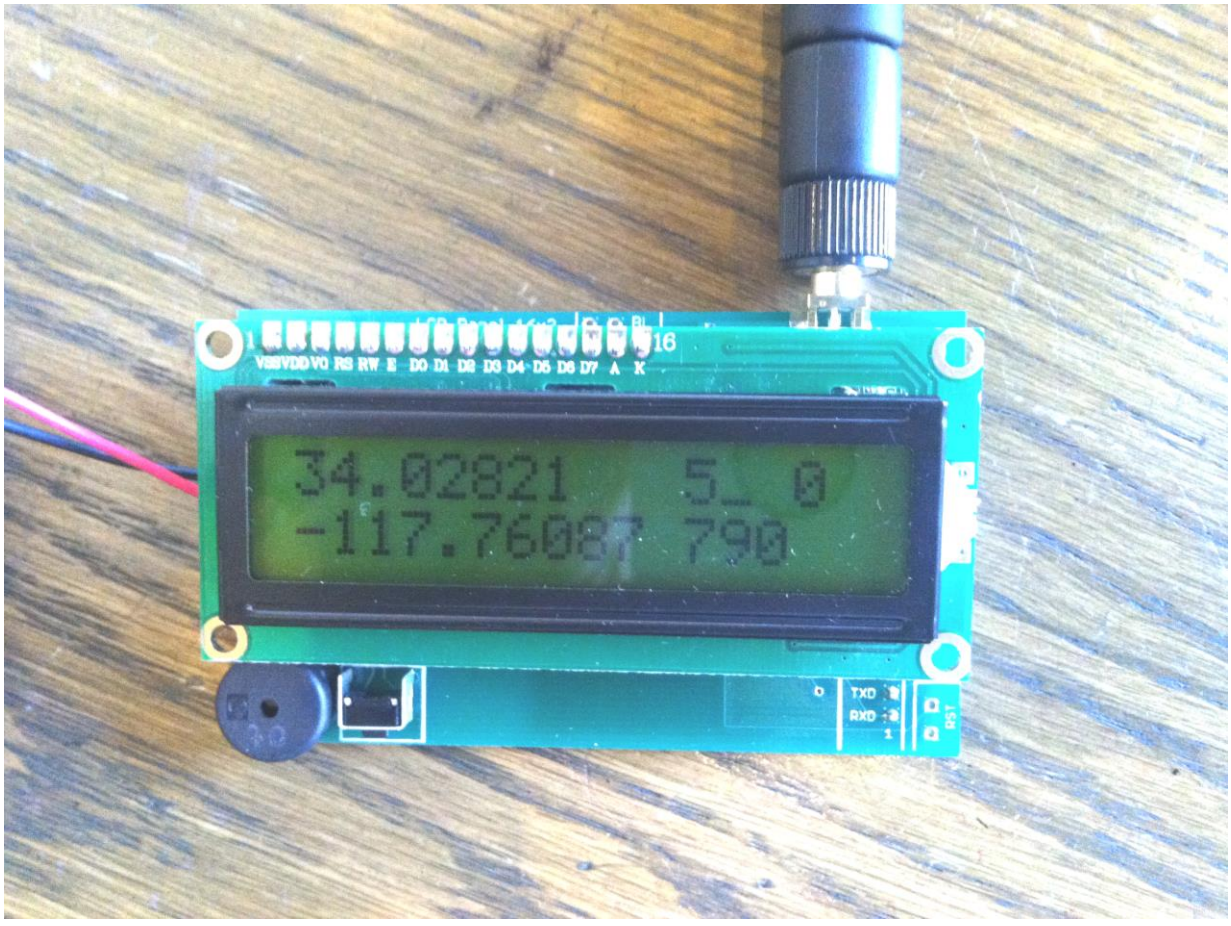
Eggfinder LCD
Assembly and Users Manual

Board Revs A2/B1
Firmware Rev 1.11



California Proposition 65 Warning

WARNING: This product contains chemicals (lead) known to the State of California to cause cancer and birth defects or reproductive harm.

This kit includes a special low-temperature ultra-fine leaded solder wire. Including the solder with the kit ensures that you will have solder that can be used to mount the surface-mount parts in the kit. Leaded solders have been used for over a century in electronic assembly, but you should take the following precautions when using it (or just about any chemical, for that matter):

- Do not eat or drink while using it
- Wash your hands after handling it
- Keep it in the protective bag when you're not using it

The MSDS can be found at

http://www.kester.com/download/245%20FluxCored%20Wire%20Lead%20Alloy%20SDS.pdf

The European Union RoHS (Restriction on Hazardous Substances) regulations exempt kits such as the Eggfinder from its regulations, because they are not for resale and since it is well known that hand soldering with non-leaded solder is much more difficult and more damaging to heat-sensitive components.

(For information on EU/UK versions, please visit www.EggtimerRocketry.com)

Important Regulatory Information

> **This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**
>
> **It is intended to be used ONLY for educational and experimental use in Class II/III amateur High Power Rockets which are classified as aircraft by the Federal Aircraft Administration (CFR 14 §101.25), and which must by FAA and NFPA regulations be operated at least 1,500' away from any populated buildings. Although unlikely, this device may cause interference with consumer devices that run on the unlicensed 902-928 MHz band, and therefore must not be used in residential areas.**

The Eggfinder uses RF modules in the 902-928 MHz ISM band manufactured by Hope RF, model HM-TRP-915. They are intended to be used only in the United States, Canada, Australia, and other countries in which this band (or a subset of it) is not subject to licensing. These modules have been tested by Hope RF to be compliant with the FCC Part 15 regulations for non-licensed intentional emitters, and as such have been permitted to be imported into the US. However, Hope RF (at the time of this document) has not obtained formal certification with the FCC. As a hobby kit, designed for educational and experimental purposes, the Eggfinder is considered by the FCC to be "generally exempt" from authorization requirements. Nonethless, we have made a good faith attempt to comply with all technical regulations, and you should too by building it **exactly** as per the instructions, and by using only the antenna on the transmitter module that we recommend in the instructions, or a suitable replacement as outlined in the Appendix.

Because the Eggfinder runs on an unlicensed band, there is no protection against interference from other sources; basically, you get what you get. We've done substantial testing and are confident that your Eggfinder system is unlikely to be significantly affected by outside radio sources, but there's no guarantee.

If your Eggfinder causes interference in a residential setting, or with licensed radio systems (such as TV or ham radio), you **must** stop using it until you correct the problem. This is extremely unlikely given the small amount of power and the "tightness" of the transmitter's output, and in particular the distance from any population that HPR rockets must be flown. Nevertheless, you need to be aware of this, and be willing to abide by the rules. These are the same rules that govern other non-licensed transmitters, such as cordless phones, WiFi and Bluetooth® devices, and garage door openers.

Important Links:

FCC Part 15 (governing unlicensed intentional emitters)

http://www.ecfr.gov/cgi-bin/text-idx?SID=adb12f74b498e43ec453f7899e9ef0fd&node=47:1.0.1.1.16&rgn=div5

Hope RF HM-TRP Documentation (FCC test documentation)
http://www.hoperf.com/upload/rf/HM-TRP-915(20dBm)-FCC.pdf

FAA Regulations for Amateur Rocketry (Part 101)
http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&rgn=div5&view=text&node=14:2.0.1.3.15&idno=14

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Before You Start…

• Go to our web site at www.Eggtimerrocketry.com and download the latest Release Notes.

• Go to our web site at www.Eggtimerrocketry.com and download the latest Assembly/Users Guide..

• Read them thoroughly before starting… it will save you some grief later, we promise!

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Thanks for buying an Eggfinder GPS Tracker! The Eggfinder is a hobby rocketry GPS tracker that uses a GPS module and a 900 MHz license-free transmitter module to broadcast your rocket's location in real-time to a computer or tablet. With appropriate GPS tracking software, which is available for free on the Internet, you can actually track your rocket in flight, and ultimately find out exactly where it landed.

Like other Eggtimer Rocketry products, we sell it as a kit, to keep costs down and provide an outstanding value. This means that you have to do a little work, of course, but considering that most hobby rocketeers that would use our products have some degree of electronics expertise, this should not be much of an impediment. If you do not have any experience soldering kits such as the Eggfinder, we recommend that you ask around… chances are that somebody in your rocketry club would be more than happy to assist you for a small bribe (beverages work well!).

