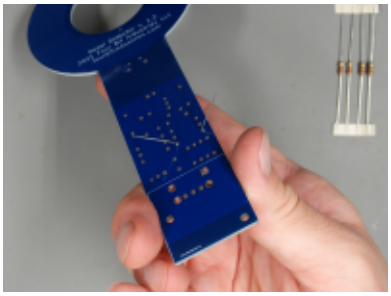
WARNINGS

Always follow best safety practices for soldering, including the wearing of eye protection and adequate fume extraction. This kit is not for children.

1. Verify the parts in your kit.

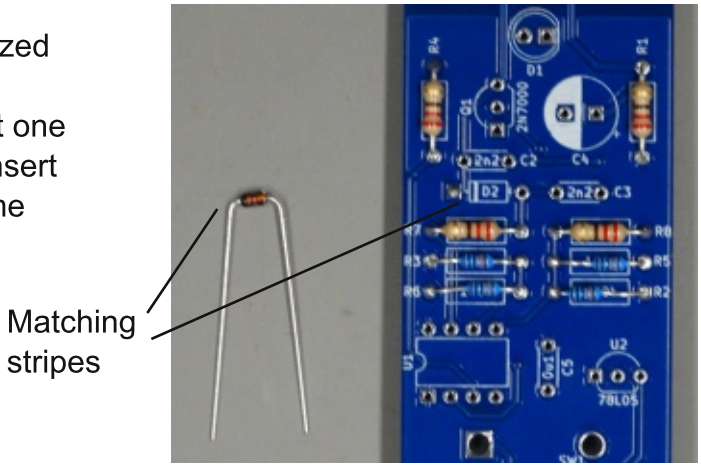


2. Start by placing and soldering the four 100k resistors. These resistors have a blue body. Look for footprints marked R2, R3, R5 and R6. Each should have "100k" written inside a rectangular box that represents the body of the resistor. Bend the leads of each resistor and insert them into the holes at the end of each box. Insert the resistors from the front and solder them at the back as shown in the photo. Resistors are not polarized so they can be inserted either way around. Once inserted, you can bend the leads out slightly to hold them in place for soldering. You can tape the PCB down to your work surface so it doesn't move while soldering.

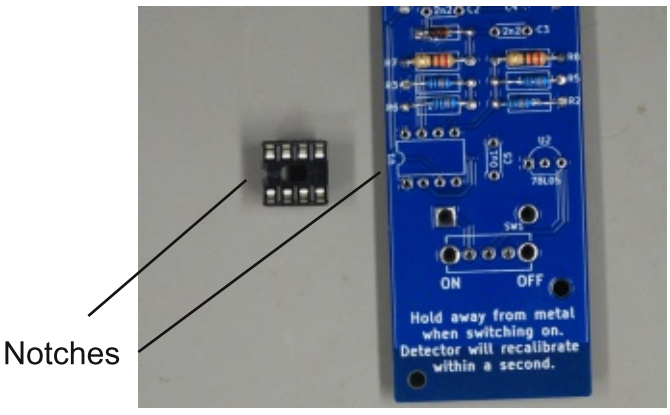




3. After the first four resistors, you can place and solder the 220 ohm resistors. These are in locations R1, R4, R7 and R8. All should have "220R" written inside the footprint. The resistors have tan bodies to help distringuish them.

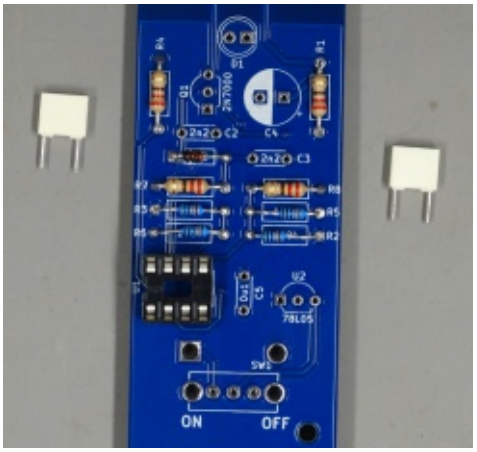
4. Next you can insert the diode. Diodes are polarized so you must insert it the right way around. Locate footprint D2. You will notice a heavy white stripe at one end. This matches the black stripe on the diode. Insert the diode so that the stripes are pointed in the same direction.



5. The DIP socket also must be inserted the right way around. Locate the footprint marked U1. You will notice a notch drawn in one end of the footprint that matches a notch in one end of the socket. Insert the socket so the notches line up. You can tape the socket into place for soldering. Solder just one lead and check the socket again to make sure it is flush against the board. If it isn't, you can reheat the solder and push it into place with a heat-safe tool.

