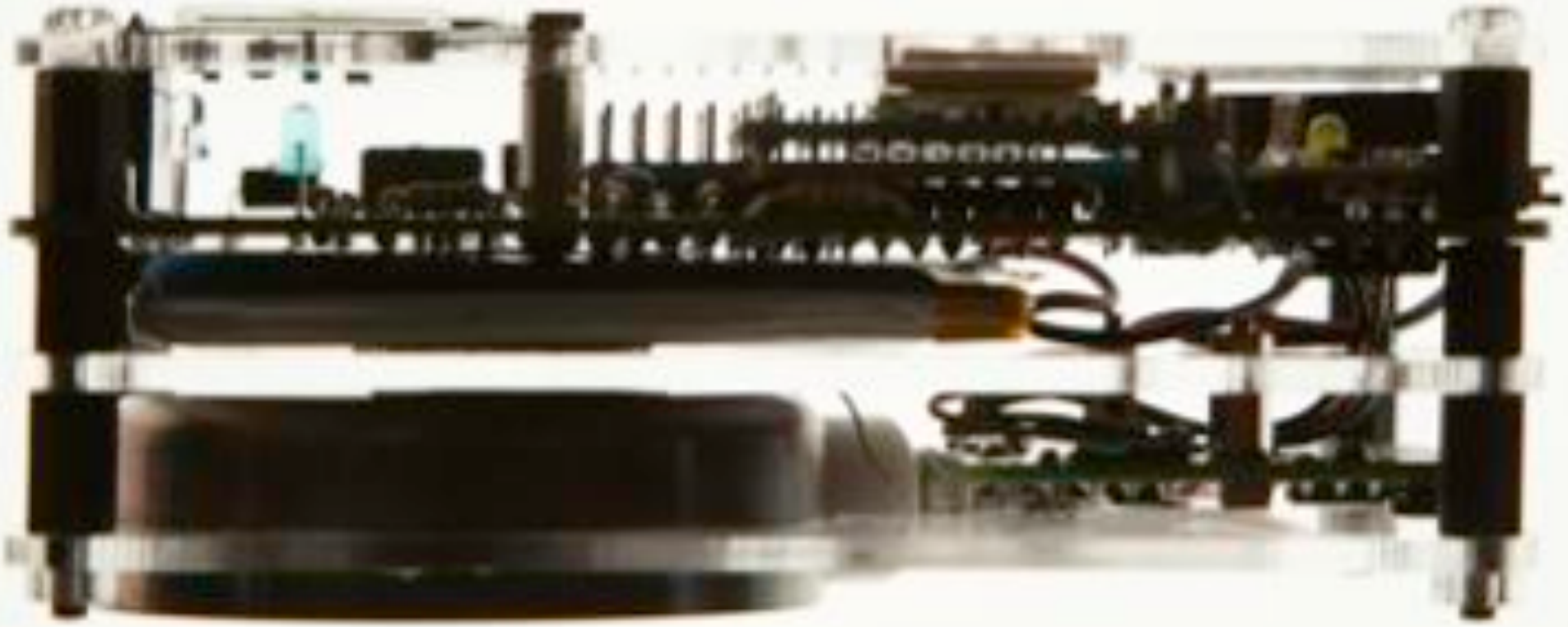
# bGeigie Nano



Assembly ideas and guide

bGeigie Nano assembly instructions, v4

Congratulations on obtaining a SAFECAST bGeigie Nano kit. This high-performance geiger counter with GPS logging and memory has been developed by SAFECAST volunteers and thoroughly tested in the field. We're happy to be able to make it available in kit form for radiation enthusiasts everywhere to build on their own.