The Eggfinder LCD receiver is different than the standard "dongle" Eggfinder RX receiver because it contains a processor and a LCD display. It displays the rocket's coordinates, the number of satellites and quality of fix, and the last received GPS altitude. This allows you to use the LCD receiver with a smartphone and inexpensive (usually free!) GPS tracking program to find your rocket easily, and if the rocket is in a different location due to being blown around by the wind (or being driven back to the pad by a well-meaning club member), you will get location updates on the LCD display so you can plug the updated coordinates into your smartphone (and find the guilty party!). You can also program the frequency to match your Eggfinder TX transmitter, so you don't need to use a different one for every transmitter frequency.

About Soldering Your Eggfinder…

Assembling your Eggfinder kit isn't that hard, but we recommend that you don't choose it as your first kit project. You must be able to solder small components using fine solder and get nice shiny solder joints. If you have never soldered before, you need to learn anyway, because if you are going to do rocketry electronics you're going to be doing some soldering. If you want to get into advanced projects like telemetry, you're probably going to be doing a lot of soldering. We recommend that you get a few small kits from Ramsey or SparkFun, put them together, and hone your skills on them first. There's a lot of fun stuff out there, so go for it!

The Eggfinder uses a few Surface Mount Technology (SMT) parts, they are large by SMT standards, and are within the realm of being hand-solderable. In our case, the RF module could potentially be damaged by the heat of surface-mounting in an oven; that's why we chose to have you solder them. In order to help make your assembly successful, we have included about 3' of very fine (.020"), very low temperature (about 180°C), no-residue solder. This is not the stuff that you get at Radio Shack… it's designed for soldering small temperature-sensitive parts without transferring much heat to the part itself.

Important Note: DO NOT use any kind of extra flux with this board. There is no reason for it because the parts are new and clean, and any flux that you buy is almost certainly going to be incompatible with the flux in the no-clean solder. Extra flux just makes a mess, and may require excessive heat in order to boil off the flux, possibly damaging the sensitive components in the kit.

For soldering components on a board like the Eggfinder, we recommend a small pencil soldering iron, about 15W. If you are only going to use it occasionally, Weller makes a decent cheap 12W iron, it's about $15. There is also a similar iron that's sold by ECG. We like those, but the copper tips seem to oxidize and corrode rather quickly compared to some more expensive irons; fortunately, the tips are replaceable and cheap. Better would be a fancier soldering pencil with iron tips; those run about $30, but they'll last forever. The best iron would be a temperature-controlled solder station, they typically start at about $50 for a cheap one and can go to a few hundred dollars if you want to get really fancy. Weller makes a good one for about $50, if you make the investment that will probably be the last soldering iron you will ever need to buy. These solder stations usually have a little well with a tip-cleaning sponge, so they end up taking less room on your workstation too. Get the smallest tip you can find, preferably with a conical tip that's about the same width as the smallest pad. .032" conical tip is ideal. We do NOT recommend that you use an extremely-fine "needle nose" tip, we have found that they may not conduct enough heat to the pads to allow the solder to flow out well.

General Assembly Information

We're sure that you are ready get started, but before you do you will need to get some tools together. The tools that you will need are:

___ Low-wattage soldering iron, 15W or less, with a fine conical tip

___ Small needle-nose pliers

___ Small diagonal cutters

___ Tweezers to handle the SMT parts

___ A small damp sponge for cleaning the tip of your soldering iron

___ A lighted magnifier, for inspecting solder joints (not essential, but very helpful)

___ A jewler's loupe or small 10x magnifier, for inspecting the SMT solder joints (again, not essential but VERY helpful)

___ A well-lighted place to work, preferably with a wood or metal surface, also preferably not carpeted

___ Some PAPER masking tape (do NOT use Scotch® tape or electrical tape)

___ A round wooden toothpick

Each installation step has a check-off line, we strongly recommend that you check them off as you go, and that you perform the steps in sequence. We have listed the steps in order to make it easiest to assemble the Eggfinder, deviating from them isn't going to make your life any easier.

We strongly recommend that you consult the assembly pictures on the Eggtimer Rocketry web site, www.EggtimerRocketry.com . Go to Photos/Eggfinder LCD Build.

Each step is pictured, so you can see exactly what you need to be soldering. Looking at the pictures as you go will help prevent you from soldering the wrong thing, or putting something in the wrong way.

Assembling your Eggfinder LCD Board

Important Note:

We STRONGLY recommend that you drill/cut the case **BEFORE** building the board. This is because the recommended procedure is to use the bare PC board as a drilling template, and it's very difficult to do this once you've built the board. See the "Mounting the Board in the Case" section…

Step 1: Sort the Components

Before you start soldering anything, you need to lay everything out and make sure that you are familiar with all of components, and that you have everything. If you are missing something, let us know immediately so we can send you whatever you need. You should have the following parts, check them off as you sort them…

	Qty	Description
__	1	Circuit board
__	1	Hope RF HM-TRP-900 RF module
__	1	1602 16x2 LCD Display
__	1	Atmel ATMEGA328P-PU Processor
__	1	NCP1117-33 3.3V voltage regulator (the markings end in "33")
__	1	NCP1117-50 5V voltage regulator (the markings DO NOT end in "33")
__	1	16.000 MHz ceramic resonator
__	1	1K ohm 1/8 watt resistor (bands are brown-black-RED)
__	3	10K ohm 1/8 watt resistors (bands are brown-black-ORANGE)
__	1	10K ohm trimmer potentiometer
__	2	.1 uF capacitors (marked "104")
__	3	10 uF electrolytic capacitors (tubular component with two wires, one is marked "- - - - -" on the side of the case
__	1	12mm Round Pizo Buzzer
__	1	3mm x 6mm horizontal Tactile Switch

__ 1 16-pin header strip

__ 1 16-pin socket strip

__ 1 4-pin right-angle header strip

__ 1 1/32” Brass Antenna wire (4”)

__ 1 4” length of 1/16” heat-shrink tubing

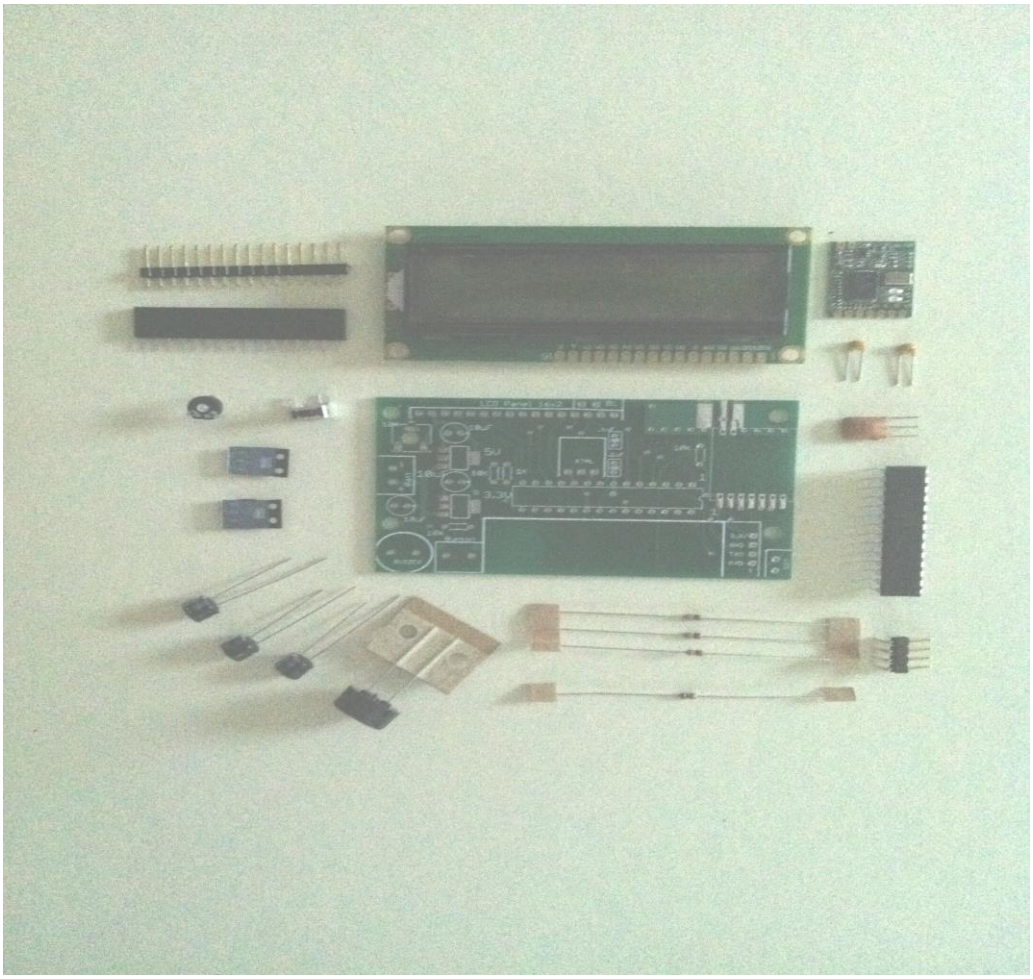
__ 1 Coil of .020” 63/37 No-Clean solder wire

