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Version: Feb 22, 2007

Modification to the Yaesu FT-8800 standard MH48 mic to add two superbright LED's

This project works great and gave me a great sense of satisfaction... I hope you enjoy it!!!

After I finished I was very pleased with the outcome. I now have a multipurpose "flashlight" available at all times in my vehicle which can be used to light up the button labels on the radio and look for what ever I drop on the floor or read a map with.

Being frustrated that Yaesu did not provide back light for the buttons on the control panel for the FT-8800, I decided to take matters into my own hands. After studying the schematic for the MH48 microphone (posted in the files section of the YAHOO groups FT-8800R)... I realized I could convert the switch that is normally used to "LOCK" the buttons on the mic to turn on and off a couple of super bright LED's, I never use this LOCK switch for its intended purpose anyway.

The MH48 mic has available 8-9 Volts DC available to drive our LED's. I did some experimenting using a 1000 ohm variable resistor and my multi-meter set up to measure current. I started with the variable resistor set to maximum and then started decreasing the resistance until I measured 20 mA through 2 LED's in series. I then measured the resistance of about 100 ohms... if you do not have a 100 ohm resistor choose the next higher value (do not go lower as this will increase the current flow and possibly damage the LED's)

A NOTE ABOUT LIGHT EMITTING DIODES: An LED is a semiconductor device that emits light when current flows through it. It will work off of most any voltage a hobbyist or HAM is likely to want to hook it up to IF you limit the current to about 10 to 20 mA (read the data sheet for the LED you choose) using an external resistor of appropriate value. In other words do not be so concerned about what voltage you are driving the LED's with, but rather make sure that you limit the current to an acceptable level of usually 10-20 mA (0.010 to 0.020 amps). Here is the URL for a neat LED resistor calculator on the internet... I just did a google search for "led resistor calculator"
http://www.metku.net/index.html?path=mods/ledcalc/index_eng

NOTE: the spec sheet for the Allelectronics LED-75 shows a forward voltage drop of 3.6 volts... so 2 in series would have a 7.2 volt drop, if you enter that in to the calculator at 9 volts and 20 mA it tells you to use a 90 ohm resistor. Another way of looking at it is if you subtract the 7.2 volt drop from the 9 volts you are left with 1.8 volts. R=E/I so R= 1.8 / 0.020 therefore R=90 ohms. 100 ohms is a little safer and if you overdrive the super bright LED's it will damage them making them not so bright anymore.

I chose to install 2 LED's but you could probably fit 1-3 led's in the mic housing. NOTE: you will need to reduce the value of the resistor if you use 3 LED's or increase the value of the resistor if you use 1 LED.
The LED's I used work best at 20 mA (milli amps) of current flow according to the pdf data sheet available on the allelectronics web site.

Materials needed:

1 large amount of ... Patience

Do not rush it... take your time, work slowly and carefully and you will be rewarded.

This will test your soldering skills as you will be working in close quarters and on very fine circuit traces

Small gage wire	(AWG 26 to AWG 30) I used AWG 30 "wire wrap" wire
2 superbright white LED's	such as www.allelectronics.com LED-75 or similar, about $2 each
1/8th watt resistor	use 100-150 ohms for 2 LED's

Razor knife or something to cut the copper circuit traces with and scrape away the green solder mask paint.

A Good quality soldering iron with a very fine tip (you will be working on very small traces) something I recommend you invest in, if you are going to ever do much soldering you won't regret it.

Possibly a magnifying lens or hood or lamp... something to see what you are doing. Again once you have one of these you will wonder why you didn't get one sooner.

Various tools ... needle nose pliers, wire cutters, phillips screwdriver, etc.

You are welcome to email me at n7kbc@arrl.net or better yet post a question on the Yahoo groups for the FT-8800 radio.

I recommend you read and study this whole document before you begin.

NOTE: I apologize for the various inconsistencies in this document, such as font size and figure labeling. I wanted to get this project posted as soon as I could and with as much detail as possible... I did not want to spend too much time editing.

