# Assembly instructions
for the
QRPme
MATCH-less KEY Kit
Version 2.0
****

The Night Sender Key
is a fully populated version
of the MATCH-less Key Kit.

Step #1: Understanding the circuit.

The MATCH-less KEY is basically a switch made out of two pieces of printed circuit board (pcb) mounted to a block of wood. The printed circuit board (PCB) is snapped into two pieces which are then mounted together using the provided screws. The two washers are used to separate the two pieces of PCB material thereby forming a switch. The switch contacts are made available at the two pads in the rear of the pcb.

Extra pads and circuit traces are on the MATCH-less KEY circuit board and when populated, form an self contained visual Morse Code signaler nicknamed the Night Sender KEY by QRPme. The circuit for the Night Sender Key is pretty simple. The PCB has etched copper traces which function the same as wires. The PCB traces connect three devices in a serial fashion which constitute a complete electrical loop as diagrammed below. Pressing the piece of PCB material marked 'KEY' down against the head of the screw mounting the piece of PCB material marked 'BASE' allows current to flow out of the battery, through the resistor, light emitting diode (LED) and then back to the battery causing the LED to light up. Releasing the KEY opens the circuit and the LED goes dark. The resistor limits the amount of current that flows into the circuit. The LED included in this kit is an ultra-bright LED and requires between 10 and 20ma of current to operate. You can use more current for even higher brightness by reducing the value of the resistor. Of course, more current to the LED means more current out of the 9 volt battery thereby shortening it's life. You have to be careful though, because too much current into the LED can burn it up. The resistor included in this kit drives the LED with enough current to be able to see the Night Sender LED at a distance of over a mile.

Night Sender Circuit
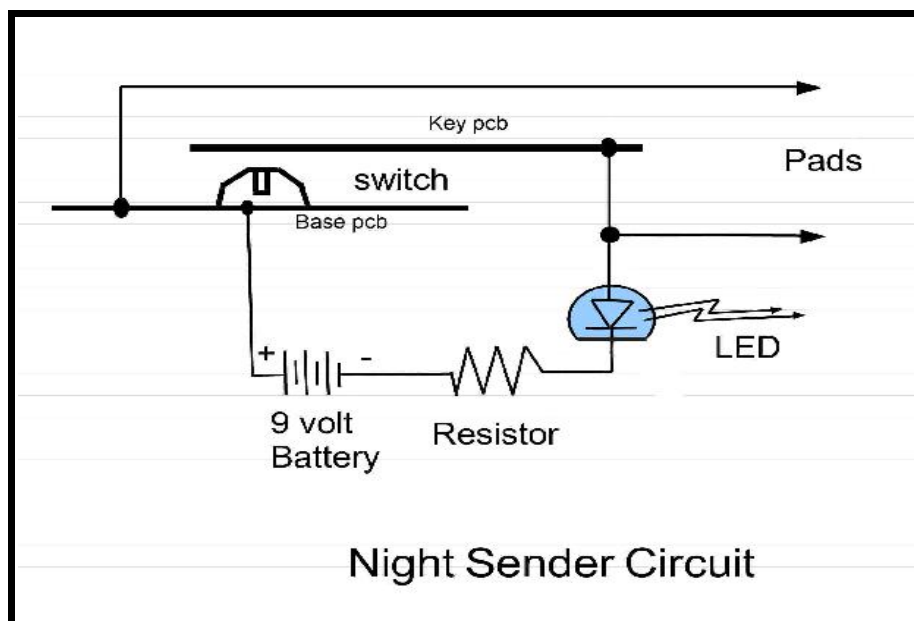
Step #2: Got all the stuff?
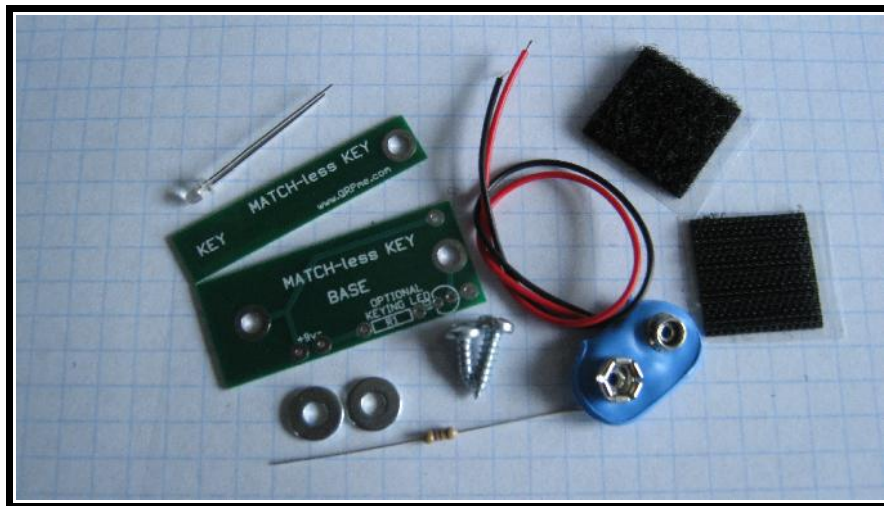
Open the kit up and organize all the parts. Check them off on the parts list below.