__ 1 Case with screws

__ 1 4xAA battery box with slide switch

__ 1 Hardware kit ((4) 1 ¼” #4 screws, (4) #4 locking nuts)

__ 1 4” length of ¼” vinyl tubing



Note that some of the components are static sensitive, so you should avoid sources of static electricity while you are handling them. We recommend that you assemble the Eggfinder on a wood or metal surface unless you are fortunate enough to have a high-temperature anti-static mat (don't buy one just to build the Eggfinder, however!) Avoid putting it on plastic surfaces that generate static, and preferably put it together in a room that's not carpeted. That being said, it's very unlikely that you will zap any of the components in the Eggfinder with static electricity, but consider yourself notified of the possibility…

Also note that some of the components are polarized, i.e. it matters which way you put them in. If you solder one of these components in backwards, the effect will range from something not lighting up (LEDs) to nothing at all working. It is CRITICAL that you test-fit the parts before you solder, and that you make ***SURE*** that you have them pointed the right direction before soldering. Like the old adage says, "Measure twice, cut once." If you solder a part onto the board incorrectly, it can be a minor pain to remove if it only has two pins, or it can be virtually impossible for something with a lot of pins. ***The Eggfinder Limited Warranty does not cover incorrect assembly***, so if you mess up badly enough you may end up having to get another kit and starting over; neither of us want that.

It is very important that you assemble the Eggfinder LCD in the order listed. This makes it easier to access the surface-mount components, if you start soldering out of order it's going to be tough for you to get to the pads of the SMT parts. Some of the instructions will call for you to tack-tape parts to the board to maintain alignment while you solder. You should ONLY use paper masking tape for that purpose, DO NOT use "Scotch"® tape or electrical tape for this; plastic tapes can pick up static electricity and damage parts, and electrical tape tends to leave a sticky residue.

If you have any questions about the assembly, please send us an email, to support@eggtimerrocketry.com , BEFORE you start building. We generally answer all questions the same day, and we do our best to ensure your success.

Eggfinder LCD Assembly Checklist

Before you solder anything, make ***absolutely*** sure that you have the correct part and that it is inserted in the board correctly. The board has all of the component values, outlines, and polarities silk-screened on the top, so there shouldn't be any doubt about what goes where and how. Nevertheless, if you have any questions about the assembly procedure, do not hesitate to drop us a line at support@eggtimerrocketry.com before you solder the parts to the board. You may have to wait a day for the answer, but it could save you a lot of grief later on!

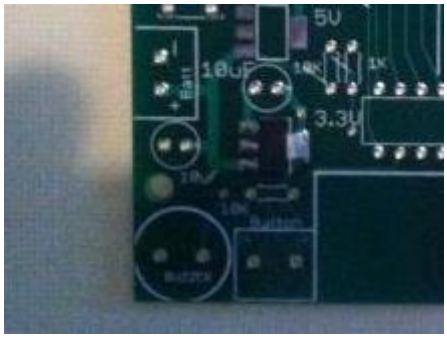
The Eggfinder Limited Warranty does not cover damage to parts while attempting to desolder them because you inserted something incorrectly. We spent a lot of time making sure that the assembly instructions were clear, but once again if you have any questions about the assembly procedures drop us a line at support@eggtimerrockety.com ***before*** you solder.

OK, so let's get started…

__ Mount the 3.3V Voltage Regulator

Locate the large pad and the three small pads for the voltage regulator. Heat up the pad with your soldering iron and melt a small amount of solder on the large pad, just enough to cover it. Locate the 3.3V voltage regulator, it is the one WHOSE MARKINGS END WITH A "33". DOUBLE-CHECK BEFORE YOU SOLDER! Place the voltage regulator IC in place, and hold it down, then heat up the large pad on the voltage regulator until the solder starts to flow. Hold your soldering iron on the pad for another 5 seconds, then remove it and wait at least 10 seconds.

One by one, solder the three small three small leads to the pads, using enough solder to cover the pad and get a good "tenting" on the leads without creating solder "blobs". Wait at least 30 seconds between each pad to prevent the chip from overheating.



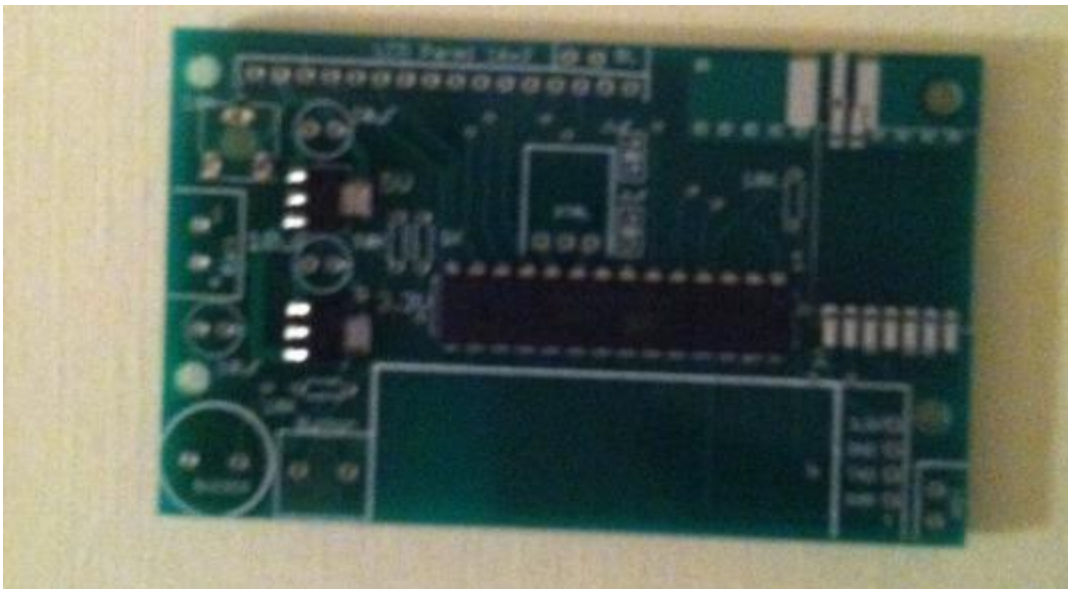
__ Mount the 5.0V Voltage Regulator

Locate the large pad and the three small pads for the voltage regulator. Heat up the pad with your soldering iron and melt a small amount of solder on the large pad, just enough to cover it. Locate the 5V voltage regulator, it is the one WHOSE MARKINGS END WITH A "5", or WHOSE MARKINGS DO NOT END IN "33". Place the voltage regulator IC in place, and hold it down, then heat up the large pad on the voltage regulator until the solder starts to flow. Hold your soldering iron on the pad for another 5 seconds, then remove it and wait at least 10 seconds.

One by one, solder the three small three small leads to the pads, using enough solder to cover the pad and get a good "tenting" on the leads without creating solder "blobs". Wait at least 30 seconds between each pad to prevent the chip from overheating.

