

# Water Leak Detector

## Enclosure Assembly Instructions

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<b>Enclosure Assembly Instructions</b>	<b>1</b>
<b>Notices</b>	<b>1</b>
<b>Purpose</b>	<b>2</b>
<b>What you will need</b>	<b>2</b>
From the materials list	2
Tools	2
<b>Step by Step Instructions</b>	<b>3</b>
Utility knife or nippers?	3
Holes in base	4
With mounting bracket	4
Without mounting bracket	5
USB hole	5
RJ11 holes	7
Ventilation holes	8
Mount components in base	9
Top holes	10
Switches preparation	12
Mount faceplate and components	13
Connect top components to electronics	15
Wire it all together	15

## Purpose

This document will provide step by step instructions for assembly of the Team Practical Projects Water Leak Detector protective enclosure.

You can find complete information about this project at:

<https://github.com/TeamPracticalProjects/WaterLeakDetector>

## What you will need

### From the materials list

1. 0.7L Really Useful Box brand plastic box
2. Water Leak Detector faceplate
3. Water Leak Detector mounting bracket or print out
4. Drill with
  - a. 0.5 inch bit
  - b. 0.25 inch bit
  - c. 0.125 inch bit
5. 12 screws 5-32 by 0.5 inch long
6. 4 screws 5-32 by 0.25 inch long
7. 4 5-32 nuts
8. 8 standoffs 5-32 by 1 inch long
9. Zip wires
  - a. One two conductor
  - b. One four conductor
10. 2 strain relief anchors
11. 2 zip ties
12. Micro servo
13. Push button switch
14. Toggle switch

## Tools

1. Utility knife or nippers
2. Hot glue gun
3. Soldering iron and solder
4. Magic marker, black

## 5. Masking tape

### Step by Step Instructions

#### Utility knife or nippers?

In building our boxes we have found that a pair of sheet metal nippers is safer, but can be more difficult to use. To use the nippers you first drill a 0.25 inch hole in the center of the area you want to clear. Then insert the nippers and trim the hole to size. Frankly, the nippers are good for the top hole, but the other holes are a challenge because of the ribs molded into the side of the enclosure. Sometimes one of the ribs molded into the enclosure will be in the way of the nippers and you'll have to trim that away by hand. Diagonal cutters are good for removing the ribbing.

You can get good results with a sharp utility knife. However, these enclosures are made of tough plastic so be very careful that you don't slip and cut your hand. Go slowly and take your time. Our technique is to drill a 0.125 inch hole in **each** corner of an area you need to cut out. Then use the utility knife and oh-so-slowly work it from one corner to the other.



Using diagonal cutters to remove some ribbing.

## Holes in base

There are two methods for assembling the base. If you are using the laser cut mounting bracket, then this provides a guide for the numerous holes you must drill in the base of the enclosure. If you are not using the bracket, then print out the bracket PDF file and cut out the bracket outline.

### With mounting bracket

If you are using the mounting bracket, carefully align the bracket with the outside bottom of the enclosure box. Be sure that the writing is facing the bottom of the box; you should not see the writing when looking at the bottom of the bracket. Use some masking tape to hold the bracket in place.



Mounting bracket held in place with tape.

Now carefully drill 0.125 inch holes through the bottom of the box in each place where there is a hole in the bracket. With the utility knife, clean off any plastic scrap from the holes. Another technique for removing the flash is to take a much larger drill bit, say 0.5 inch, and gently twist it in each hole.



Holes drilled in box bottom

#### Without mounting bracket

Using a box knife, carefully score an "X" in the center of each of the indicated mounting holes on the printout. Carefully place the printed image of the mounting bracket on the bottom of the enclosure box. Be sure that the writing's on the side towards the box. Hold this paper in place with masking tape.

Now carefully drill 0.125 inch holes through the bottom of the enclosure in each place where a hold is indicated on the printout. With the utility knife, clean off any plastic scrap from the holes.