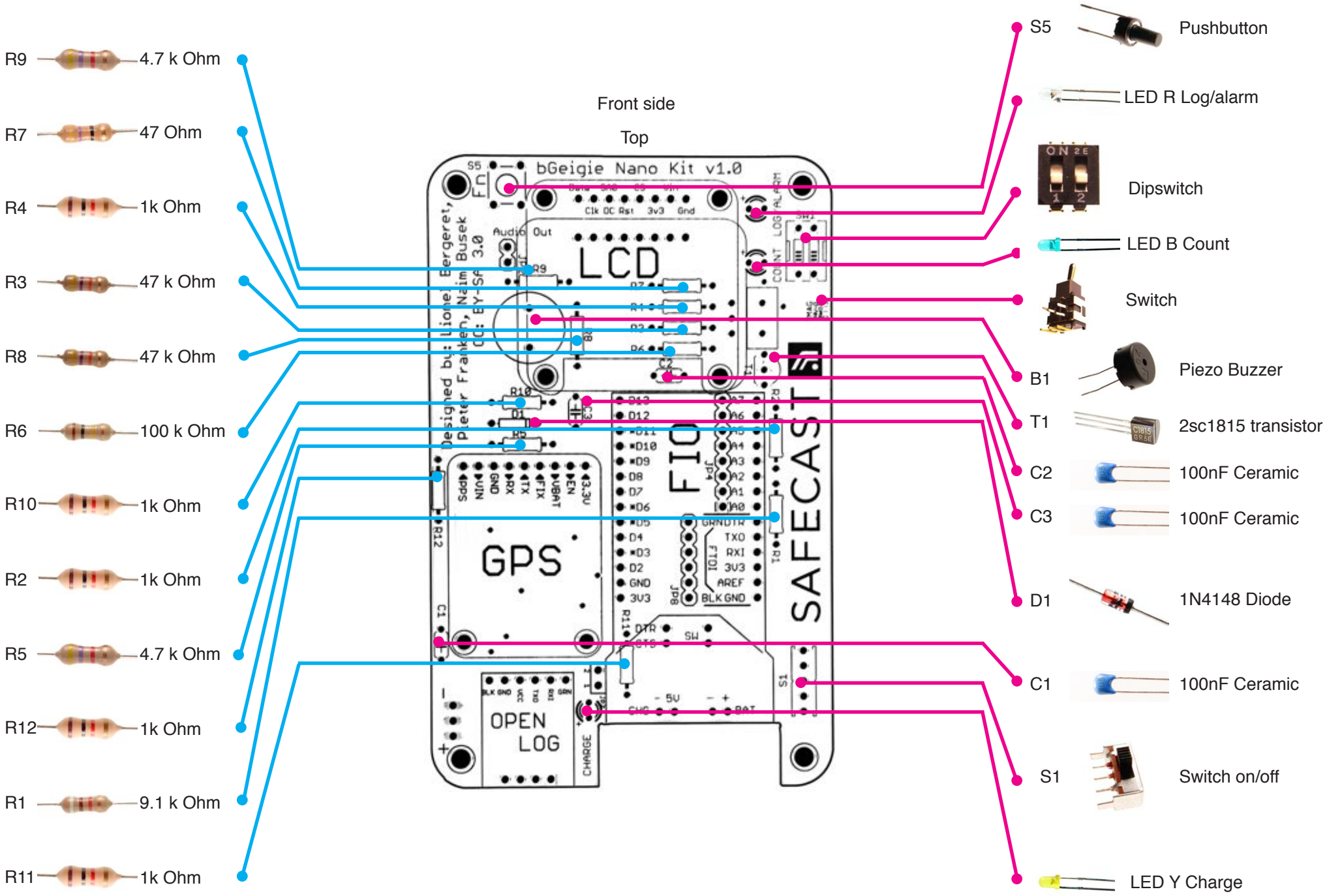
Depending in your skill and experience level, assembly should take about 3-4 hours. We've tried to anticipate possible bumps and snags along the way, and have tempted to make these instructions as helpful as possible for novices. So if it seems like we're explaining the obvious from time to time, that's why. If you're very experienced at assembling electronic devices, feel free to modify the order of the steps.
Docs, including the schematic, parts list, and a copy of these instructions as well as the user's manual can be downloaded from: [ where?]

BEFORE YOU START:
The LND7317 pancake sensor looks robust but is very delicate! Please handle it carefully! It has a thin mylar covering on one face, and inside is a partial vacuum. The mylar is easily punctured, rendering the tube useless. Since it's the single most expensive component, it would be a sham to trash it. May we recommend that you leave it in the box until you're ready to attach it? (That would be step D...)

Warnings:
Solder iron should be 200-350 degrees Celsius 400-650 degrees Fahrenheit?]
We hate to be a nanny, but smoke from solder is dangerous for your health, so work in a well-ventilated area please.
Wear safety glasses when cutting of leads. They become needle-like projectiles that could blind you or your cat.
--Many of the small components are not very robust, and it's possible to yank the wire leads out accidentally.

Essential Tools:
--soldering iron or gun
-- solder 60/40
-- screwdriver (small Phillips-head/plus)
-- needle-nosed pliers
-- nippers (for cutting component leads)