MATCH-less KEY Parts List:

- ➢ 1 circuit board scored with a snap line separating KEY and BASE
- ➢ 1 #6 x 3/8" tapping screw
- ➢ 1 #6 x 1/2" tapping screw
- ➢ 2 #6 flat washers

Night Sender Parts List:

- ➢ 1 circuit board scored with a snap line separating KEY and BASE
- ➢ 1 #6 x 3/8" tapping screw
- ➢ 1 #6 x 1/2" tapping screw
- ➢ 2 #6 flat washers
- ➢ 1 ultra-bright LED (clear case but emitted color could be red, green or blue)
- ➢ 1 470 ohm resistor (marked yellow-violet-brown)
- ➢ 1 9 volt battery snap
- ➢ 1 set Velcro squares

Report any shortages to w1rex@QRPme.com

Step #3: Prepare to mount.

Decide on the block of wood or item that you want to use as a base for the Night Sender Key. Prepare the surface of the wood to have a flat area for the key and the 9 volt battery. Sand the area smooth and finish it as desired.
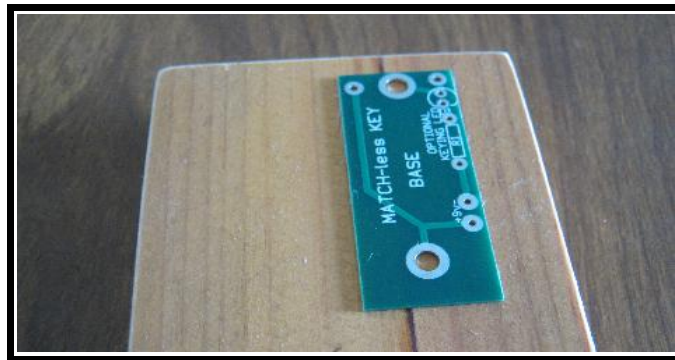
Position the base board as you want it to be on your mounting surface and mark the position of all the holes with a sharp pointed item. A small brad, very sharp pointed pencil, awl or other item with a very slender point that will fit down inside the smaller component holes will work. I used a very fine Pilot pen here to mark the holes...
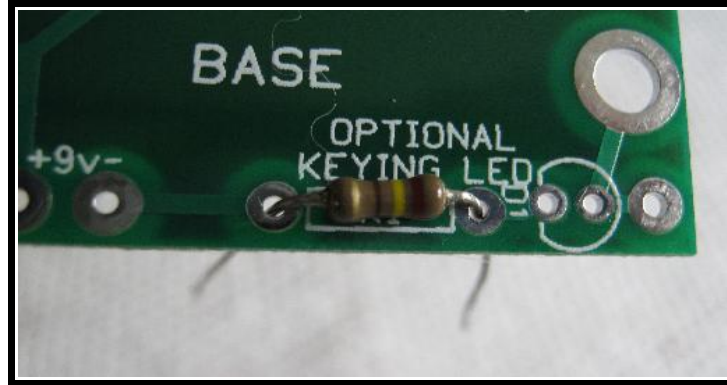
I then used a 16d nail to make the 'dents' or recesses for the solder connections. You want the board to lay flat on the mounting surface after assembling for smooth operation.


You could also drill a #6 pilot hole for the 2 mounting holes on the key.

Step #4: The piece d'Resistance.