FIG 1

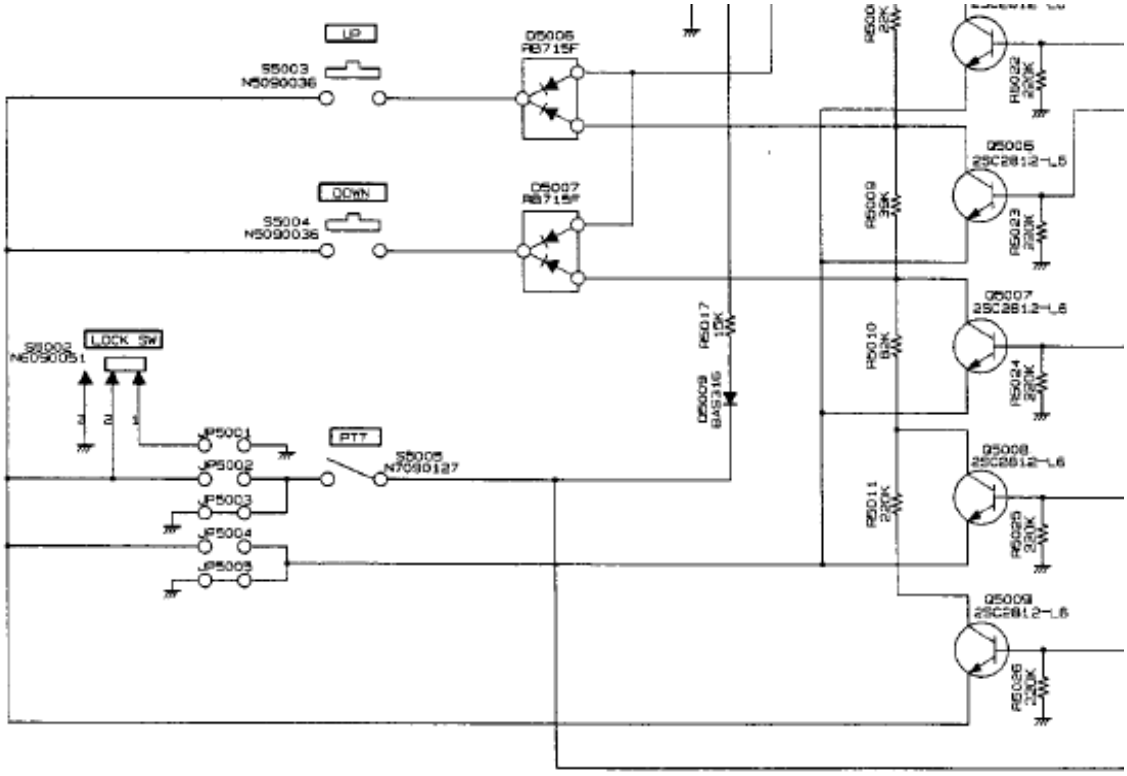
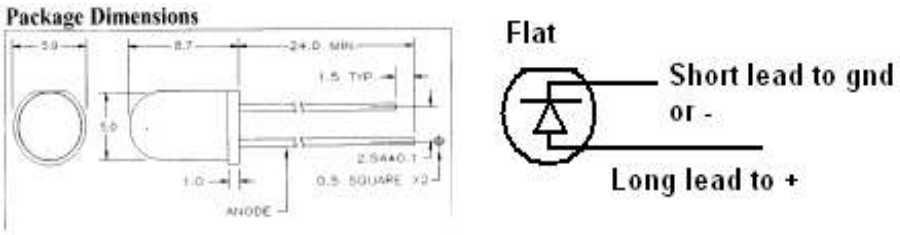


Fig 1 is a section of the schematic for the MH48 Microphone. The complete schematic is located in the files section... thanks to who ever posted that schematic.