# Small parts placement guide



# Large parts placement guide

OLED display

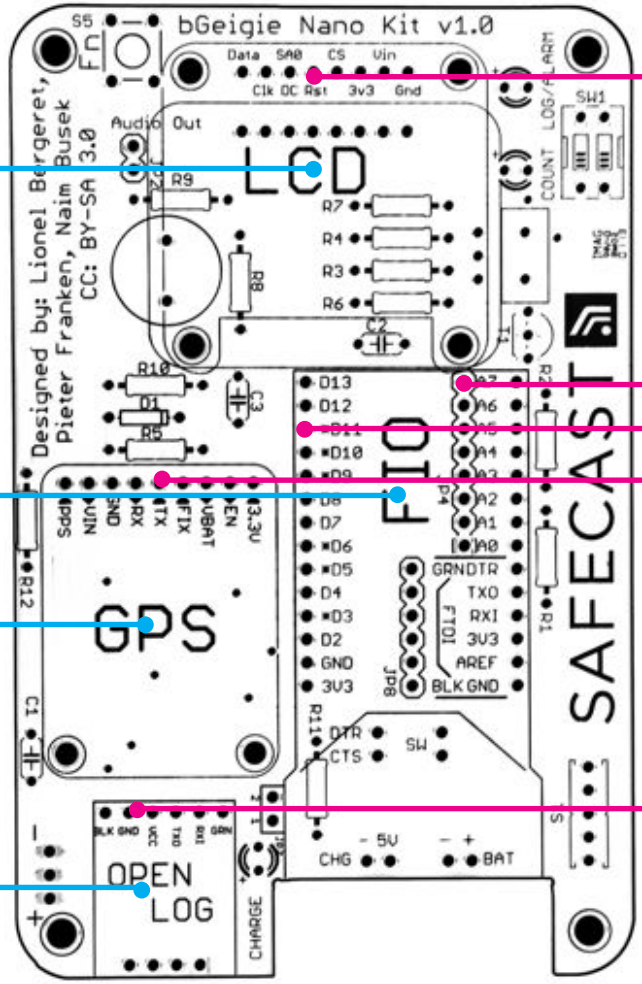
Arduino FIO

GPS board

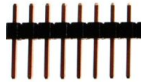
Open Log

Front side

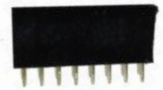
Top



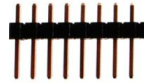

8 leg male header



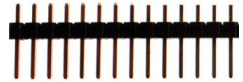
8 leg female header



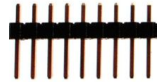
8 leg male header



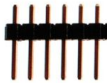
14 leg male header



9 leg male header



6 leg male header



SORT AND CHECK PARTS
it's a good idea to check the parts against the parts list to make sure you know what everything is and that it's all there.

POLARITY NOTE:  What is polarity and why should you care? Basically, several types of electronic components are designed to work with the current flowing in one set direction only, while others can work either way. Putting a component that has polarity in the wrong way will usually only prevent the device from working properly, but in some circumstances it could fry a few things as well. So make sure!


MAIN BOARD
Refer to the component placement diagram.
While we suggest working from components with the lowest height to the higher ones, we understand that this is a matter of preference. The same goes for whether you place all the components and then solder them, or place one or two at a time and solder them as you go.
t's a good idea to attach 4 black plastic standoffs through the holes in the corners of the main board first, to make handling easier. At each corner, insert a 10mm standoff from the upper face of the board, then screw an 8mm one to it from the bottom


SMALL COMPONENTS:

Place and solder these, nipping off the leads. Refer to the diagram!

Resistors (R1 through R12): There are 6 types, 12 in all. It can get confusing! But they have no polarity so they can go in either way (Be especially careful not to confuse the 4.7k resistor with the 47k one).

b. diode (D1): Take care with the polarity (see note). The little black stripe on one end of the small brownish glass part should align with the small stripe on the component outline on the board.: (image larger then actual size )

**capacitors (C1- C3)**:They're blue with two leads. These have no polarity, and can go in either way. take care not to split them in two, they can ride a little high off the board so you do not have to risk splitting in two spreading the wires.

**LEDs**: One each, red (the case is clear, though), blue, and yellow. These have polarity and must go in the proper orientation. One lead is longer than the other; this is the positive (+) lead. It goes in the hole marked "+" on the board. Also, if you look carefully, one side of the plastic case is flattened; that's the negative (-) side. Take care not to overheat the LEDs when soldering! he wrong polarity is the most common mistake

--Red (clear): goes in the "LOG/ALARM" spot

--Blue: goes in the "COUNT" spot

--Yellow: goes in the "CHARGE" spot


**Transistor (T1):** goes in the "T1" spot. This has three leads; they need to be spread a bit to fit. It needs to be mounted matching the shape on the board, with the flat side of the case aligned with the flat side of the diagram.

# Switches: there are four of them

**Dual DIP switch (SW1)** goes in the "SW1" spot. It has 4 pins. It should be positioned so that the side with the"ON" label points towards the top of the board, i.e. the "ON" label aligns with the "SW1" label on the board (This is not because of polarity, but it needs to go in this way to work.

**Toggle switch**: No label on the case. It fits above the rectangular outline between transistor "T1" and the blue "COUNT" LED. It has three leads, and a mounting clip with 2 pins. Solder them all in place.

**Shift switch (S1):** goes in spot "S1." It has 3 leads which need to be soldered in place, plus 2 pins on the aluminum case which need to be nipped off. The 3 leads go in the 3 center holes in the board; the two outer holes are unused (Ok, you could try filing the aluminum case pins down enough to fit in these holes, but it's plenty secure enough attached by just the 3 leads.

**Black push switch:** goes in the "Fn" spot. It has 2 leads which need to be mounted in the holes that are set back from the boards edge. The leads can be bent so the switch lays flat if desired.

**Piezo buzzer:** goes in the large circular spot in the upper left quadrant of the main board, and has 2 leads. It can go in any orientation.

