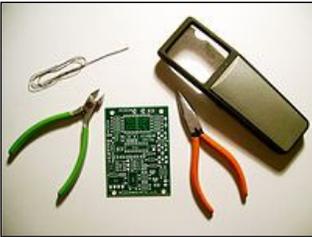


# Assembling the Digital Bat Scanner

## Circuit Board Assembly - Step-By-Step ...

**Special Note:** The circuit board that the BatScanner uses is a four-layer board, with internal ground and power planes. Unsoldering and removing parts with multiple leads can be very difficult on this type of board, so take your time, and make sure each part is correctly inserted BEFORE soldering. The silk-screened parts layout makes it easier to locate the position of the parts, and the solder mask will help to reduce shorted traces. Still, good soldering skills are required for good results !!

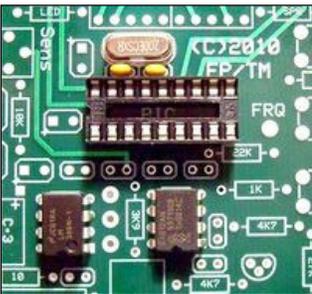
As you go, refer to the [Circuit Board Parts Layout](#) diagram on page 5 for the locations and values of the parts.



First, gather together all the parts and tools you will use in assembling the circuit board.

You will want a good magnifying glass to properly identify some of the parts ( in particular the small ceramic capacitors ). Good lighting at your work place is also essential.

You will need solder, a soldering iron, wire cutters, and a pair of needle nosed pliers. I also find it helpful to use a circuit board vise to hold the board in position while soldering.

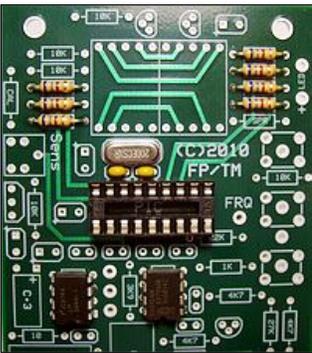


The first part to go on the board is the [18 pin socket](#), followed by the [LM386](#) and [SA612](#) IC's. The notches on these items should be aligned with the notches on the PCB outlines.

This is also a good time to install the [20 MHz crystal](#) and its two [22pF](#) capacitors, as it would be more difficult when the 7 segment LED's are in place.

The two [22pF](#) caps will be marked [220](#) ... use the magnifier !

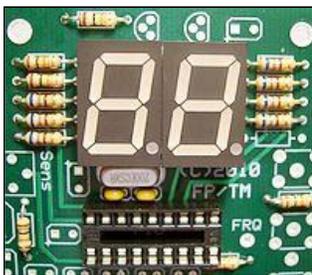
**Be sure to use the mylar insulator ( see image at right ) on the crystal ... otherwise the metal case may short out the PCB connections !!**



Next, install the resistors. Most of the resistor positions on the PCB are labeled with the value of the resistor that is placed there .... There are 2 exceptions :

- There are seven resistors labeled as **LED**. The value of these resistors is [680 ohms](#).
- The resistor labeled **XLED** is not normally used, and the spot is left empty.

**NOTE:** As reference, there is a resistor color code chart on page 4 of this manual.



Now is a good time to install the two 7 segment LED displays.

**Note the position of the decimal points !!**

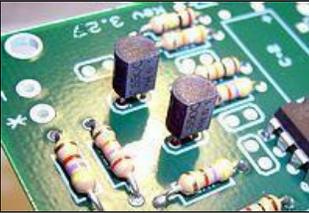
This is one part you really don't want to solder in wrong !

After you have soldered all of the pins on the LED displays, clip off the excess lead lengths on back side of the PC board.



The next step is to sort out the transistors and regulator IC. These look very similar. It helps to note that there are four transistors, and only one regulator IC.

The transistors are clearly marked with [C550C](#) .



Install the four [BC550C](#) transistors on the circuit board in their # marked locations. The silk-screen outline on the circuit board shows their proper orientation.

**NOTE:** This is when you are most likely to create a solder bridge between two pads, as the transistor pads are very close. So don't use too much solder, and be sure to inspect your finished solder joints with the magnifying glass before moving on.

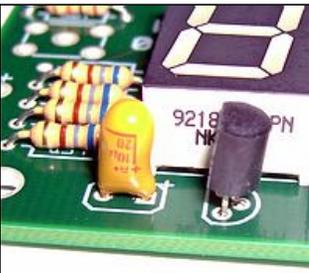


Now install the [LP2950A](#) , a 5 volt regulator IC, on the PCB.

The flat side of the IC faces the outside edge of the circuit board, as shown.



Install the 6 volt, [1N753A](#), glass packaged zener diode ... with the banded end oriented toward the 220 ohm resistor, as shown on the PCB silk-screen.



Next, install the five [10uF](#) tantalum capacitors, as shown on the layout sheet and PCB.

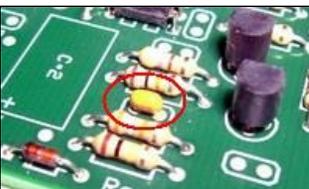
Note in the picture how the positive lead of the cap is marked with a band and + sign. The positive lead is inserted into the square pad on the circuit board, nearest to the + marking.

The polarity of these capacitors is very important, so double check your work !