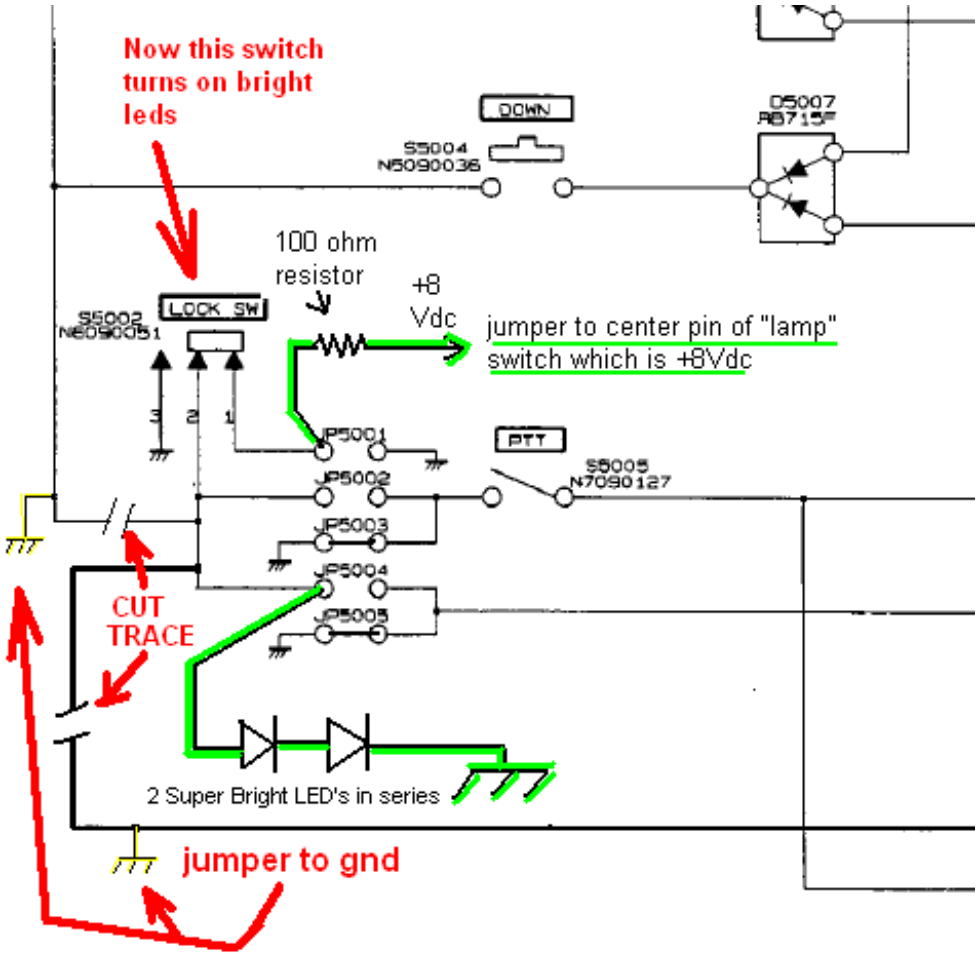
Print out the whole schematic pdf from the FT-8800 files section so you can compare the section above. look in the files section for "**mH48a6J. pdf**"

Below is a pictorial of an LED and the schematic symbol for it... note the short lead and long lead designations, and the flat side of the plastic case.



Look at Fig 2 next to see the schematic after I re-drew part of it to better depict how the circuit board traces go...

FIG 2



Here I re-drew part of the schematic above (look to the left of the 5 jumpers, JP5001 to JP5005) to more closely depict how the circuit traces go and why you have to cut two traces and install two jumpers to ground.