Solder the resistor into place at location R1 marked on the silk screen. There is no orientation to a resistor so the striped end can go into either hole. The resistor is typically 240 ohms (red-yellow-brown) to 470 ohms (yellow-violet-brown) for a nine volt battery. The smaller resistance will cause more current to flow into the LED producing higher LED brightness. Too much current can cause the LED to burn up so don't stray too far from the resistor supplied in the kit. After inserting the resistor leads into the holes. You spread the leads apart under the board to keep the resistor in place when you turn the board over to solder them. Solder the leads and snip them off close to the board so that they will fit inside those 'dents' that you made in the board. See the example below.
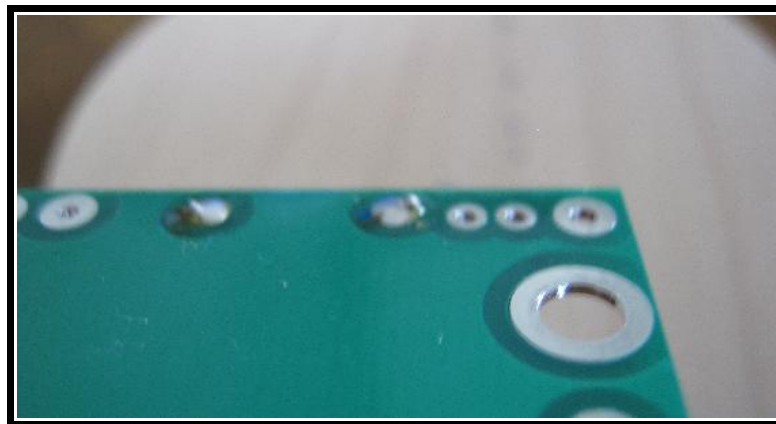
Step #5: Stand alone or transmitter straight key?

If you think you might want to hook the your Night Sender Key up to an external audio oscillator, buzzer or amateur radio transmitter, you might want to add a pair of clip lead points at the left and right pad locations marked on the silk screen. You would attach the wires or clip leads from the external device to these points.

Form a small circle from the clipped resistor leads using a small pair of needle nose pliers. Solder the circle closed, then insert the lead into the pad hole and solder the lead onto the board. Repeat this procedure for the second clip lead point.

Little clip leads formed from the leftover leads of the resistor.

The two clip leads soldered into place.

NOTE: Version 1 boards do not have the pad shown in the lower right corner of the picture next to the LED. If you wanted to include this feature on a Ver.1 board, you need to add the clip lead to the adjacent LED lead.
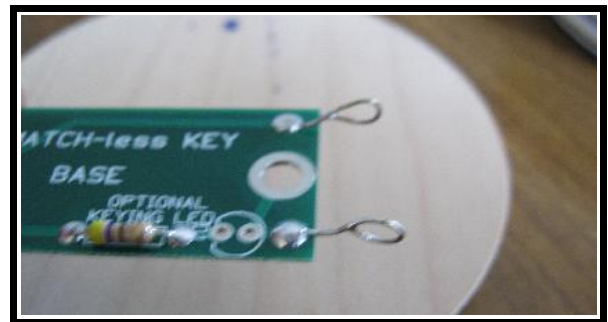

If you happen to have a spare 'alligator' clip lead laying around, you could cut that in half and solder the two halves into the pad locations instead of the little reworked clip leads.

Step #6: Installing the LED

It is now time to install the LED. The LED and the battery snap are the only two items in the Night Sender kit that have polarity. Polarity means that there is a right way and a wrong way to install the part. Install a polarized part into the circuit the wrong way and it won't work. The battery snap polarity is clearly marked and it will be discussed later. The LED polarity is much more subtle and you have to understand it before you start bending the leads preparing it for installation.

There are 2 leads on this LED. Look carefully and you will notice that one lead is longer than the other:
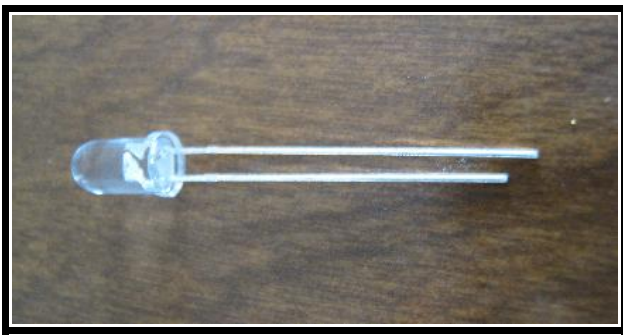
LED as it comes from the factory with one one lead shorter than the other.

The SHORTER lead is the CATHODE or MINUS lead
The LONGER lead is the ANODE or PLUS lead

If you look very carefully at the little plastic 'shoulder' running around the base of the LED body, you should see that there is a little FLAT side. This FLAT side should be right next to the SHORTER lead and further indicates the CATHODE or MINUS lead. If you should happen to clip off the leads so that you can no longer verify which lead was the longer of the two, the lead next to the FLAT in the MINUS lead.