**Audio/iPhone connector:** goes in the "audio out" spot. It has 4 leads. [update this for new board!

## HEADERS and BREAKOUTS

The "headers" are long black components with many pins. They are for attaching the daughter boards/shields/breakouts for the OLED display, the Arduino FIO, the GPS module, and the OpenLog memory unit, as well as for the audio connector.. They are provided in:

--one 40-pin length, straight, male (will be cut into three pieces used for mounting the Arduino FIO, the GPS, and the OpenLog memory unit, and the audio connector)

--one 10-pin length, angled, male. (attached to the Arduino FIO for connecting to an external cable for loading firmware, etc)

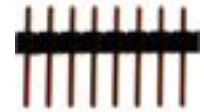
--one 8-pin length, female (used for mounting the OLED display) --one 3-pin length, female (what?)

The long ones need to be cut to the proper length depending on where they go. This is easy to do with nippers, but also possible by scoring with a cutter and snapping them off. Some people prefer to cut them all to length first, some like to cut them as needed. Please follow the cutting guide: [need to make a guide!] The short pins go in the holes in the board and the long ones project above for connecting the breakouts. It helps to have a placement aid of some sort, and usually it's possible to use the breakout board itself for this. Also, we advise soldering the pins at each end first, and the checking to make sure the header is perpendicular before soldering the rest.

NOTE: It's possible to either solder the headers to the main board first, and then to each of the breakouts, or attach them to the breakouts first and then to the main board. We've found it easier to attach them to the main board first, and these instructions describe that method.

Installation order is not critical, but because of the heights and placement of the breakouts, we recommend this sequence.
NOTE: Unless otherwise specified the short pins of the header are soldered to the main board, and the long pins to the breakouts:

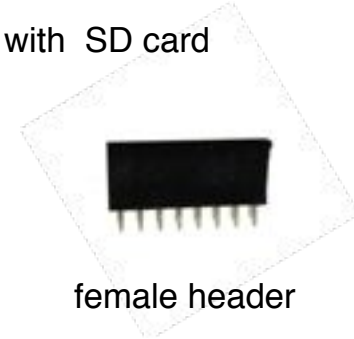
OLED display



male header

GPS board

Open Log with SD card



female header

Arduino FIO

# Arduino FIO


Placing the FIO board on the
male headers prior to soldering

Arduino FIO (see diagram) :

This has a small switch on the bottom side which should be turned OFF before soldering!

--A 14-pin length of male header goes on the left
side of the FIO outline on the main board.

-- An 8-pin length of male header goes on the upper right side

-- A 6-pin length of angled male header goes on the FIO itself, in the row of holes beginning with GND BLK and ending with DTR GRN. It is inserted from the top and soldered on the bottom (see diagram).

**-- There are four pairs of holes in the main board labeled CHG, BATT, SW, and DTR-CTS. Each gets a 2-pin header make sure you install these before you solder the the FIO to the board**

-- You can go ahead and solder the header pins to he top of the FIO now, or wait until all the headers are in place to solder the breakouts. perhaps mention here as a tip! using the male headers attached to the FIO and PC board in order to the headers on the board properly if each header is tacked in with at couple of solder points you can be assured of proper alinement!

Topside of FIO note angled headers these are  used for programing programing FIO  by  safecast !

--GPS (see diagram):

--A 9-pin length of male header goes in the holes at the top of the "GPS" spot.

--It's helpful to attach the GPS breakout with two 5mm stainless standoffs (long hex nuts), using 2 screws and 2 nuts, (see diagram), to help keep the header properly positioned while soldering it.

--Leaving the standoffs in place, solder the 9 pins to the top of the GPS breakout.

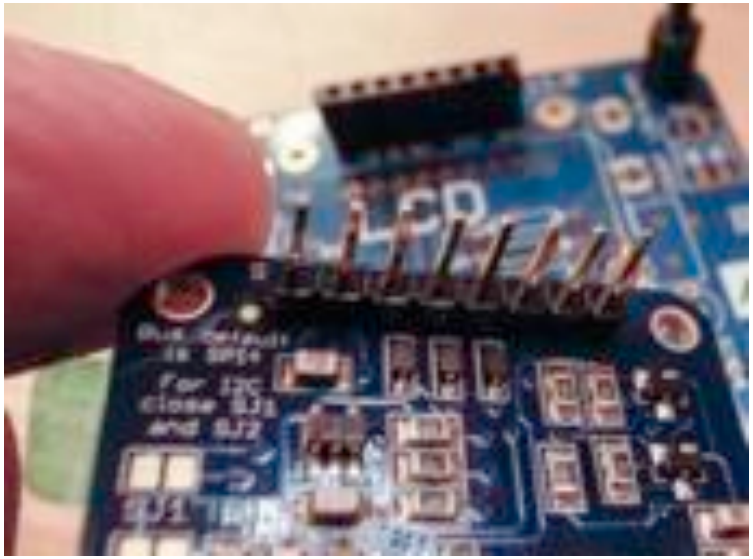
OpenLog  (see diagram):

--A 6pin length of male header goes in the 6 holes at the top of the "OPEN LOG" spot on the main board; the long pins should be facing up.