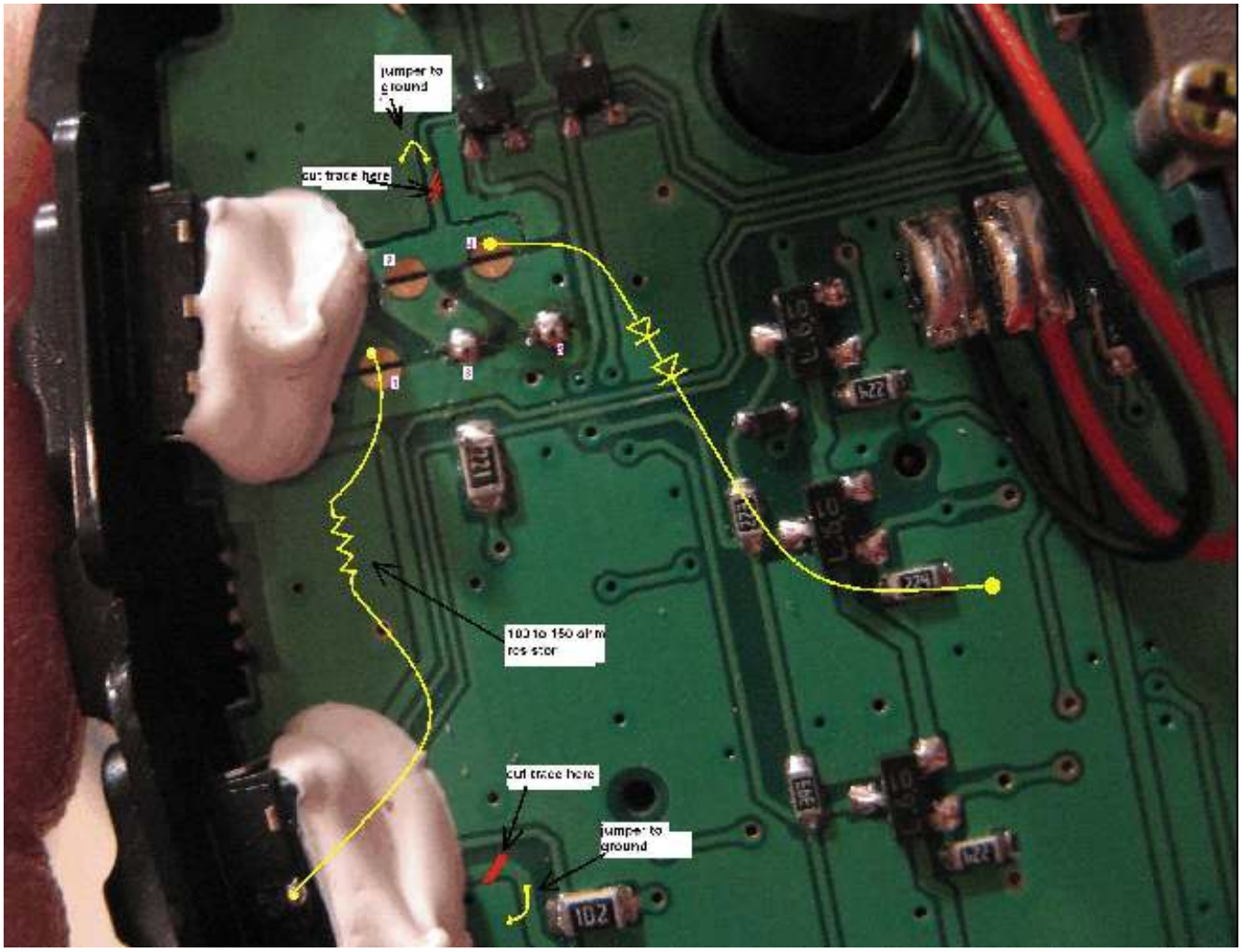
Now if you are able to follow the schematic you will see that the LOCK switch is now going to supply current limited voltage to the LED's when switched to the LOCK position.

You need to install the upper ground jumper so that the UP and DN buttons still work and the lower ground jumper so the P1 through P4 buttons will continue to work.

Be sure that JP5003 and JP5005 are installed on your mic. And be sure JP5001, 2 and 4 are not bridged..
See Fig 4 for jumper labels.

Note how the LED's are soldered in series. The LED case has a flat spot on one side of the plastic, that side should go to ground. Short lead is cathode, connect to gnd. Long lead is anode, connect to + .

FIG 3



Here is an **over all view** of the whole project. If you can't read the text above look to Fig 4, 5 and 6.

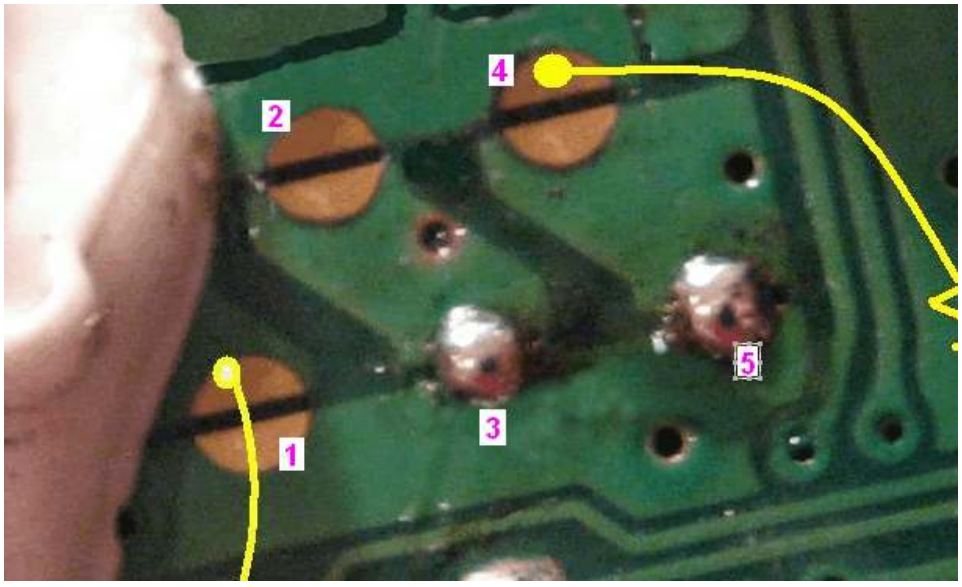


Fig 4

Here is a view of the jumper pad numbering and where the wires should land.