#### USB hole

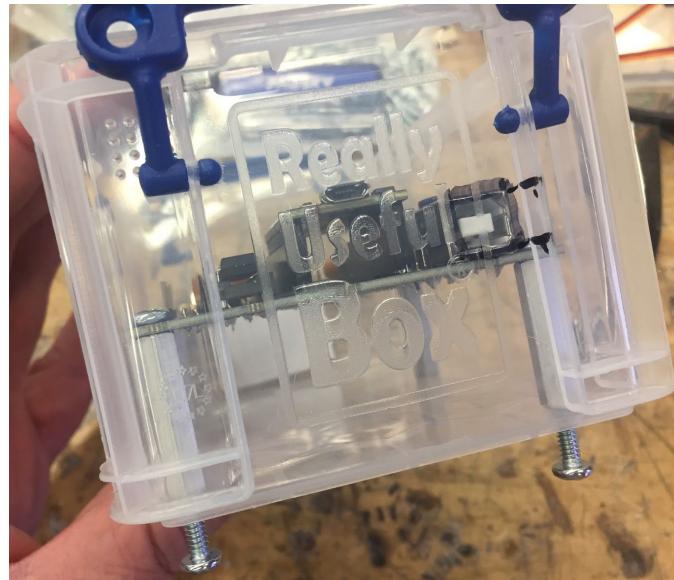
You will now cut a hole in the side of the enclosure to accommodate the USB connector mounted on the Water Leak Detector PCB.

Attach 4 standoffs to the bottom of the PCB using 4 screws.



Standoffs attached to PCB

Place the PCB in the enclosure with the standoffs over the four mounting holes in the base. Use two bolts to hold it in place. Using the magic marker, draw a square on the side of the box that is just a bit bigger than the USB connector housing.



PCB held in place with 2 screws. USB hole marked.

Remove the PCB from the box. Using nippers or a utility knife, cut out the square area.

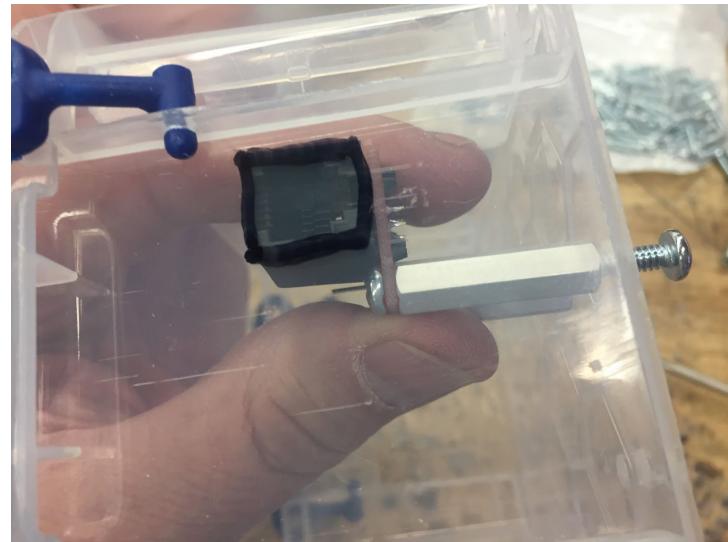


Hole cut for USB power cord. We used nippers so  
Some of the ribbing is also removed.

## RJ11 holes

You will need to cut two holes in the side of the enclosure to accommodate the RJ11 jacks.  
Note that these jacks will extend through the side of the enclosure.

Attach 2 standoffs to one of the RJ11 breakout boards. Place the board in the enclosure with the standoffs over one of the two sets of mounting holes. Using the magic marker, draw a square on the side of the box that is just a bit bigger than the RJ11 connector.



One RJ11 hole is marked.

Move the RJ11 board to the other set of mounting holes and draw another square. Remove the board from the box. Using nippers or a utility knife, cut out both squares.



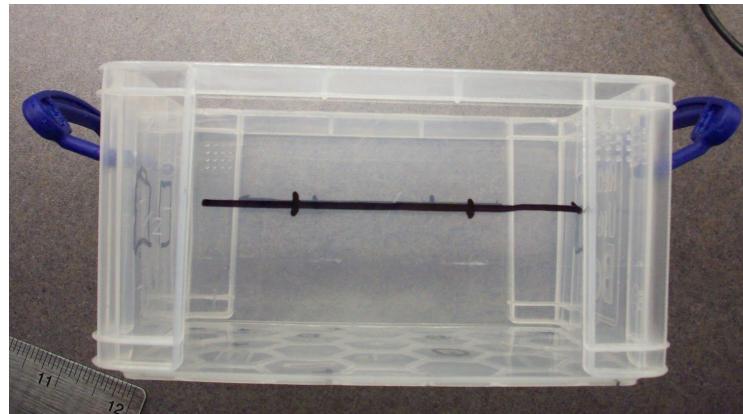
2 holes cut for RJ11 connectors.