First we have to do some custom lead bending. The leads are bent in a special way so that the LED will point out the back of the sender AND be parallel to the board AND spaced a little off the board. The picture below shows the original LED and the LED after bending the leads. Make sure you start by bending the longer lead first so that it forms the inner corner of the bend. The shorter lead is then bent to form the outer corner of the bend. The little flat should now be oriented so that it is on the outside of the bend. The diagram below shows the starting and ending orientation of the LED.

NOTE: Version 1 MATCH-less KEY boards have the LED orientation marked incorrectly on the silk screen. Version 1 boards are not marked as Version 1 as I wasn't expecting to make a Version 2. You can easily verify which version you have in hand by looking at the silk screen marking for the LED. If the FLAT side of the LED silk screen marking is oriented adjacent to the resistor, then it is a Version 1 board. Version 2 boards also have an 'extra' single pad to the right of the LED.

If you do have a Version 1 board, simply reverse the LED orientation from the marked orientation on the silk screen.   The lead associated with the FLAT side of the LED should always go to the hole closest to the resistor..... and then on to the MINUS side of the battery snap.

Step #7: Snap (Crackle Pop?)

Now its time to solder in the 9 volt battery snap. As mentioned earlier, the battery snap is polarized and you need to install it properly for the Night Sender Key to work. The RED battery snap lead is the POSITIVE or + lead. The BLACK lead is the NEGATIVE or – lead. The battery snap should be soldered onto the circuit board with the red/positive/+ lead towards the front of the pcb and the black lead in the rear hole. This orientation is marked on the Night Sender key silk screen where it shows + 9v -. Once both leads are soldered, you should 'dress' them up so that they exit the board off to the side and secure them with a little hot glue to act as a strain relief. Be careful that the hot glue does not wander into the interior of the board where the key switch action takes place. Keep the glue towards the edge of the board. The wires inside the battery snap leads are very small and easily broken by wiggling. Hot gluing them around the solder points will keep the delicate leads from wiggling around and breaking off.
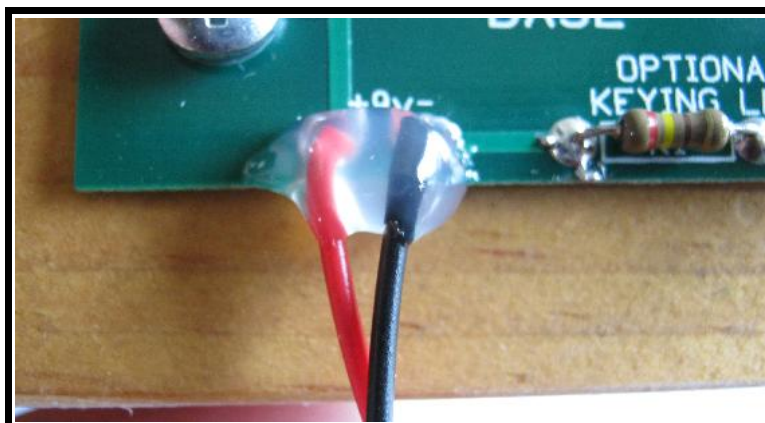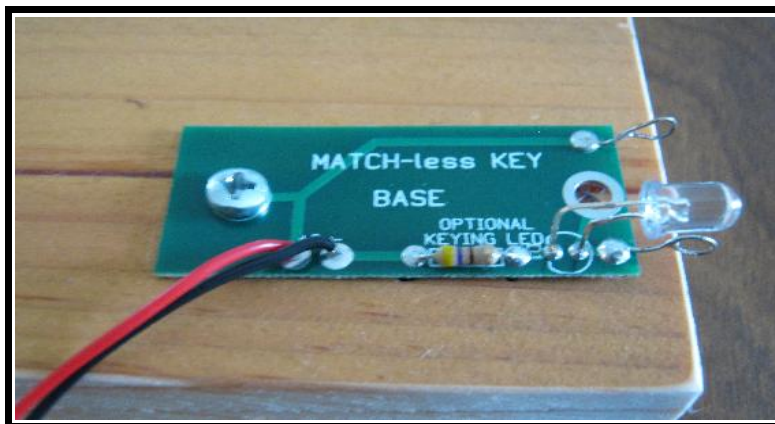
If you do choose to add a little hot glue for strain relief, make sure you keep it close to the edge of the board. Don't get any in the area where the KEY board will be as it will interfere with the KEY action.