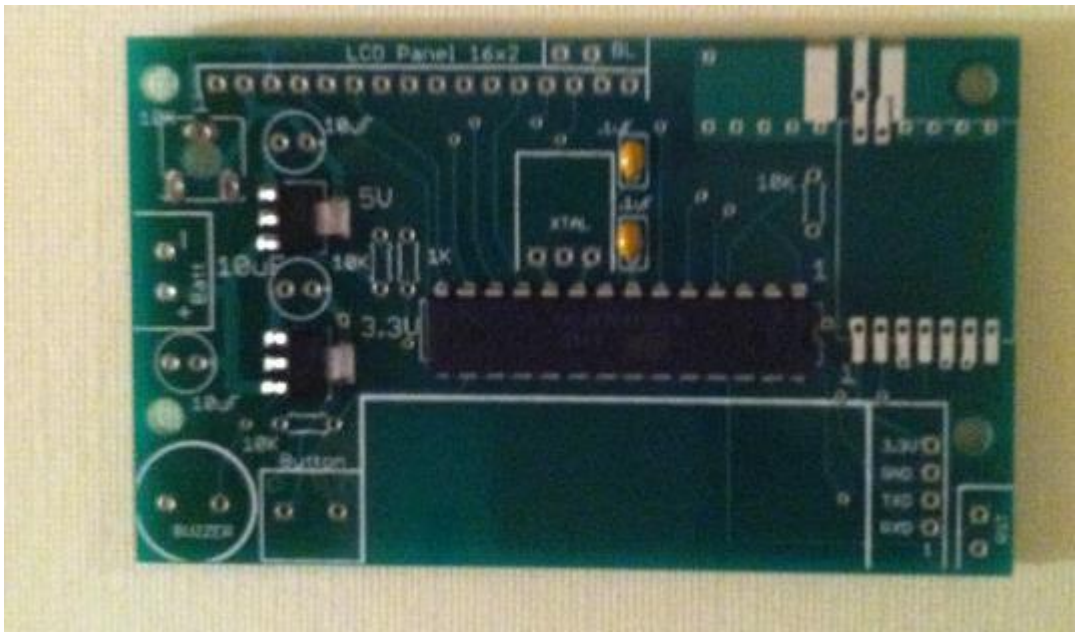
__ Mount the Atmel ATMEGA328P-PU Processor

Carefully remove the processor chip from the anti-static foam or tube in which it was shipped. Identify the notch at one end of the chip, this notch needs to line up with the notch that's silkscreened on the PC board. Gently insert the chip into the holes, and turn the board over. The holes are small, so you may have to wiggle it around a bit to get all 28 pins into them. Solder ONLY two opposite corner pins, then turn the board upright again, and make sure that 1) you have the chip pointed in the right direction, and 2) the chip is seated completely against the circuit board. If you made a mistake, you will have to carefully unsolder the chip and fix the problem; two solder joints are a lot easier to fix then 28. If it looks good, turn it back over and finish soldering the rest of the pins.



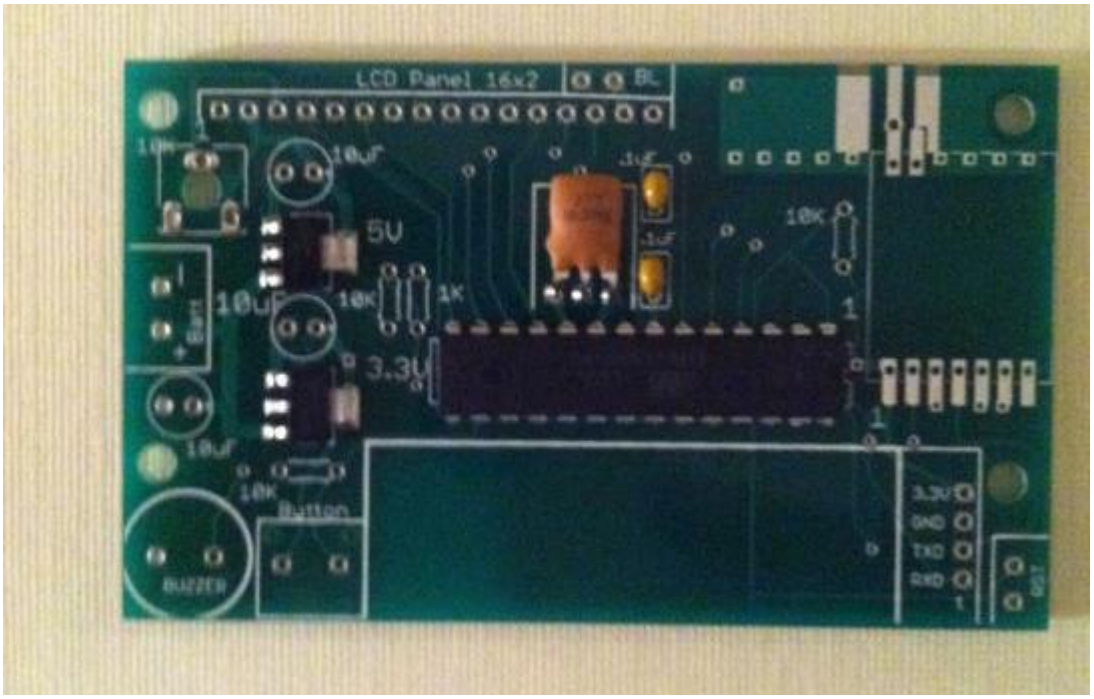
__ Mount the .1uF capacitor

Insert the .1 uF ceramic capacitors(marked “104”) into the appropriate holes. It's not polarized, so it doesn’t matter which way you mount it. Turn the board over and solder them to the board. Trim the excess leads.



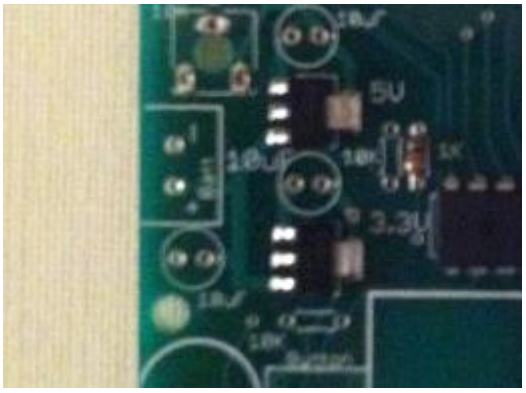
__ Mount the 16.00 MHz resonator

Bend the leads of the 16.00 MHz resonator 90 degrees so it will lay flat against the board. Insert the resonator into the space next to the processor chip. Tape it down with a piece of masking tape, then turn over the board and solder the pads. Trim the excess leads, and remove the tape.



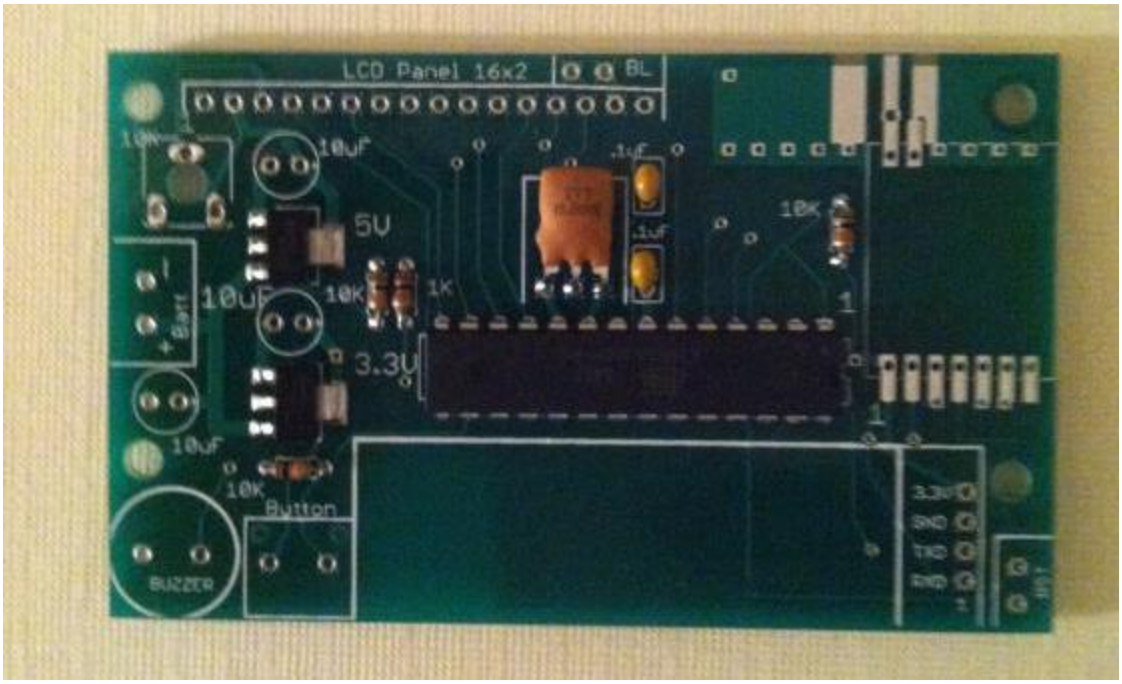
___ Mount the 1K Resistor (brown-black-REDs bands)

Bend the leads down 90 degrees on the 1K resistor. Locate its position on the board, and insert the resistor in the board. Tape it down to hold it in place. Turn over the board and solder the resistors in place, trimming the leads flush afterwards. Remove the tape.