## Ventilation holes

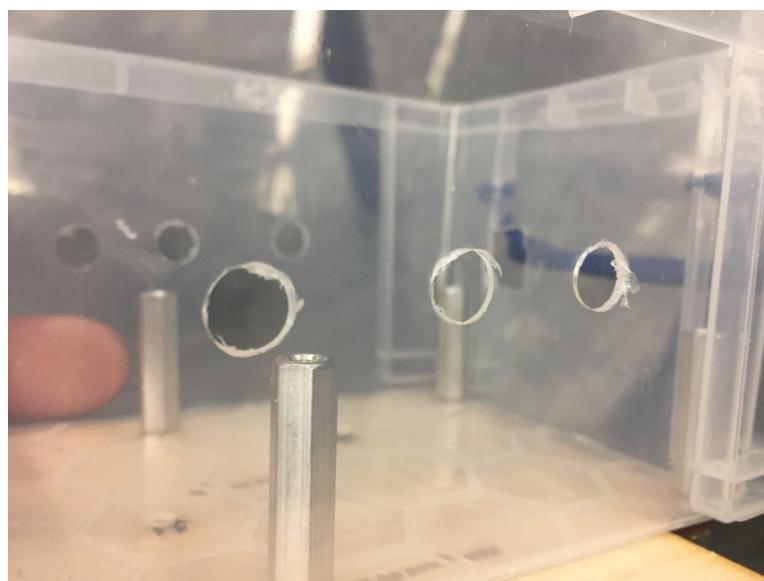
The enclosure needs to be ventilated. This is required so that the DHT11 reports the correct ambient temperature and humidity.

On each of the long sides of the box, draw a horizontal line about 1-½" up from the bottom of the box. Make two marks on this line about 1" in from the reinforced sides of the box. These

will be for drilling ventilation holes on the box. On each of the two long sides of the box, drill two half inch holes.



Marks made for ventilation holes.

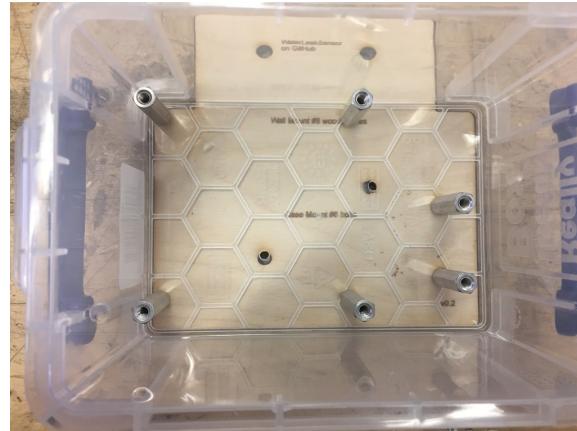


Ventilation holes drilled in box sides.