Break out the magnifying glass ... we're doing the small ceramic caps next.

First find the two [.1uF](#) caps ... marked [104](#) ... and install them in the position shown next to the 18 pin IC socket. Polarity doesn't matter with these caps - they can go in either way.



Next, locate the single [.0047uF](#) cap ( labeled as [4n7](#) on the layout sheet ). The cap will be marked [472](#). ( Don't confuse this cap with the .047uF cap to be installed next ! )

The [.0047uF](#) cap goes between the four resistors next to C-2 on the circuit board.

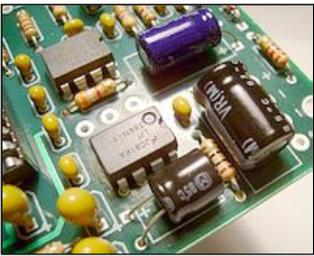


Now find the [.047uF](#) capacitor. It will be marked [473](#).

This cap goes next to the 10 ohm resistor near the 386 amplifier IC



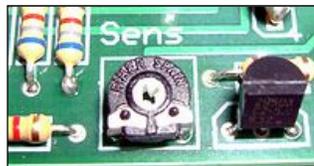
There should be five spots left on the circuit board for the five remaining [.01uF](#) caps. The [.01uF](#) caps are marked [103](#). Once these are in place, the small caps are done.



There are three electrolytic capacitors that need to be installed next. These caps are marked C-1, C-2, and C-3 on the circuit board. [C-1 is a 470uF](#) cap, [C-2 is 220uF](#), and [C-3 is 100uF](#).

**NOTE:** These caps are polarized, and must be installed correctly. The stripe on the side of these capacitors marks the NEGATIVE lead. So, it is the lead WITHOUT the stripe that is the POSITIVE lead, which goes to the square pad on the circuit board marked with the + symbol.

This can be a little confusing, so take your time to make sure you have done it correctly.



The spot for the 1K [SENS](#) potentiometer has five pads. You will only use three of the pads, and which ones depend on the PC Pot that you have. The pot shown in the picture to the left uses three pads on the top and bottom. Set the pot fully CCW with a jeweler's screwdriver.

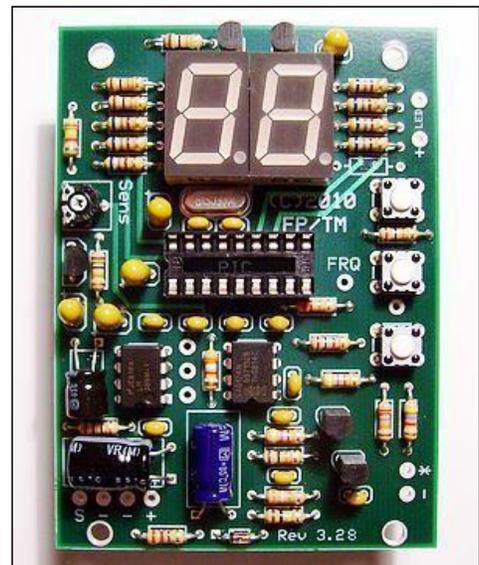
### [Congratulations, the circuit board assembly is complete !](#)

If you wish, you can install three PCB mount pushbutton switches, but they are not really needed.

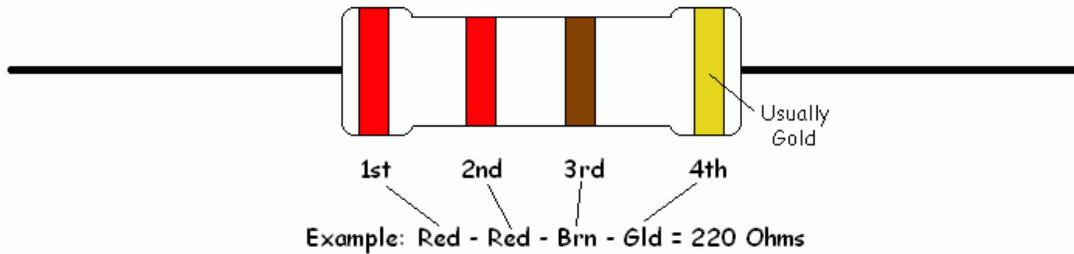
You should also install the PIC microprocessor in the 18 pin socket ... the notch should face the regulator IC.

Give the bottom of the circuit board one last examination. Look for missed solder joints, solder bridges, cold joints, bits of clipped leads that are clinging to the circuit board, and any other irregularity that may need to be cleaned up.

Now you are ready to work on the case.



## Resistor Color Codes Chart



10 Ohms = Brn-Blk-Blk-Gld	4.7K Ohms ( 4K7 ) = Yel-Vio-Red-Gld
220 Ohms = Red-Red-Brn-Gld	10K Ohms = Brn-Blk-Org-Gld
680 Ohms = Blu-Gry-Brn-Gld	27K Ohms = Red-Vio-Org-Gld
1K Ohms = Brn-Blk-Red-Gld	39K Ohms = Org-Wht-Org-Gld
1.5K Ohms ( 1K5 ) = Brown-Green-Red-Gold	100K Ohms = Brn-Blk-Yel-Gld
3.9K Ohms ( 3K9 ) = Org-Wht-Red-Gld	