Note the wires should land on only one side of the jumper pad. Do not bridge the pad with solder

Jumper pads 3 and 5 should be bridged as shown in the schematic.

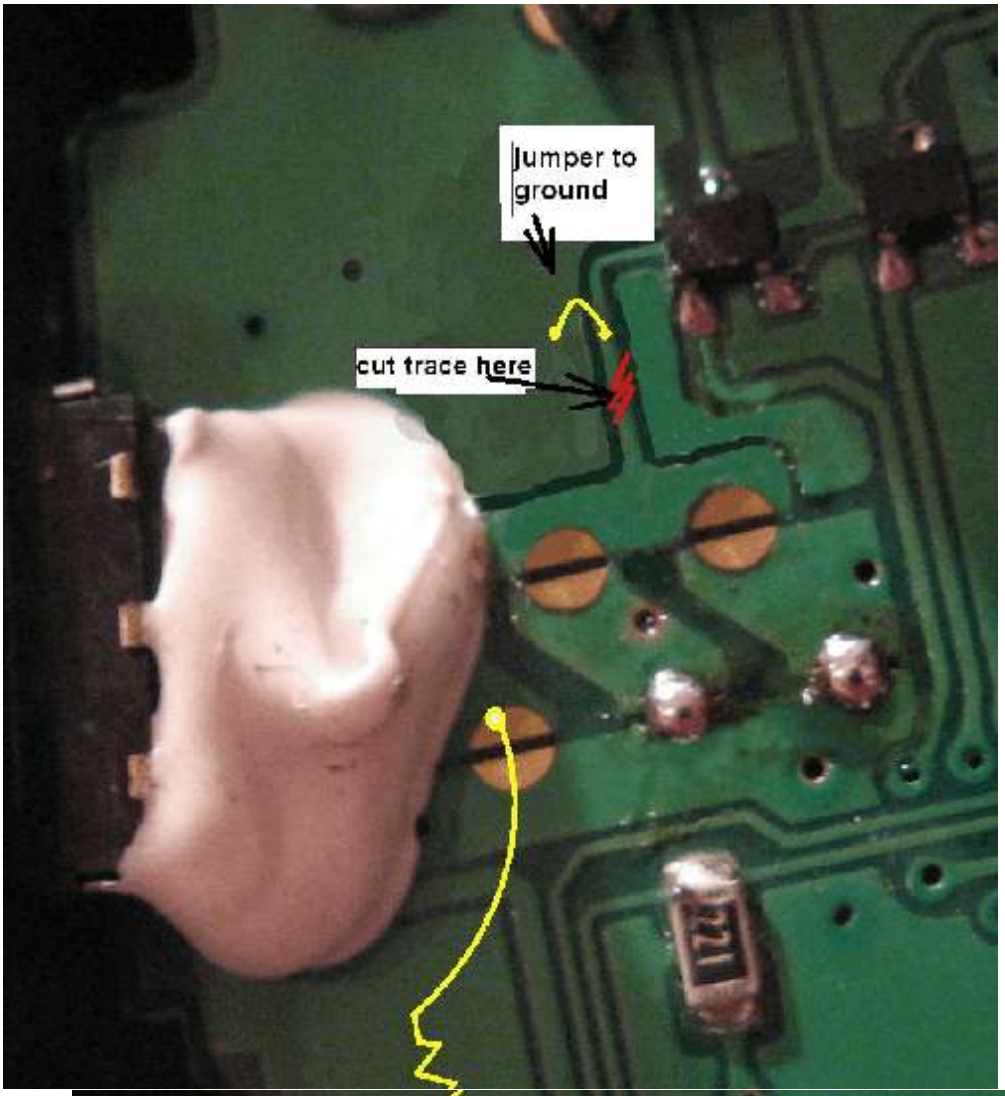

Jumper to ground
cut trace here
221

Fig 5

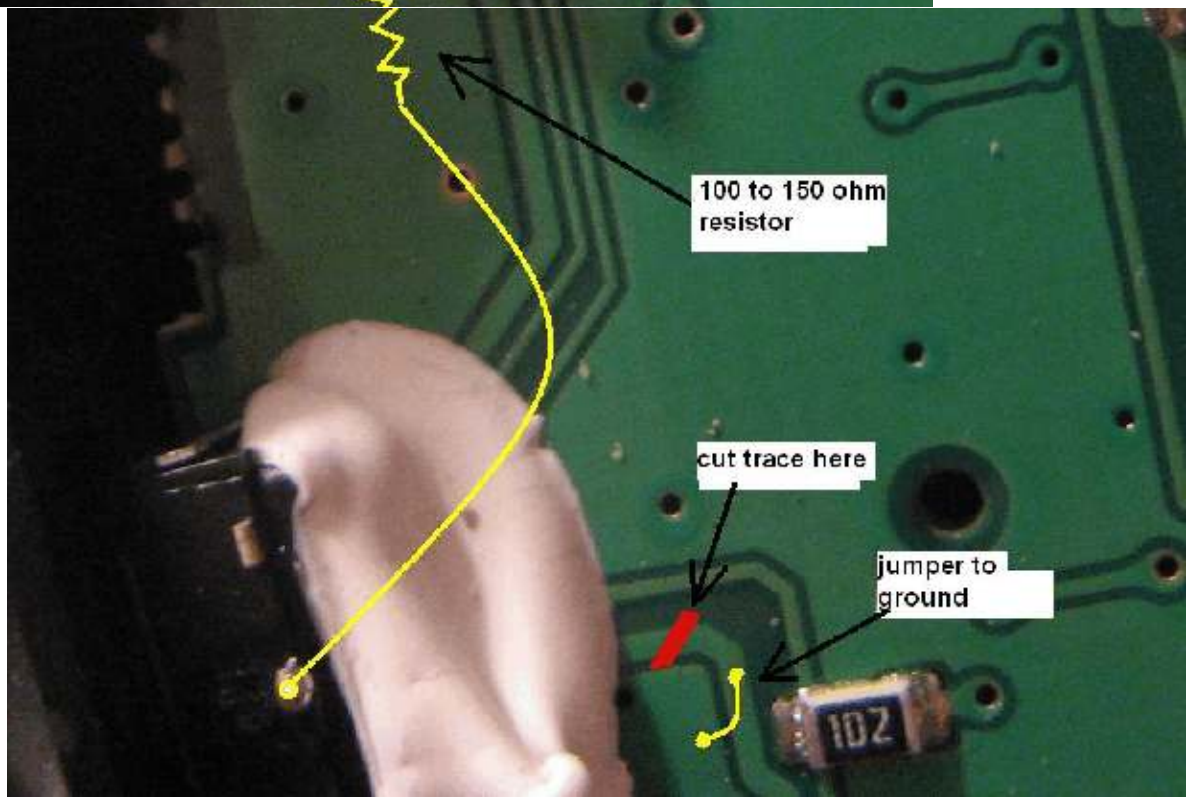

100 to 150 ohm resistor
cut trace here
jumper to ground
102

Fig 6

Be sure that only solder jumpers 3 and 5 are installed on your mic as above.
If other solder jumpers are installed you can (**and must**) safely remove them... only solder jumpers 3 and 5 should be installed. (See Fig 4 for jumper labels)