<<Need correct photo>>

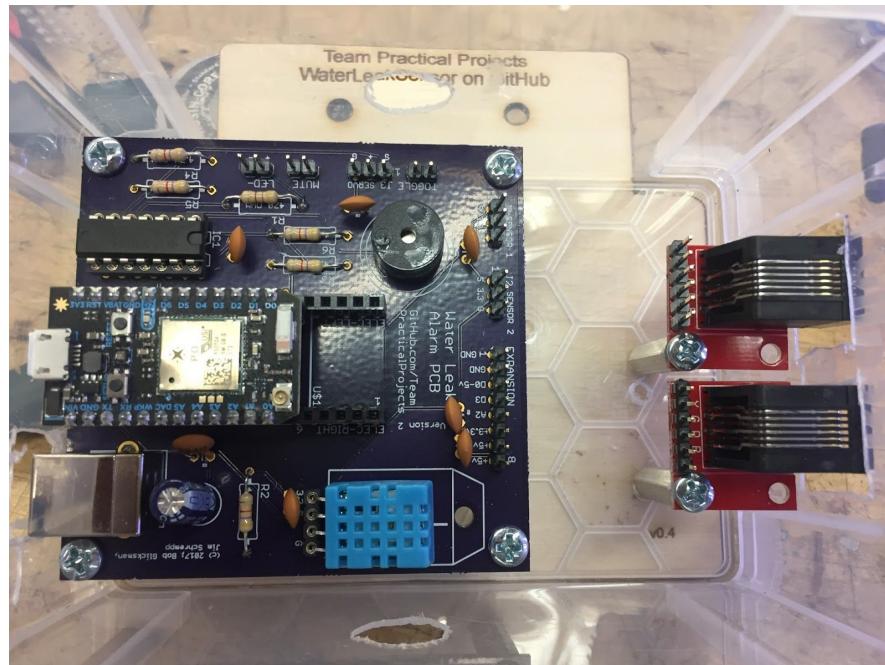
## Mount components in base

Hold the mounting bracket against the base of the enclosure with the writing on the side towards the box. Using half inch bolts mount four standoffs to hold the PCB. Now mount four standoffs to hold the RJ11 breakout boards. The bolts will also hold the mounting bracket in place.



Case with one inch standoffs in place.

Use four 0.25 inch bolts to mount the PCB board to the standoffs. Now mount the two RJ11 breakout boards with two screws each.



PCB and RJ11 boards mounted.

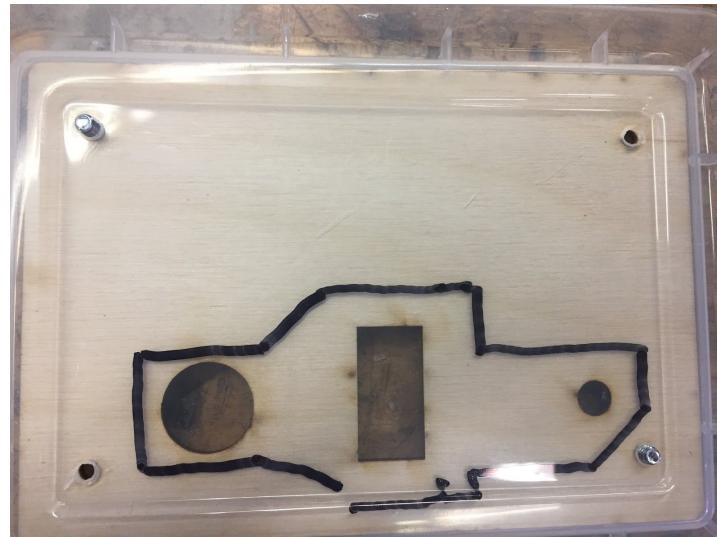
## Top holes

Hold the bezel (or a printed version of it) against the outside top of the box. Drill the four corner holes. Use two bolts to temporarily hold it in place.



Bezel temporarily mounted to box top.

Using a magic marker, outline a large area that will give space for all of the top mounted components.



Area marked to be removed.

Remove the bezel and use your nippers or utility knife to cut out the large area.

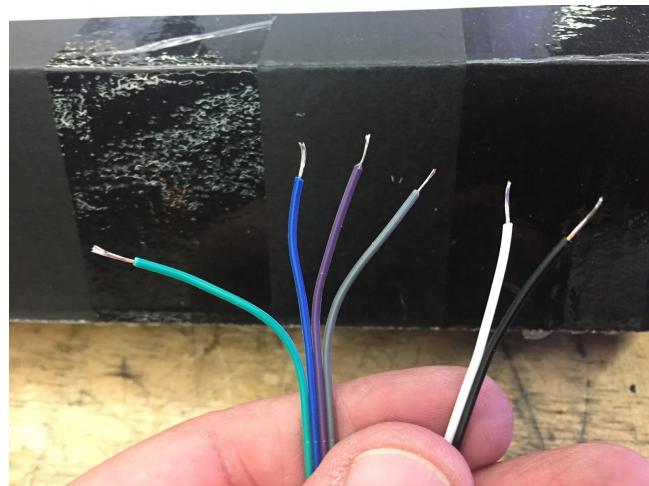


Plastic removed, bezel held in place to check clearance.

## Switches preparation

Locate the two zip wire pieces, one with 2 conductors and one with 4 conductors. Cut the female connectors from one end of all the wires. Using wire strippers, carefully strip off 0.25 inch of insulation from the ends. Use a wire stripper for 22 gauge stranded wire. It is easy to break the strands, so be gentle. We recommend stripping off 0.125 inch at a time.