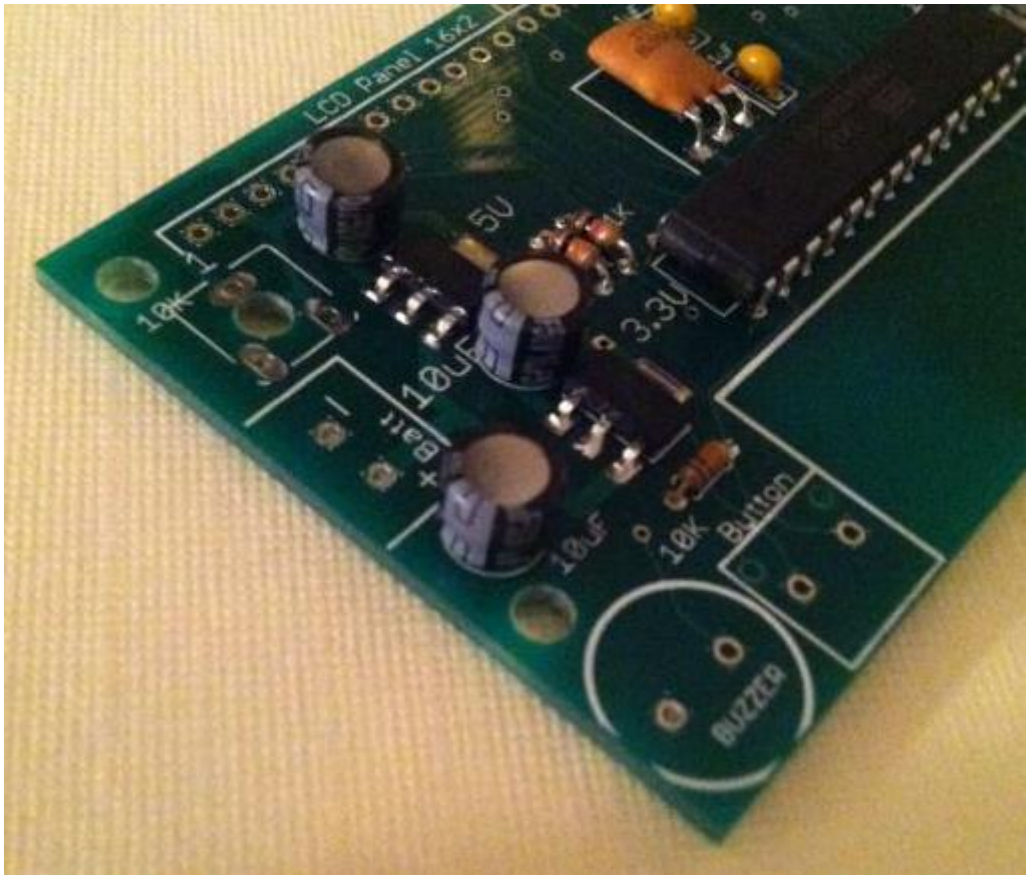
___ Mount the 10K Resistors (brown-black-ORANGE bands)

Bend the leads down 90 degrees on the three 10K resistors. Locate their position on the board, and insert the resistors in the board. Tape them down to hold them in place. Turn over the board and solder the resistors in place, trimming the leads flush afterwards. Remove the tape.



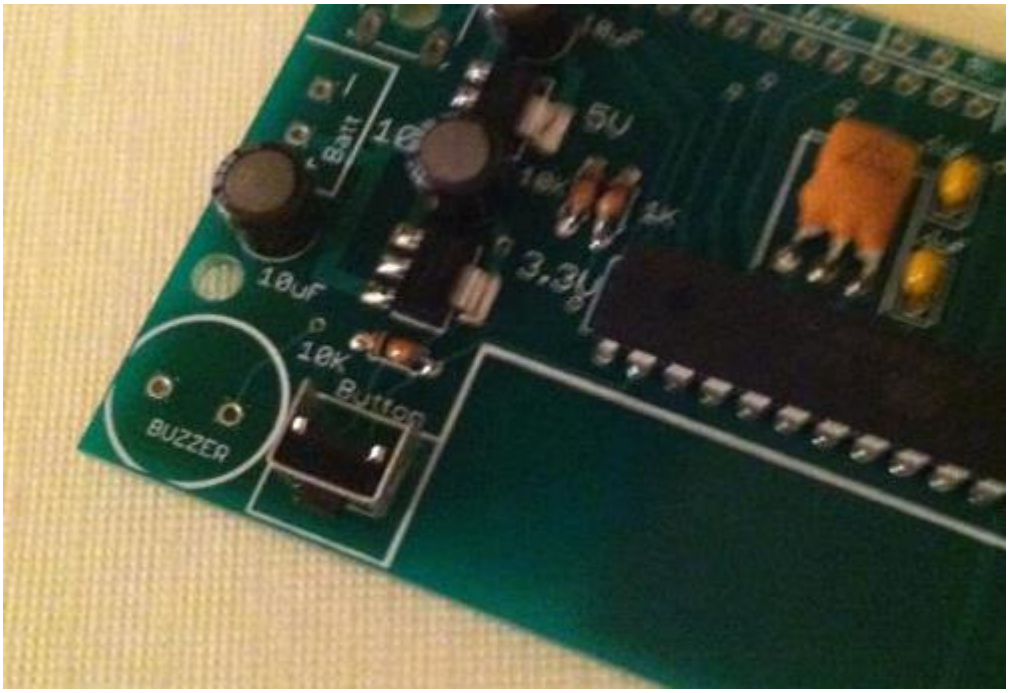
___ Mount the 10 uF electrolytic capacitors

Insert the three 10 uF electrolytic capacitor into the holes on the board, making sure that the leads with the "- - - -" markings next to it is inserted OPPOSITE the holes marked "+". Double-check to make sure that you have them inserted correctly! Turn over the board and solder the leads to the board. Trim the leads flush.



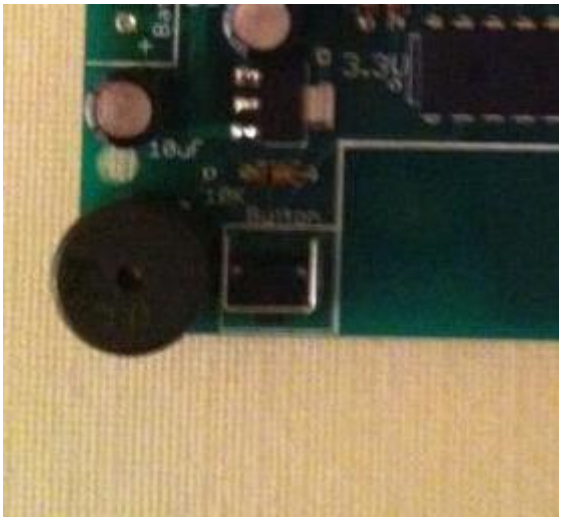
___ Mount the push button switch

Insert the push button switch into the holes on the board. It has a little kink in the mounting "ears", so you may find that it is difficult to get it into the holes; we recommend that you crimp (not bend) the kinked ears with the end of a pair of pliers to straighten them out before you insert it. Turn over the board and solder the leads to the board, then bend the ears inward to help anchor the switch.