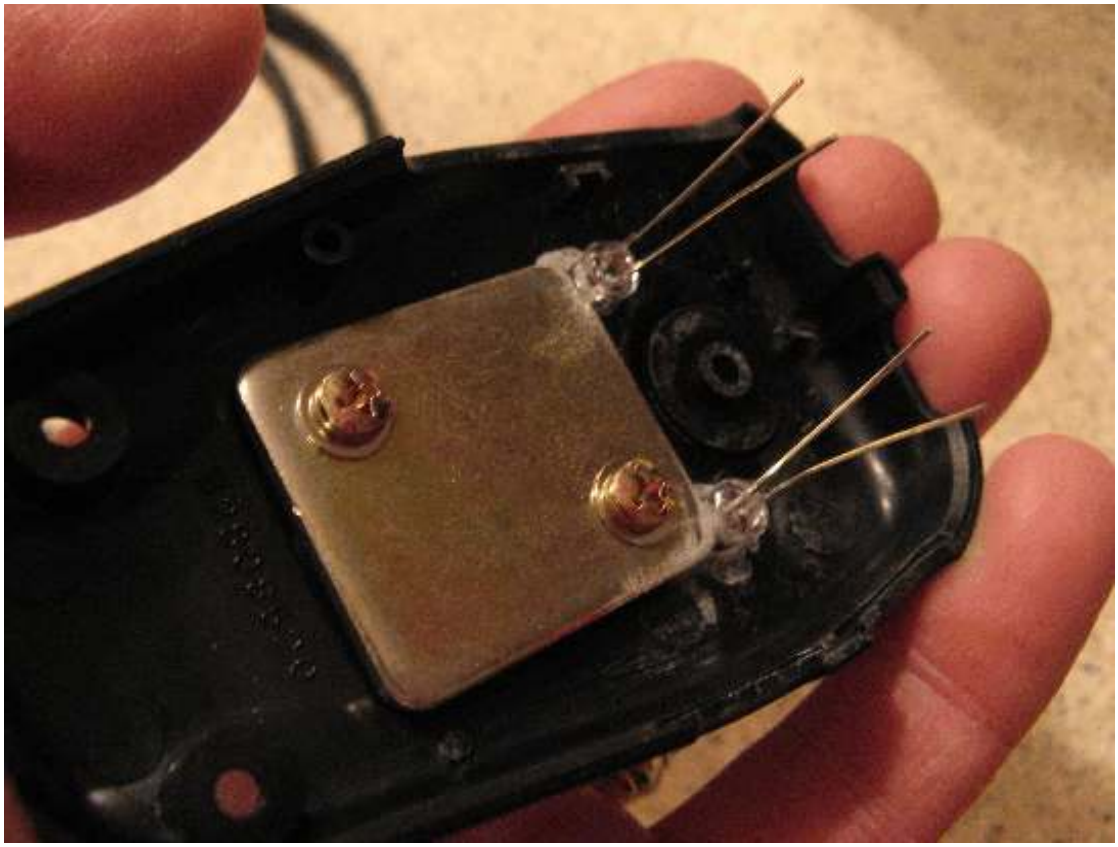
Cut the circuit traces where shown by the red lines. It is only necessary to cut through the trace enough to separate the copper. Then scrape the green paint where the yellow jumper shows a jumper to ground... you may be able to imitate the copper colored solder jumpers near the switch by scraping a spot on the ground plane next to the spot you scrape on the trace and then just melt a puddle of solder to make a bridge to the ground plane. Move the tip of the iron back and forth where you scraped the paint away while you melt some solder and you should be able to get the solder to bridge the gap... if not then use a small piece of wire.

(Note: most of the large areas of the circuit board are ground)

NOTE: In order to solder to the traces and ground plane you MUST scrape away the green "solder mask" paint so the solder will stick.

NOTE when soldering the wire from the resistor to the location shown in Fig 1 above be sure **not** to solder across the jumper pad. Only solder the wire to the side where the yellow dot is located. I found it helpful to scrape more of the green paint away before trying to solder the wire.

Note that the wire from the resistor needs to be soldered to the center pin of the "lamp" switch (not the "lock" switch).



Be careful when locating the spot to drill for the LED holes... watch out for the metal “weight”.

Fig 7

I did not want the LED’s to protrude from the plastic very much... just a little.

Fig 8

I used Super glue to install the LED's

(Actually super glue and baking soda..... I know what you are thinking.... that's right super glue and baking soda. Just glue the led in place and then instead of waiting for the glue to dry take a pinch of baking soda and sprinkle it on the wet super glue... and it will instantly set up, then just blow away the excess baking soda. And very strong it is. Try it on a scrap of something and you will be amazed... I have been wearing a pair of perscription nylon sunglasses for a couple of years that were repaired that way. Then I painted the repair black so I don't look like a geek..... just keep building up layers of super glue followed by baking soda. You can file it or drill it. Amazing what you might learn on a HAM radio web site!!! :-)

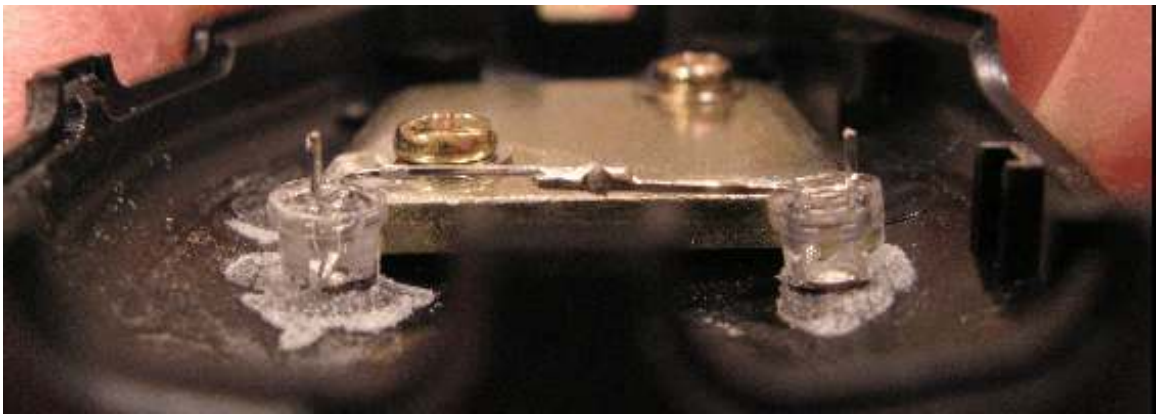


Fig 9

The LED's as installed. Drill a test hole in a piece of scrap wood or plastic to check LED fit.