-- Use a piece of foam tape to shim and secure the OpenLog, to avoid the risk of inserting the SD card into the space between the logger and the main board.

-- Solder the 6 pins to the OpenLog from above.

# OLED display

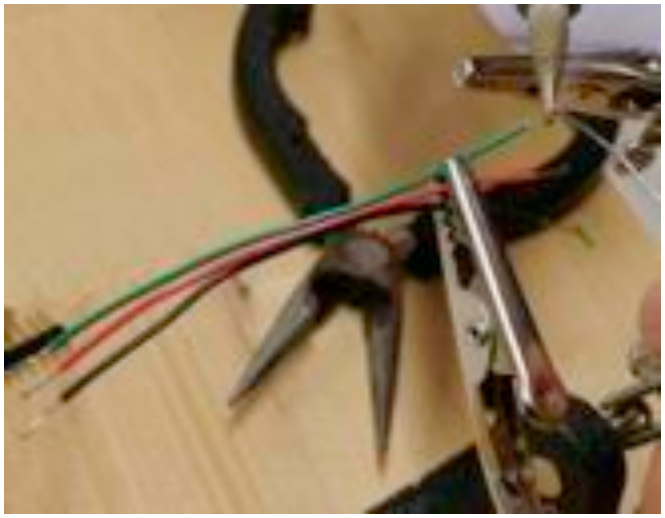


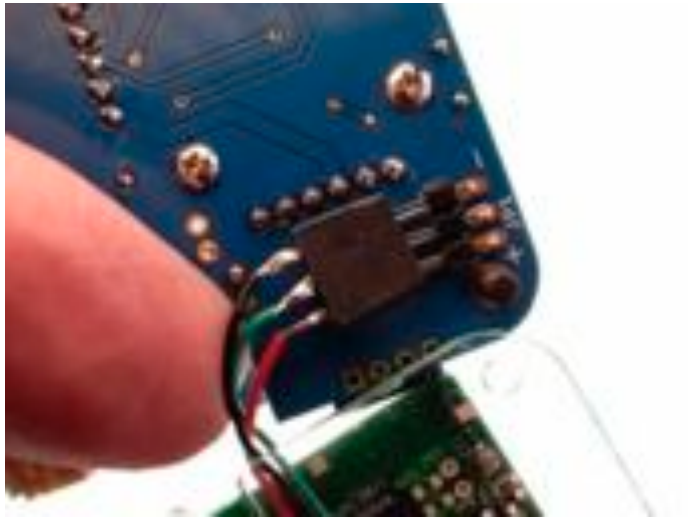

-OLED display (see diagram):
There's more than one way to do this, but this is the method that has worked best for us:

The 8-pin female header goes in the holes at the top of the "LCD" spot (the ones marked DATA,

Insert the long pins of an 8-pin length of male header into the female header, and attach the OLED board to the main board using two 10mm stainless standoffs, screws, and nuts placing 2 nuts on the  standoff before pacing the display on top of them, very few threads are available to attach the  display  to the standoffs)

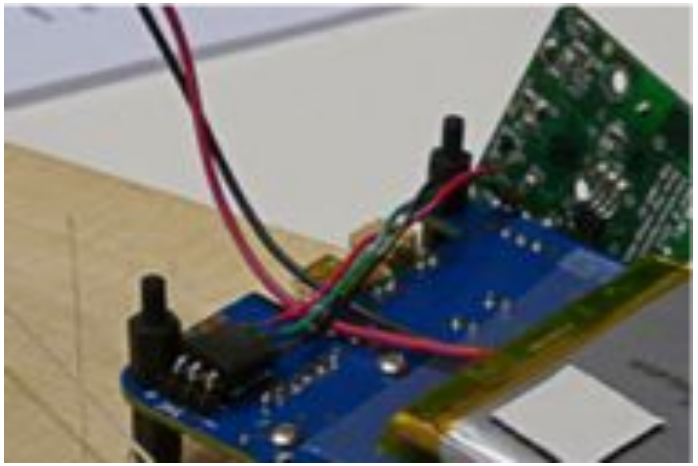
Then solder the 8-pin male header to the OLED board from the top. and to the  pc board on the bottom





Tinning the wire with solder before making connection,  solder to 3 pin female header then  solder to iRover  to connect to three pins on back of main board taking car to connect the  red to positive, black to negative with the green in the middle it is helpful to have a "third hand" for this solder.