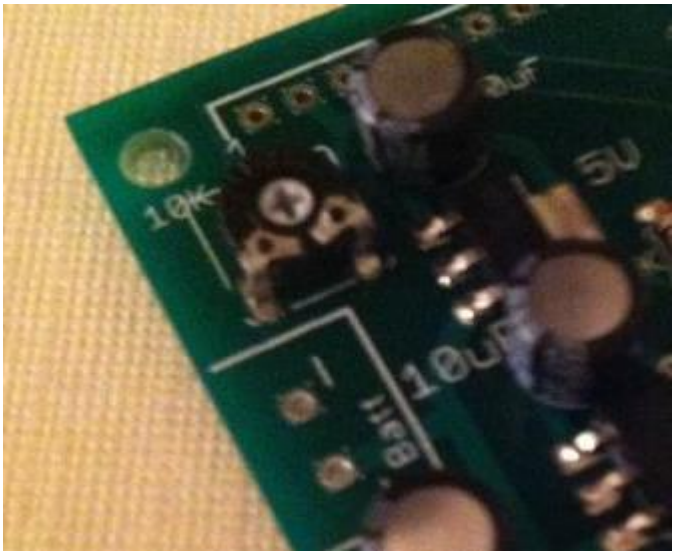
___ Mount the pizo buzzer

Insert the pizo buzzer into the holes on the board. It is not polarized, so it doesn't matter which way you mount it. Hold it down with a piece of masking tape, turn over the board, and solder the leads to the pads. Trim the leads flush, then remove the tape.



___ Mount the 10K potentiometer

Insert the 10K potentiometer into the holes on the board. Make sure that the middle lead is at the top of the board. Hold it down with a piece of masking tape, turn over the board, and solder the leads to the pads. Trim the leads flush, then remove the tape.



Mounting the Hope RF Radio Module

You will be surface-mounting the Hope RF radio module to the board, the pads are relatively large and spaced relatively far apart, so if you didn't have any trouble with the voltage regulator you won't have any problems with the RF module either.

__ With a piece of paper masking tape about 2" long, tape the board to your work surface so it won't move. Don't cover the area where the RF module is going to be mounted!

__ Cut another piece of masking tape about 2" long and about ½" wide.

__ Carefully position the Hope RF module on the board so that its pads line up in the center of the top pads, the "half-moon" cutouts on the module should be centered on the pads on the board. With the masking tape that you just cut, lay it across the top to hold it in place on the board. Make sure that it's properly positioned, there are some small holes on the pads on the module, they should line up with similar holes on the board. You may find that using a few pieces of cut-off resistor leads helps, put one in each corner to line up the holes before you tape the module down.

It is important that the masking tape covers as much of the RF module as possible, up to the exposed pads. This is to prevent any errant solder splatter from getting onto the RF module. There are some VERY tiny exposed parts on the RF module, if you get the tiniest bit of errant solder on the module chances are excellent that it will be ruined

__ Solder the BOTTOM RIGHT pad of the Hope RF module to the board. Make sure that the board is properly positioned after you solder this joint; it it moves, heat up the solder joint and move the board slightly so that it is properly positioned. Wait 30 seconds after soldering before continuing.

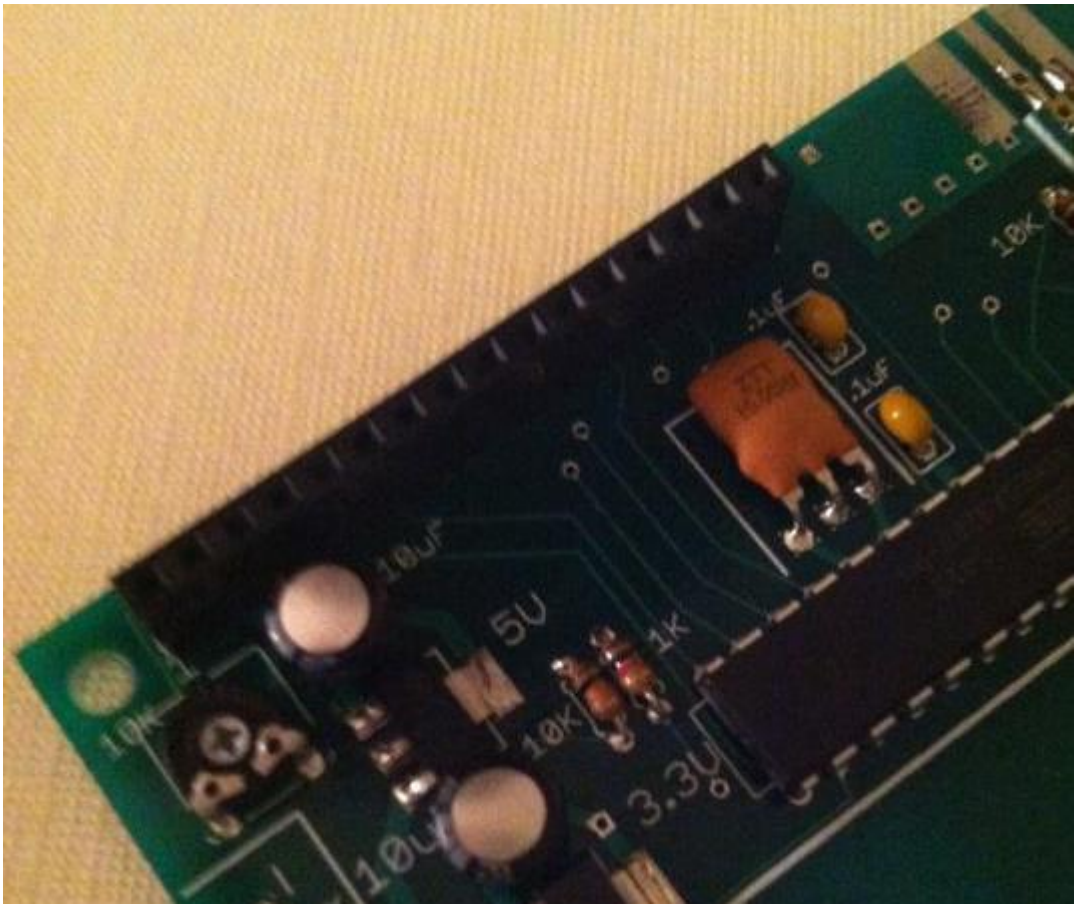
__ Stick a round toothpick in the hole in the middle of the solder pad marked ANT. This is to prevent any solder from getting into the hole. Solder the TOP LEFT pad of the Hope RF module to the board, this is the one next to the ANT terminal. Wait 30 seconds, then remove the toothpick.

__ Solder the remaining pads to the board, waiting 30 seconds between pads to prevent the module from overheating. If you used cut-off resistor leads to line up the holes, be sure to remove them **before** soldering the pads, so they don't get soldered there!