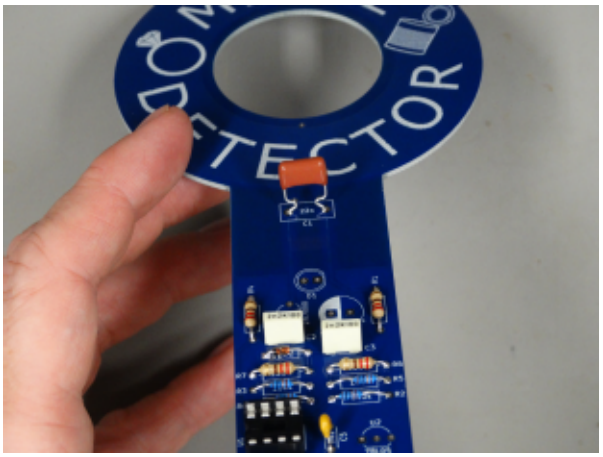


5. The two white film capacitors (2.2nF) are not polarized and can be inserted into footprints C2 and C3 either way around. The leads on these components are short, but you should be able to bend them to hold them in place for soldering.



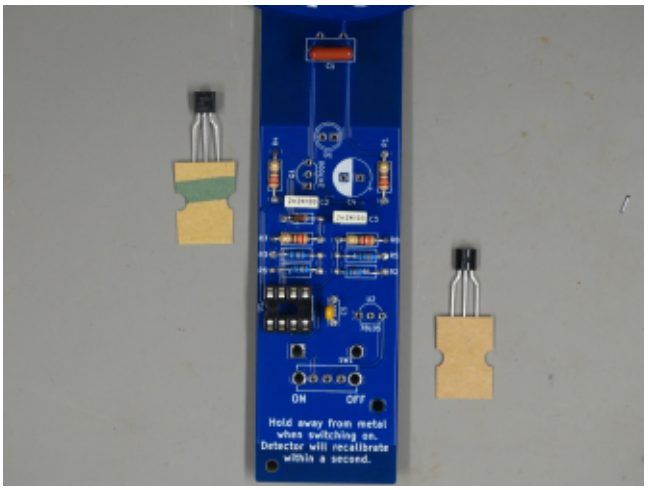
6. The tan bodied capacitor (100nF) is also not polarized and can be soldered into C5, next to the IC socket.

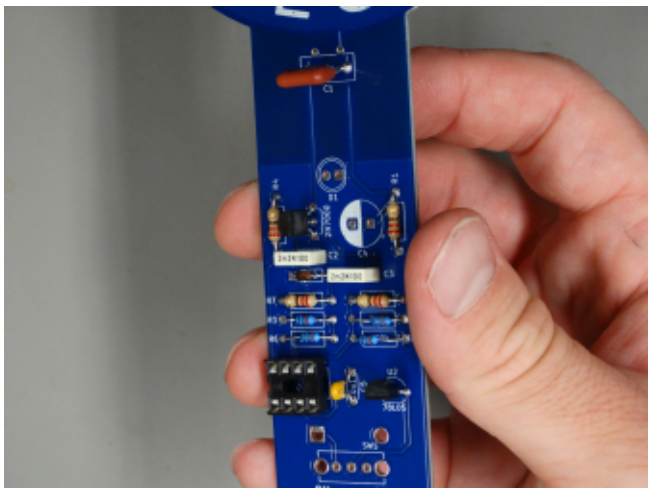
7. The last non-polarized capacitor (22nF) is larger and brown. It may have bent leads. Simply insert it as far as it goes into C1 and bend the leads out to hold it in place for soldering.



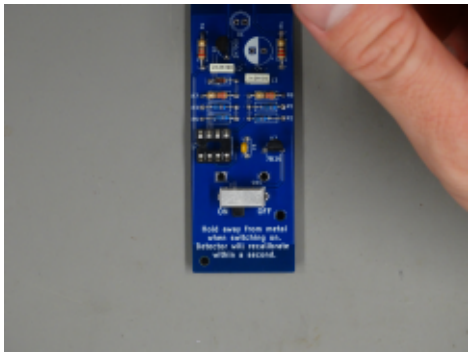
8. There are two parts with three leads that look identical but are very different. One is the 2N7000 FET, which we have marked with a green marker. Insert this part into footprint Q1 so that the flat face of the package points the same direction as the flat line on the footprint.