Note that one leg of each LED is solderd together... be sure to solder an anode to a cathode (flat side of one LED to the round side of the other) then be sure that the remaining flat side of one of the LED's is the one you wire to the ground plane, the remaining round side of the other LED is wired over near the LOCK switch. See Fig 3.

Fig 10

The 100 ohm 1/8th watt resistor prep'd with wires, but before optional heat shrink tubing.

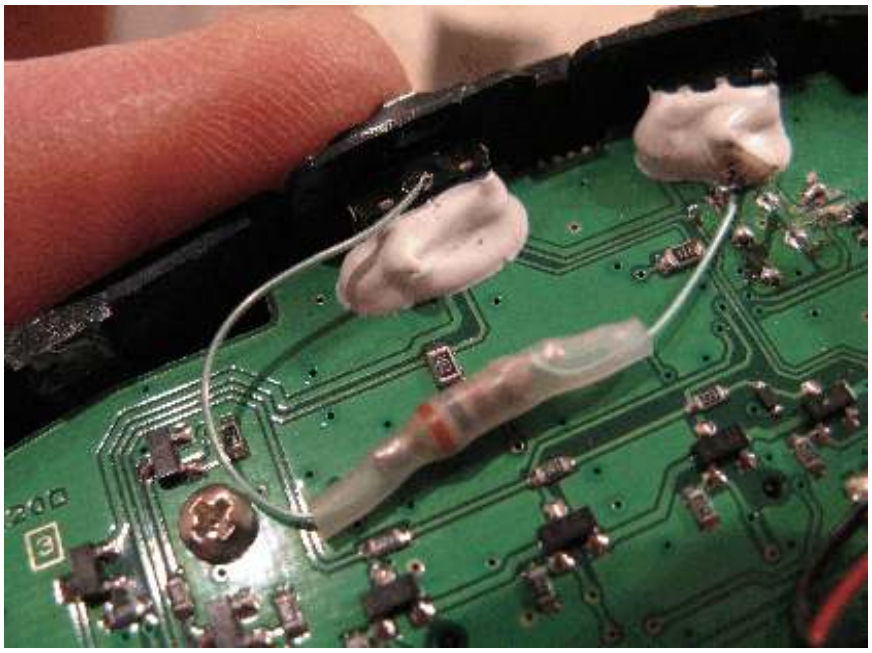


Fig 11

The resistor installed between center pin of the “lamp” switch (thats the switch that turns on the red back light for the mic keys) and the other “lock” switch. The spot near the lock switch is better depicted in Fig 5

You probably do not need the heat shrink tubing if you are careful where you locate the resistor when you put the mic back together... or wrap the resistor with tape or a scrap of large gage wire insulation slipped down over it before you solder the wires.

Fig 12

This is a spool of AWG 30 (Thirty gauge) wire wrap wire that I used for this project, very small stuff.

Any small gauge wire (solid or stranded) should work... But do try and get wire that is not too big so that it will not be too stiff. Use stranded if you use bigger wire

As I stated above I used wire that is called “wire wrap” wire... this is a very fine wire, again... 30 gage.
AWG 26 - 30 should work.

Fig 13 The finished project before re-assembly.

(I can hardly wait to test it out. It is now about 1AM so it is nice and dark out in my truck!!!)

In the DARK without the Mic-Light turned on

Fig 14

Now that's MORE LIKE IT!!!

Fig 15

I find that the letters on the buttons are easier to read if you hold the mic light so the lighting comes from a low angle. You can move the light around to get the best view from where you sit.

Fig 16

Makes a great utility light for the cab of the truck if you drop something.

Fig 17

Another view.

Fig 18

This magnifying hood is a must for me. My eyes are starting to go. And the traces are much easier to see and work on..

Fig 19

A quality soldering iron and small gage solder is a must.

Fig 20

Showing the small tip on the soldering iron.