Step #8: All A-board!

Now you can assemble the MATCH-less key to your base piece. The base unit is mounted using the #6 x 3/8" tapping screw in the large hole towards the front of the base. The key arm is mounted using the #6 x 1/2" tapping screw AND using the 2 #6 washers to space it off the base board.


After mounting the KEY arm, look down through the gap between the boards and check that the KEY arm is raised slightly off the front screw head that mounts the BASE board and also serves as the key contact. If the KEY arm is touching the screw, you should gently bend the KEY board up and away from the screw until there is clearance between the two. Be careful, don't bend the board too much at one time. Several little bends 'sneaking' up to the right gap are much safer that trying to bend it all at once as you might over bend it

Step #9:   Batter(y) Up!

You now need to add the battery. A set of Velcro squares are included to attach the battery to your base board in order to keep your Night Sender KEY nice and orderly....AND to keep those battery snap leads from wiggling all around.
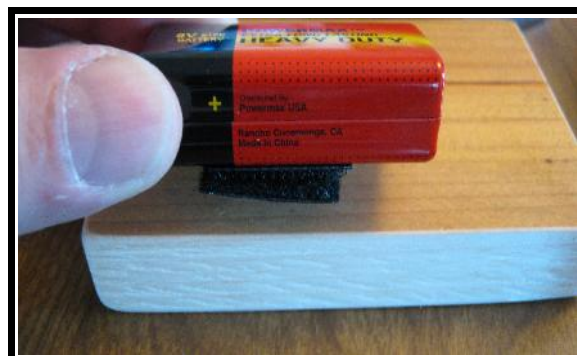
Attach a sticky Velcro hook section to the battery.
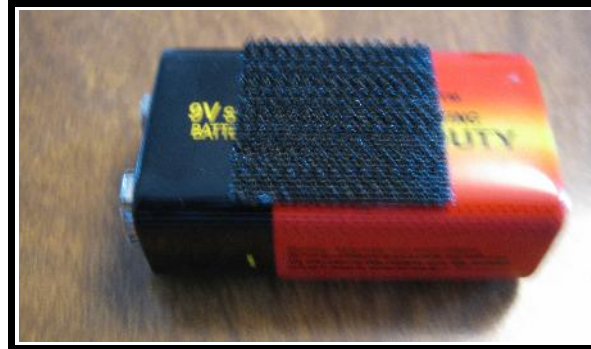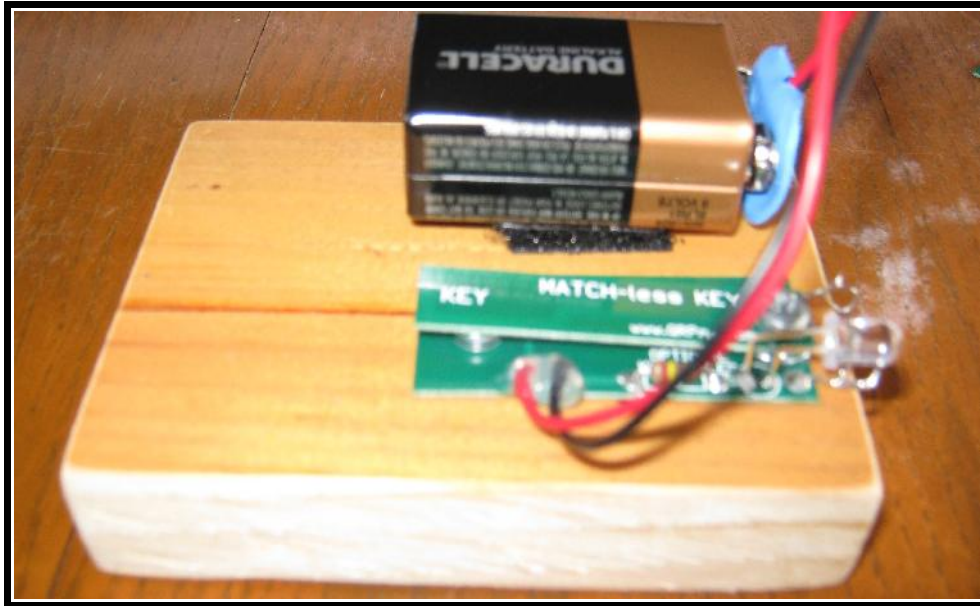

Then stick the Velcro loop piece to the hooks.