**3. TRIPLE CONNECTOR  made to connect to iRover *(see diagram)***
(This is for connecting 3 wire leads from the iRover sensor controller board to the main board)

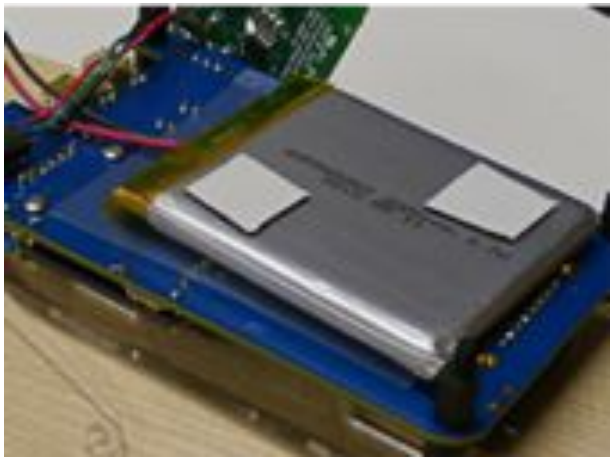


Insert the 3-pin connector from the underside of the main board, in the spot marked "JP1," and solder it from the upper side of the board.
Cut 3 wires to length *(see diagram)*, and strip the ends to leave about 5mm exposed. *(the red will be positive, the black negative, and the green in the middle)*

Solder the wires to the black plastic (female header)connector
Solder them to the iRover board as shown in the diagram  three gold pins on back of iRover (middle picture above)

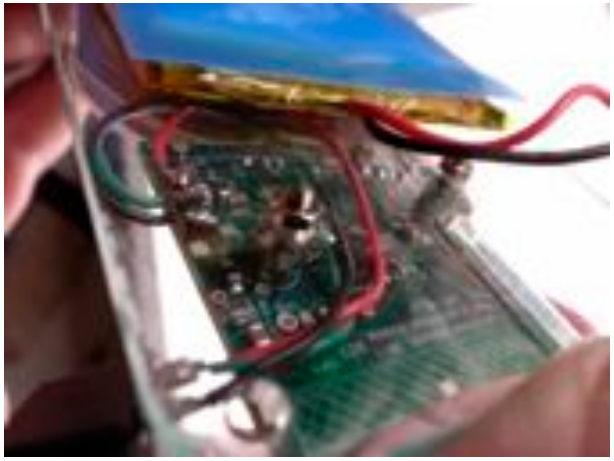
Now is a good time to attach the upper plate, using plastic screws through the four holes in the corner to attach it to the black plastic standoffs. Use pliers to tighten all the stand-offs.
*(see diagram need photo during next assembly)*

# BATTERY

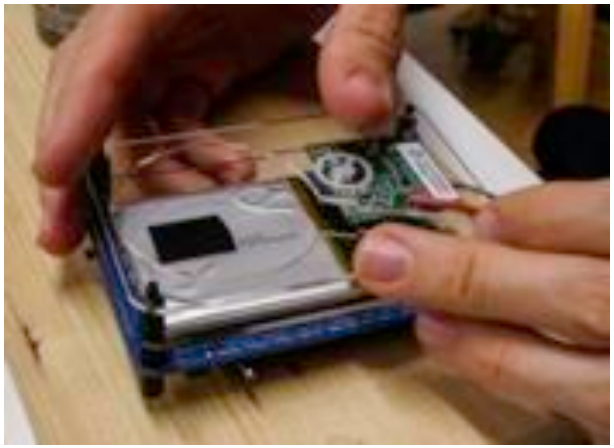


D. BATTERY
Attention: The lithium-ion battery is encased in a mylar membrane which can be punctured, causing damage. Handle it carefully!

Attach the battery to the middle plate with foam tape, locating it behind the circular etched outline. You can position it on top of the main board then place the middle clear plate on top of it notice the plastic protective sheet has already been applied between the battery and the circuit board.