Comb the bare strands to a neat look, twist them slightly if needed. Use the soldering iron to tin the bare ends of each wire.



Two zip conductors stripped and tinned.

Locate the toggle switch. Solder the two conductor zip wire to the center and one end leads of the switch.

Locate the LED push button switch. Solder the four conductor zip wire to the four leads.

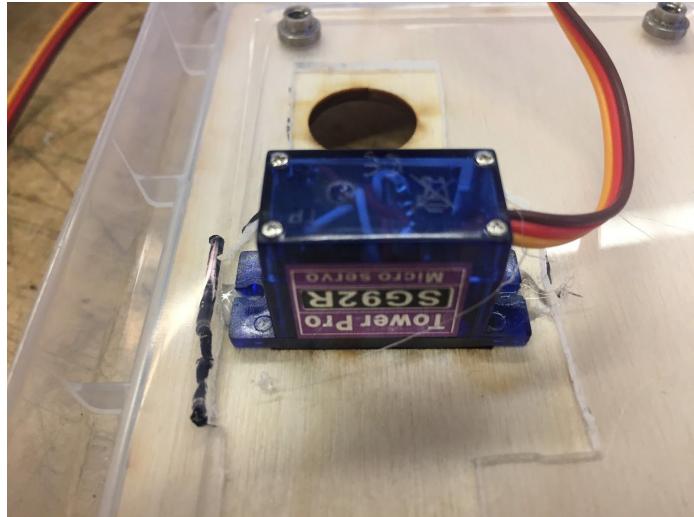


Zip wires soldered to switches.

## Mount faceplate and components

Using four 5-32 bolts 0.5 inch long and five nuts, secure the bezel to the outside top of the box.

Locate the micro servo. Test fit it in place in the bezel, inserting it from the back. Make sure the rotating shaft is at the top of the bezel, so that it is in the center of the radiating dial marks. Take the servo out and place two small drops of hot glue just above and below the hole where the servo goes. Now place the servo into the hole so the hot glue will touch the mounting brackets and hold the servo in place.



Servo held in place with two drops of hot glue.

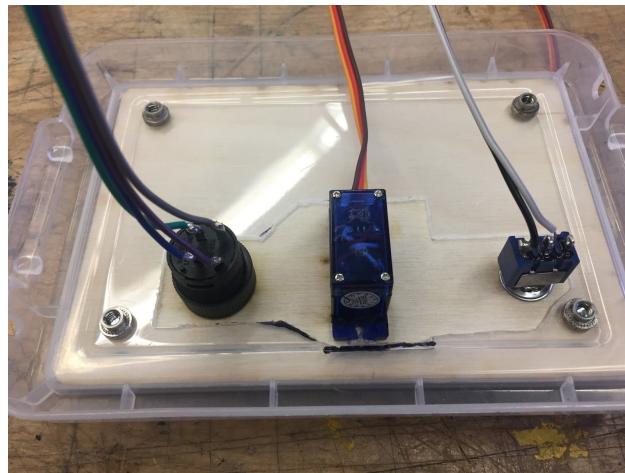
Press the single arm horn onto the servo. Gently rotate the arm all the way counter-clockwise. Now remove the horn and press it back onto the servo in the 9 o'clock position. Secure the horn with the screw.



Servo in correct position; shaft at top, horn at 9 o'clock.

Locate the toggle switch. Remove the top nut from the switch and place the switch into the bezel from behind. Note that the indexing washer should go into the corresponding hole in the bezel. Place the nut on the front of the switch and tighten it well.

Locate the LED push button switch. Remove the locking ring. Insert the wires of the switch through the hole in the bezel from the front. Thread the wires through the locking ring and screw it onto the switch from the back. Make sure the front plate of the switch is square with the sides of the bezel and tighten the locking ring.