Now you can stick the battery down on the base board. I put mine on the left hand side of the board while the MATCH-less key is mounted on the right as I am right handed.

Step #10: Operation

OK! You are ready to plug a battery into the battery snap and see if you were successful in building your kit...

OPTIONS:

If you want to use the Night Sender Key to operate a QRPme Audio Oscillator Kit or a QRP amateur radio transmitter then simply unplug the battery and attach a cable from the two pad locations to the key circuit of the oscillator or transmitter.
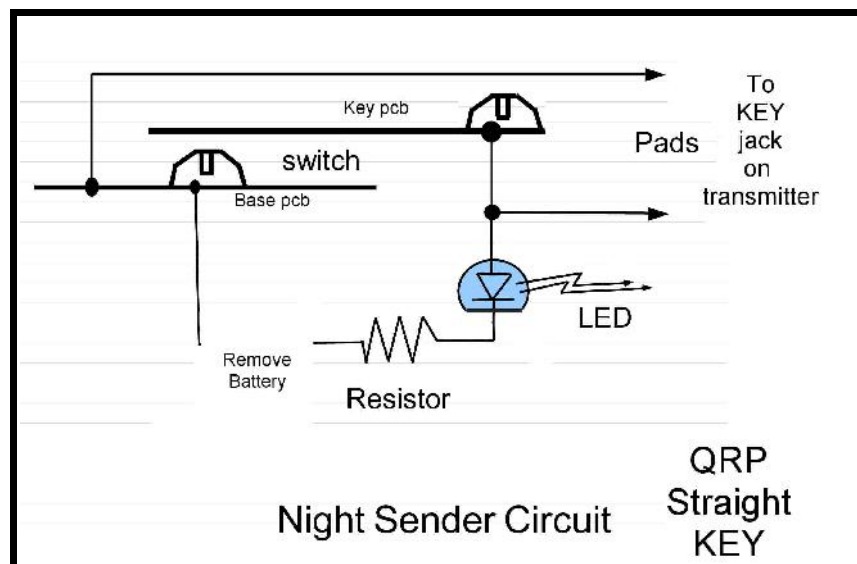
If you want to use the Night Sender Key to sound an external buzzer INSTEAD of the LED, unplug the Night Sender battery and add an external battery and buzzer to the two pad locations.
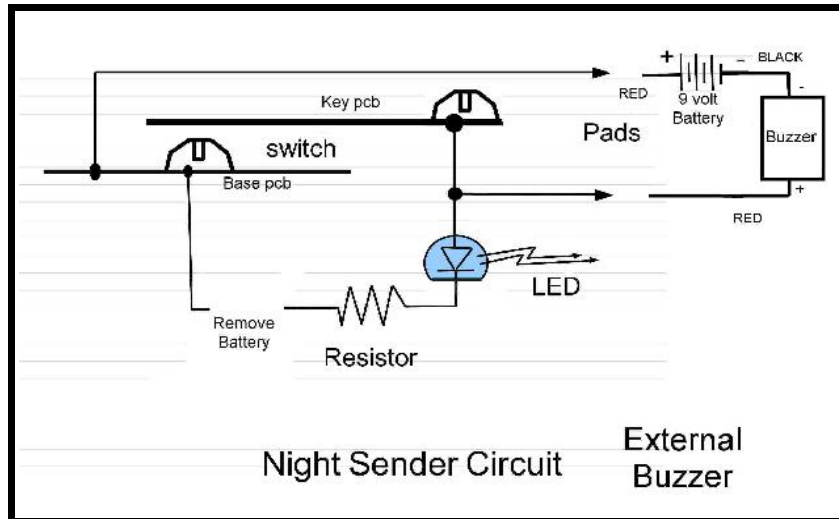
If you want to use the LED AND sound an external buzzer, attach the buzzer's POSITIVE lead to the pad adjacent to the LED and the buzzer's MINUS lead to the side of the resistor that is closest to the BLACK or minus side of the battery snap.

I'll let you draw this one out....

Troubleshooting:

The circuit is pretty simple so if it doesn't work, there are only a few things that could have gone wrong....and you should have an easy time spotting the problem.

1.) Battery any good? It should read somewhere around 7 to 9 volts.
2.) Is the little flat side of the LED oriented properly? Flat side up?
3.) Key arm slightly off the head of the front contact screw when not pressed?
4.) Battery snap leads soldered in properly and not broken?