Mounting the Remaining Components

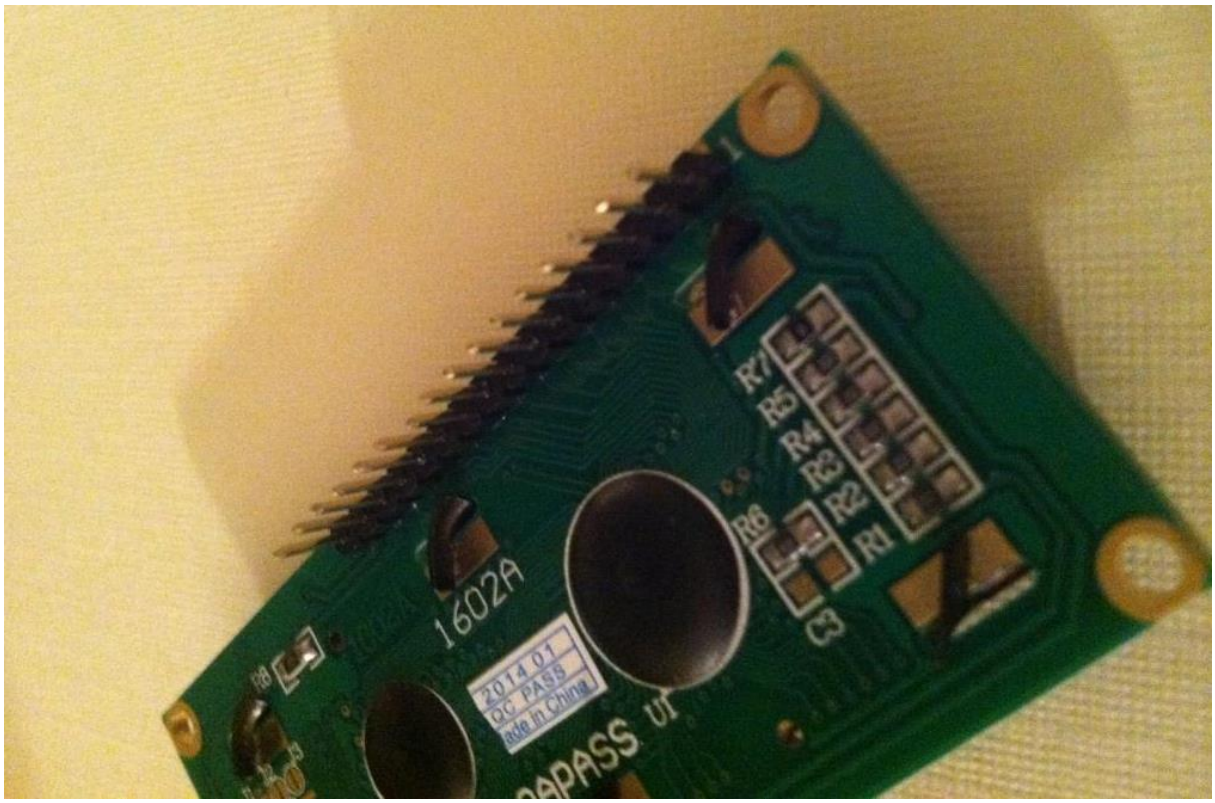
__ Mount the 16-pin Socket Strip

Place the 16-pin socket strip in place at the top of the board, and hold it into place with some masking tape. It is VERY IMPORTANT that this strip is straight, or your display will tilt and you may have problems when you go to mount the Eggfinder LCD in the case later on. Turn the board over and solder ONE pin, then turn it back over and confirm that the socket strip is flat against the board and at a 90 degree angle. If it's not, heat up the joint and gently position it into place. When you are satisfied with the position, solder the remaining joints.



__ Solder the 16-pin Header Strip to the LCD Module

Carefully unpack the LCD module, and locate the 16-pin header strip. You will see that the pins on the header strip are not the same length, one side is shorter. Insert the SHORT SIDE of the header strip into the BOTTOM SIDE of the LCD module, on the side OPPOSITE from the display. Tape it into place with some masking tape, making sure that it is absolutely straight. Carefully solder ONE PIN, then turn it over and make sure that the header strip is flat against the board and at a 90 degree angle. If it is not, gently heat up the solder joint and position the header strip into place. When you are satisfied that the header is straight, solder the remaining pins, and remove the masking tape.



Eggfinder LCD Antenna Options

The Eggfinder LCD has pads for either a "stick" antenna or a RP-SMA edge connector for a removable/remote antenna. Your choice of antenna will depend largely on your rocket, and how much range you need.

The standard Eggfinder LCD ¼ wave "stick" antenna is very simple and produces decent gain without being directional (i.e., the signal strength is pretty much the same in all directions). We have maintained a line-of-sight range of over 8,000' with this antenna, we think that most people will find that this simple antenna will suit their needs just fine if your primary goal is to get good enough GPS data to help you easily find your rocket.

In some cases, however, you may need to use a different antenna. If you want to track your rocket's flight as accurately as possible or if you are intending to fly over 10,000', you may need to use a higher gain antenna, such as a 5 dB dipole antenna. If you're really going high, you may want to use a high-gain directional antenna, such as a 10 dB panel antenna. In those cases, you will want to go with the RP-SMA connector option. Note that any antenna that you get must have an RP-SMA MALE connector on it; this connector has INSIDE threads with a JACK in the center of the connector. It must also be rated for the 900 MHZ band, NOT 2.4 GHz. Be careful what you buy, we have seen some eBay-type vendors that are selling 2.4 GHz "WiFi" antennas for use with 900 MHz systems. They "will" work, but they are certainly not optimal, and would most likely produce less range than the stick antenna. Also, be sure that

it's a RP-SMA antenna; we've seen some vendors (particularly on eBay) selling standard SMA antennas but calling them RP-SMA.

If your antenna requires a pigtail cable, get the shortest length that will work, to minimize signal loss due to cable resistance and impedence mismatch. Usually, you can get them in ½ meter (about 19") lengths, this should be fine for most applications. A pigtail cable rated for 2.4 GHz **will** work fine at 900 MHz, and a ½ meter length is so short that the type of cable (typically RG-174) is irrelevant. Make sure that the pigtail's other connector matches your antenna, of course; most of the panel antennas use N-female connectors (outside threads, center jack) so you will most likely need an N-male connector (inside threads, center pin).

Directions for installing a RP-SMA connector are at the end of this manual; the following instructions are for the "stick" antenna, and can be skipped if you are going to use a connector.

<u>Building the Stick Antenna</u>

___ Using a hard eraser or emery cloth, clean about ½" from one end of the antenna to remove any signs of oxidation.

___ Bend one end of the 1/32" brass antenna wire in a 90° angle, about 1/8" from the cleaned end.

___ Put the bent end of the antenna into the ANT pad, but **do not** solder it in. Have it stick straight out from the board, and tape it in place.

___ Measure 80 mm from the edge of the board, and mark the antenna wire there.

___ With a pair of sharp diagonal pliers, cut the wire at the 80mm mark.

___ Remove the wire from the board.

___ With some emery cloth or a jeweler's file, file down any sharp edge at the cut so that it is flat. Feel the edge with your finger, if you feel a sharp edge then keep filing until it's smooth. The goal is to get rid of any sharp edges, as these will reduce the efficiency of your antenna.

___ Put some masking tape on the two pads on either side of the antenna, to prevent solder from getting on the pads.

___ Insert the bent end of the wire into the ANT hole on the top of the board. Solder it in place on the TOP of the board, making sure that it sticks straight out from the board. Clip any protruding lead on the BOTTOM of the board flush, then solder the bottom pad. The idea is to not have any antenna lead protruding from the bottom of the board.