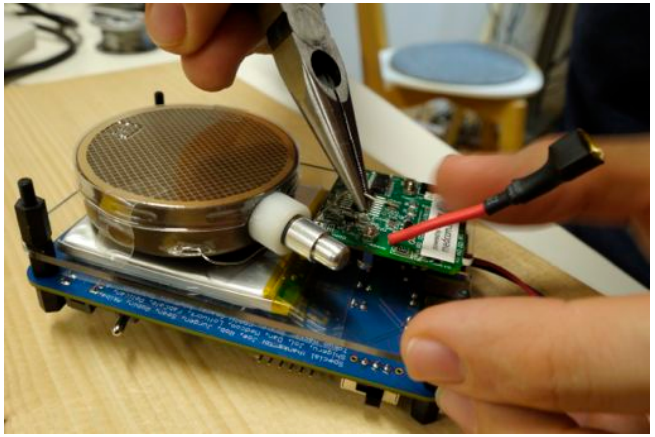


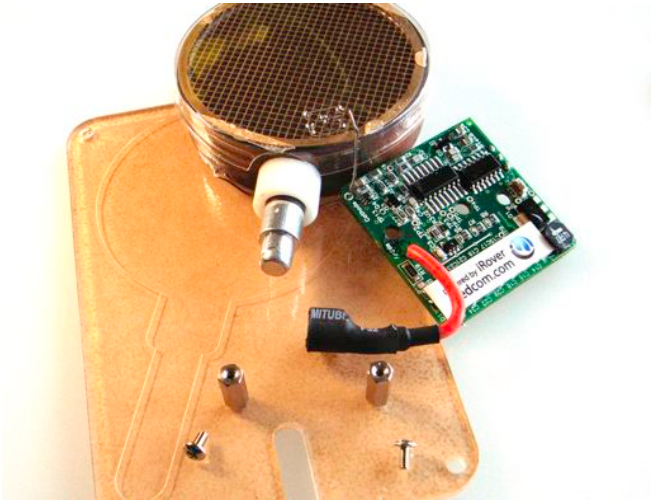
Add a piece of plastic as a puncture shield Find the connector on the FIO, but don't plug it in yet notice the position of the steel mounts for the iRover the long end of the standoffs will be on the opposite side of the plate from the battery the same side as the etched outline where the pancake sensor will be attached using double stick foam tape.



Battery and iRover installed, bottom plate to help position pancake sensor before fixing to plate with double sided foam tape. Following the guide etched on the middle clear plastic plate you can put the foam tape in the circular part of the etched outline now. We find it useful to place the back plate on the standoffs to actually place the Pancake sensor for the final attachment.

# PANCAKE SENSOR ASSEMBLY



**Like we said above, the pancake sensor is very delicate Take care to protect sensor surface during  assembly process..**

Once it's been connected to the battery it also presents an slight electric shock risk (about 500 volts! Yow! ) so be very careful about touching it. Especially the  I rover connection where the bare wire is soldered  take car not to let the  bare wire touch the silver metal connector *(see diagram)*

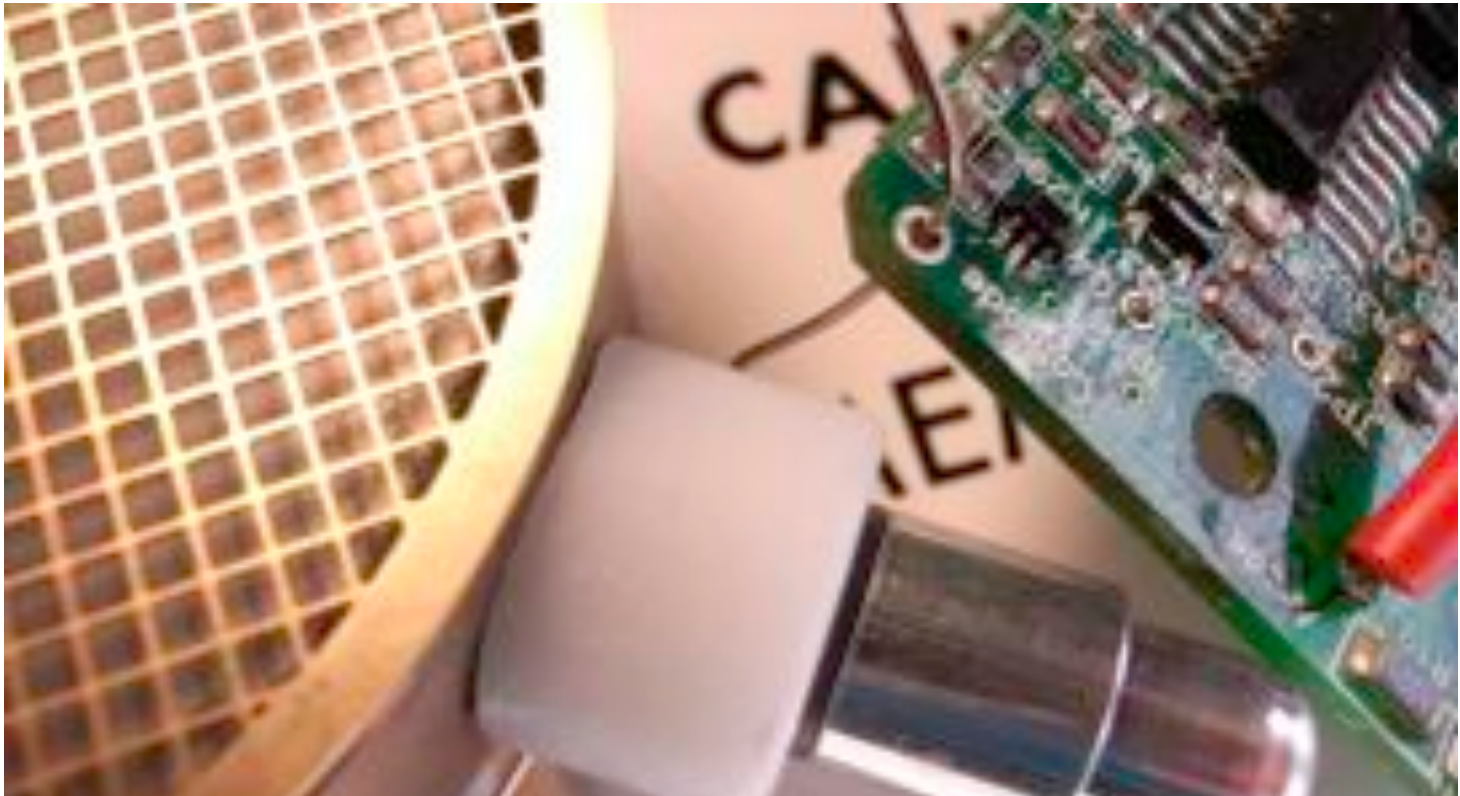
Carefully remove the pancake sensor from the box, and place it membrane-side up