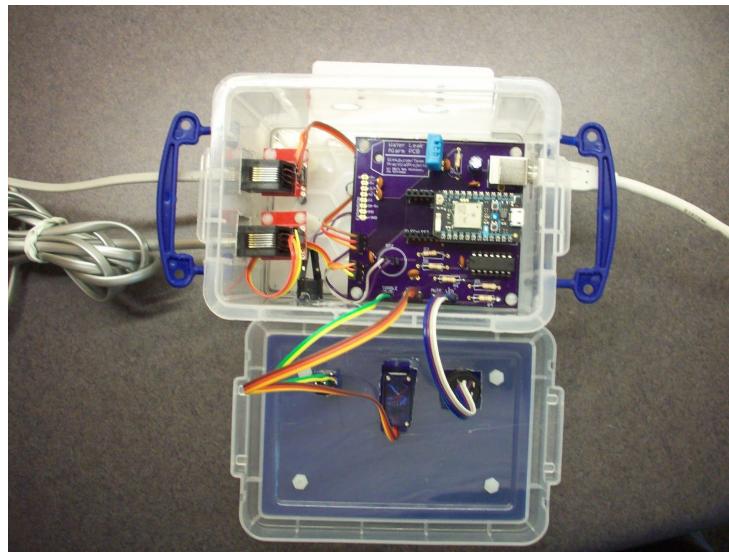


Switches and servo mounted to bezel.

Apply two strain reliefs to the inside of the top of the case. Route the zip wires through them and secure with a zip tie.

<<photo needed>>

## Connect top components to electronics

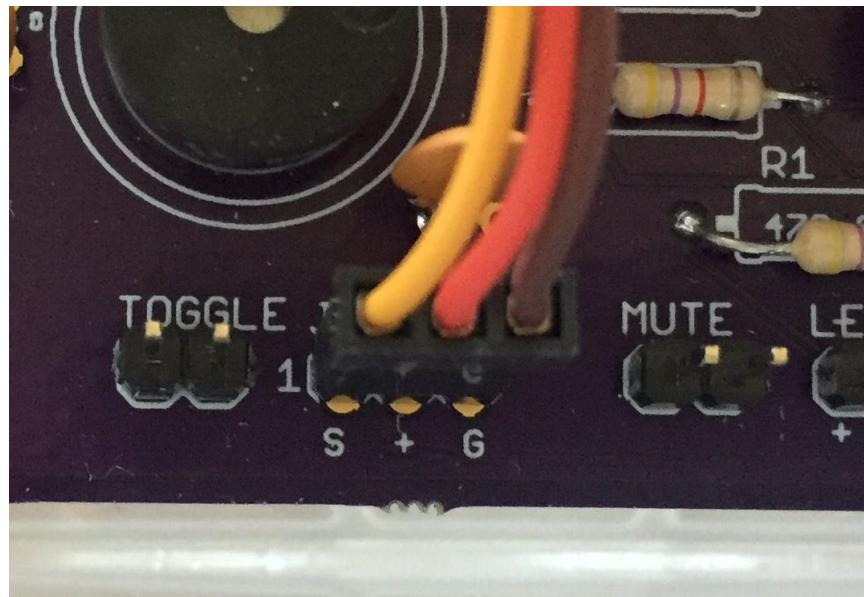


Completed wiring. Note that in this instance the buzzer was mounted to the side of the case.