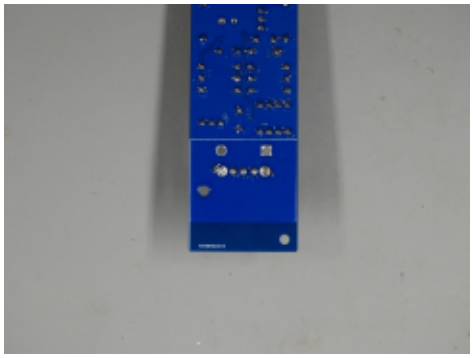
The other part is the 78L05 voltage regulator. It should be inserted in footprint U2 in a similar fashion. If you lose track of which part is which, you can read the part number which is written in small type on the flat face.



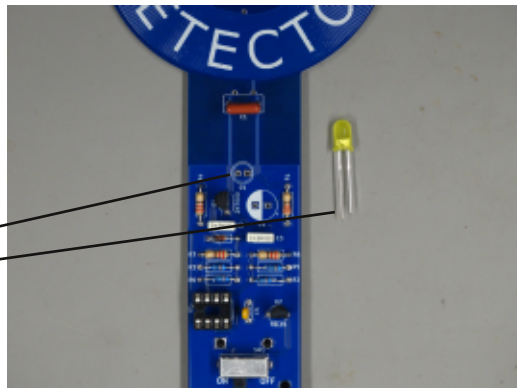


9. Next we will insert and solder the slide switch. The toggle on the switch should point down, towards the on and off labels. It is easiest to tape this part in place for soldering. Be sure to solder the three pins and also the two large legs. You will need more heat and solder for the legs. Make sure to have the iron touching both the leg and the pad and give them a few second to heat before flowing in solder.

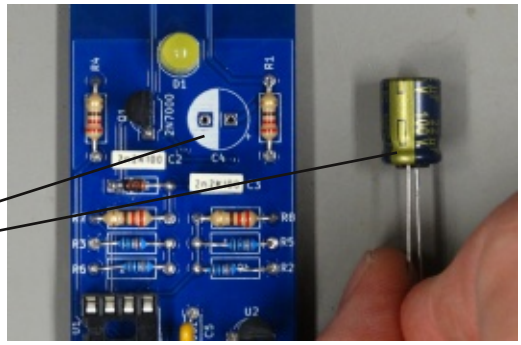




10. The LED, like all diodes, is polarized and has to be inserted correctly. There is a long leg and a short leg to the LED. On footprint D1 you will see a round pad and square pad. The long lead should be soldered to the round pad. The short lead should be soldered to the square pad.

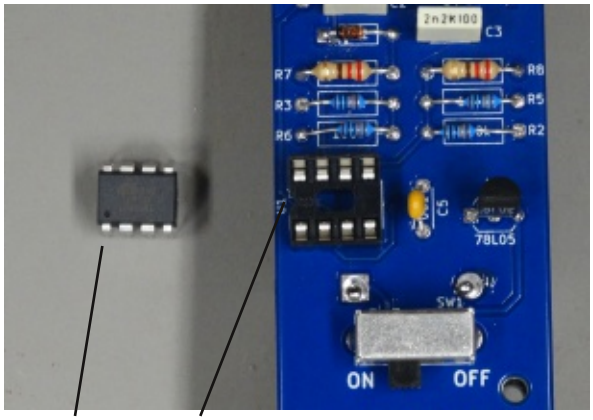


11. The electrolytic capacitor (22uF) is also polarized. If you look at the package, you will see a stripe down one side marked with negative signs. The side with the stripe matches the white-shaded half of foorprint C4.



12. The last component to solder is the 9V battery holder. This component should be inserted from the back of the PCB and soldered at the front of the PCB. Although screws are not provided, you can use a 2-56 x 5/16" screw and nut through the mounting holes for added strength. The holes for the two leads are large and will take a litle more solder that others.

13. Finally, we need to insert the IC chip. The chip will either have a notch at the end, or it will have a dot near pin 1. Either way, the notch or dot needs to be near the notch on the DIP socket. Your chip will probably have legs that are slightly splayed out. To straighten them, you can gently roll the chip on its side against the table to straighten all the pins at once. Then you can do the same for the other side. Be sure to insert the chip the right way around or it could be damaged.



Dot Notch

To use the metal detector, attach a 9V battery (not included). The metal detector calibrates itself in the first second after it is turned on. Hold the metal detector away from all metal and nearby RF sources for at least one second as you switch it on.

The LED will light when the detector is near metal. Large pieces of metal can be detected up to a foot away, while smaller pieces of metal will only be detected at close range.

If the LED remains lit when the detector is not near metal, try turning it off and back on to recalibrate it.