Place the mesh against the face of the sensor, and cover with the clear plastic cover.

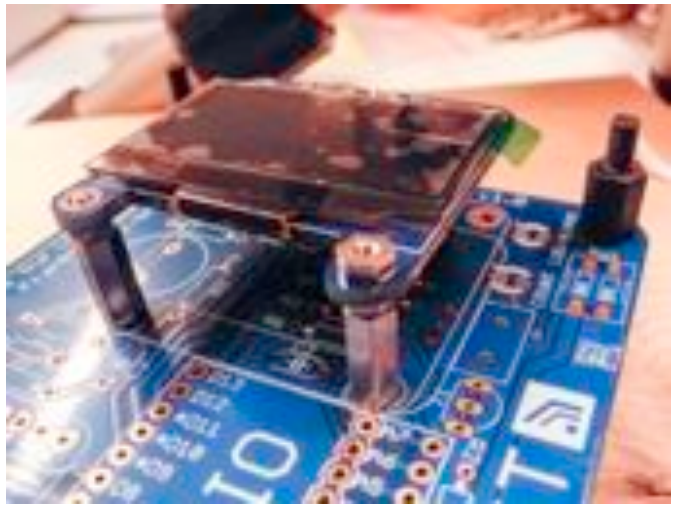
Attach the pancake to middle plate with foam tape, using the etched outline as a guide.

Solder the bare wire from pancake to the small hole marked cathode in the upper left corner of the iRover.  *(see diagram)*

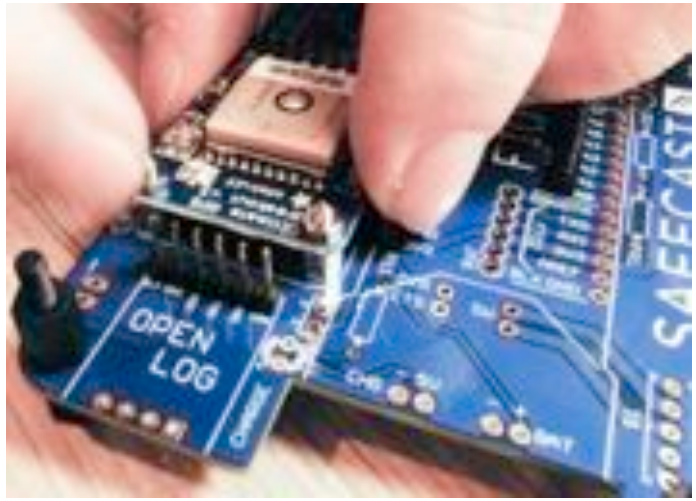
Attach the thick wire connector from the iRover to the projection on the pancake



Attaching plastic standoffs



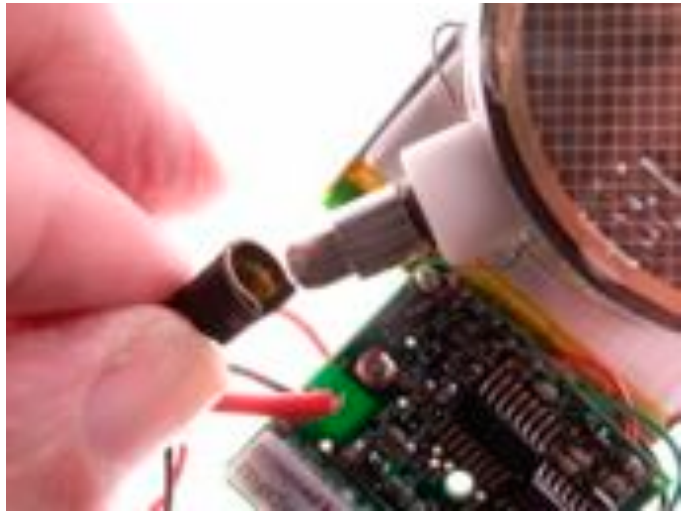
OLED Display attached to standoffs
note very little thread to attach nut.




GPS and headers for Open Log


Headers laid out on PC board

Attaching plastic nut to plastic standoff



Attaching iRover connection to pancake sensor (after soldering bare wire and attaching to plastic panel.) note mesh and plastic cover on sensor !!!!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