## Wire it all together

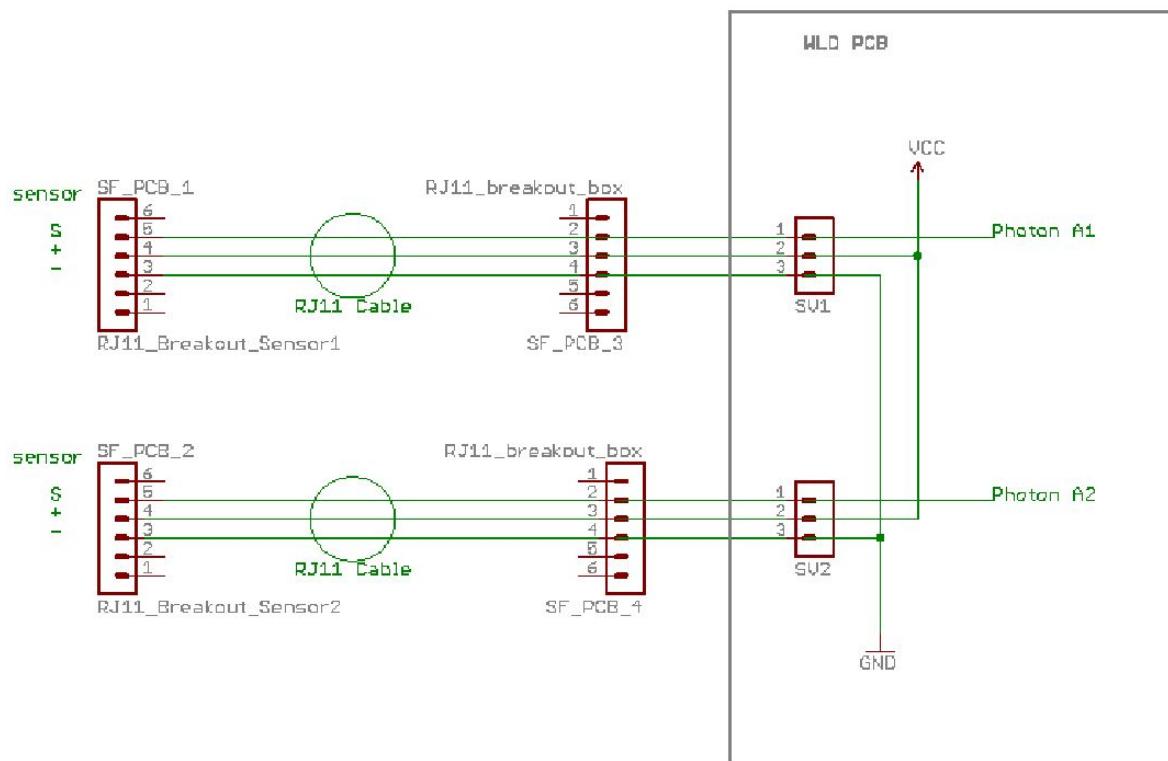
It is now time to connect all of the separate pieces together.

1. Wire up the RJ11 boards to their respective connectors on the PCB using three female-female header wires peeled off from the 40 wire ribbon cable. See the wiring diagram and photo below.
2. Connect the two wires from the toggle switch to the “toggle” pins on the PCB. There is no polarity to worry about here.
3. Connect the three wire cable from the servo motor to the servo connector (J3) on the PCB. Wires from left to right are: orange, red, brown.



Servo cable connected

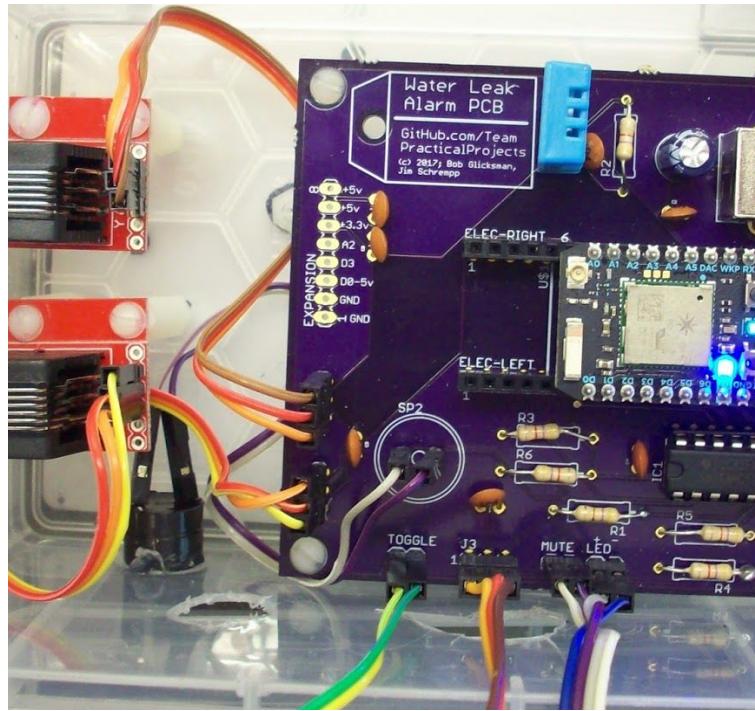
4. Wire the push button switch leads to the “mute” connector on the PCB. There is no polarity to worry about here.
5. Wire the pushbutton LED leads to the “LED” connector on the PCB. Be careful to observe the polarity marked on the switch and on the PCB. If you wire this backwards you won’t hurt your devices but the LED will not light.



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Diagram of wiring PCB to RJ11 boards, to sensors

Below is a photo of the completed wiring.



Box with complete wiring close up. Note in this instance  
the buzzer is mounted on the side of the case.