___ Solder the antenna wire to the pad on the top of the board, up to the edge of the board.

___ Remove the masking tape coving the side pads.

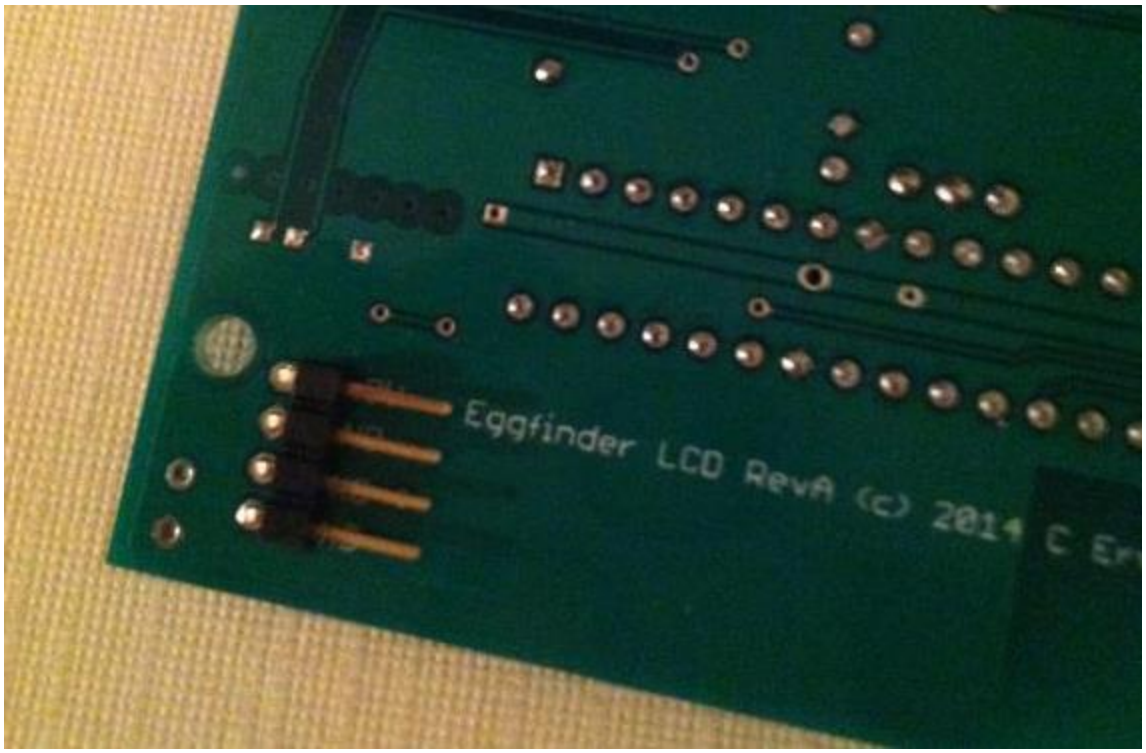
___ Cover the RF module with a few pieces of masking tape. Slide the heat-shrink tubing over the antenna wire, then with a heat gun or small torch on VERY low heat, carefully shrink it over the wire. Wait at least 60 seconds, then remove the masking tape.

~~~~~~

Final Assembly

__ Mount the 4-pin right-angle header

Find the four holes for the header, just below the RF module. Turn the board over, you will be mounting the header on the BOTTOM of the board, with the LONG end of the header facing towards the center of the board, AWAY from the edge. Insert the SHORT end of the header into the holes, then tape it into place. Make sure that it's square against the board.. Turn over the board and solder ONE of the pins, then turn it over again and make sure that the header is straight. If it's not, gently heat up the solder joint and position the header into place. Solder the remaining pins, then turn it over and remove the tape.

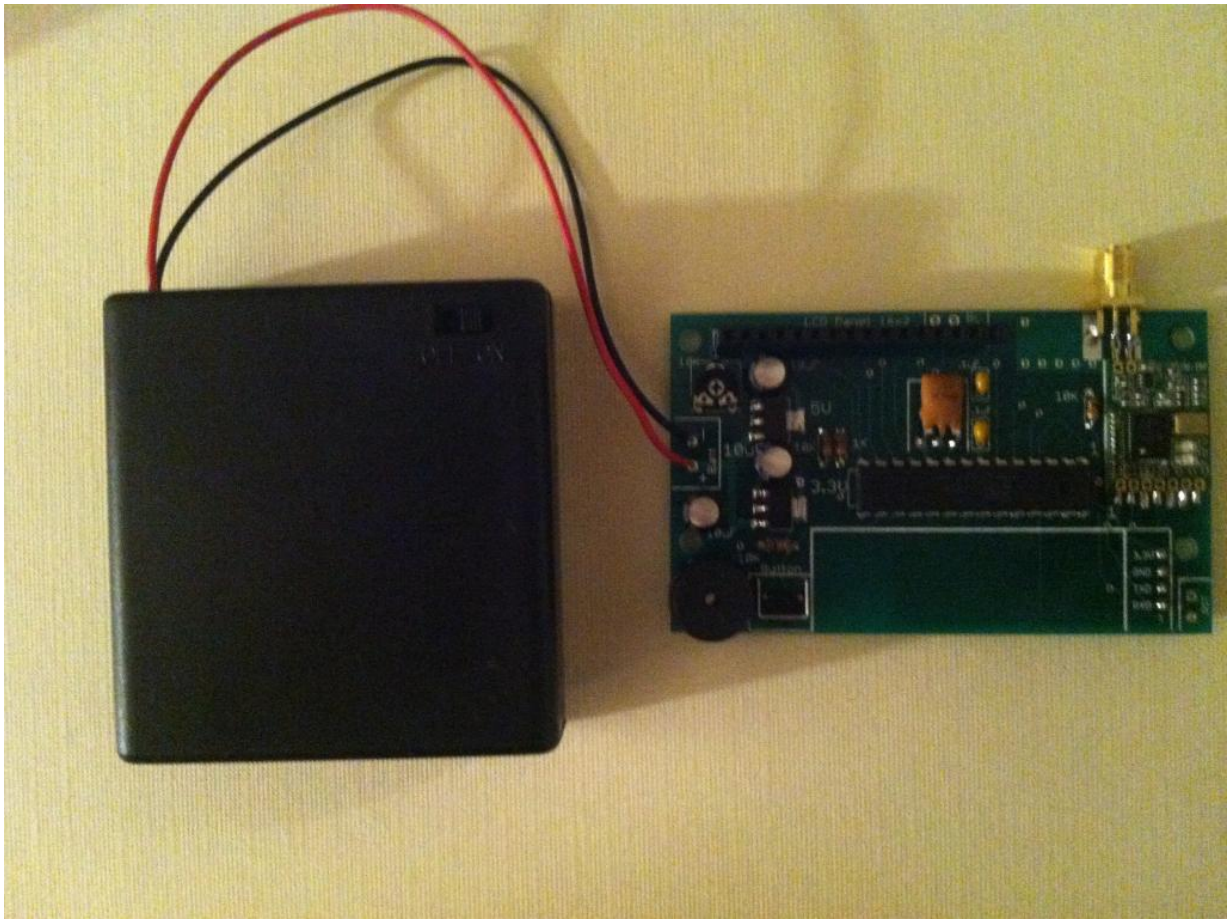


__ Solder the Battery Box Leads

If you are going to use the included 4xAA battery box, solder the two leads from the 4xAA battery box to the two BATT pads on the board: The RED lead goes to the pad marked "+", and the BLACK lead goes to the pad marked "-".

Note that if you are NOT going to use the battery box and decide to use a 2S/7.4V LiPo battery instead, you will have to come up with a battery connector (probably a JST), a switch, and
~~~~~~

some way of mounting the battery pack (double-sticky Velcro should be OK). If you go with the LiPo option, we recommend that you get a battery rated at least 750 mAH, 1000 mAH or more is better. It will also have to fit into the case, so it can't be more than about 80mm x 80mm x 20mm.



~~~~~~

Assembly of your Eggfinder LCD is now complete. Inspect the solder side of the board carefully, looking for "cold" or incomplete solder joints. Cold solder joints appear dull instead of shiny, and may appear as blobs of solder and not have the nice "wetting" of the pad that you will see with good joints. A magnifying light is good for checking the board. We do NOT recommend using flux remover or other cleaners on this board, they may not be compatible with the no-clean flux used in the included solder.

At this point, you should test the board BEFORE you try mounting it in the case…. Read On.
~~~~~~

Testing Your Eggfinder LCD

To test your Eggfinder LCD, you will need a working Eggfinder TX module on the same frequency. (That's why we suggest you build the TX module first!)

Insert four AA batteries in the battery box, close up the door, and fasten the screw. (Or, if you built it with a LiPo battery option, charge the battery.) Close up the case. Turn on the Eggfinder LCD, you should hear a long beep then you should see:

```
Eggfinder RX LCD
  Ver 1.11
```

This shows you the current software version. After about 5 seconds, you will see

```
  Status:  915
G:D   U:F  6.3V
```

This is the status screen. It shows you the frequency in MHz, the displayed units (F for feet), the GPS coordinate display units (D for Degrees), and the battery voltage (6.3V). Not e that a set of AA batteries will last you all day; they have to run down well below 5V before it's going to have an appreciable effect on the system.

From this screen, you can configure the Units, GPS Display Coordinates, and Frequency. (This assumes that your transmitter is on 915 MHz; if it's not, see the configuration section later in the manual to change it before you continue with the test.)

After about another 20 seconds, you will see:

```
Waiting for Sync
```

That means that the LCD receiver is waiting for a pairing signal from an Eggtimer TRS Flight Computer. If you have one, turn it on, after a few seconds you'll see something like:

```
Eggtimer TRS 27c
My Device
```

At this point, you'll need to consult your Eggtimer TRS User's Guide for further instructions… it's beyond the scope of this document.

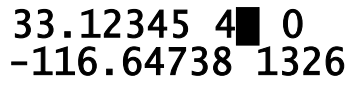
If it doesn't get a pairing signal within 45 seconds, you'll see:

```
Waiting for Fix
```

This means that the receiver is waiting for data from the Eggfinder TX module.

Now, power up your Eggfinder TX module: Press and hold the button until the GREEN LED comes on and the RED LED on the RF module begins to blink. After awhile, the Eggfinder LCD will start to beep approximately once per second, and you will see some data on the display. Depending on how strong the satellite signal is, it should be anywhere from 10 seconds to 2 minutes.

The display should look something like this:



If it does, congratulations! Your Eggfinder system is now working. Turn off the Eggfinder LCD, then press the button on the TX board until the green light goes out, then you may disconnect the power on the TX board. You may now mount the board in the case…

Mounting the Board in the Case

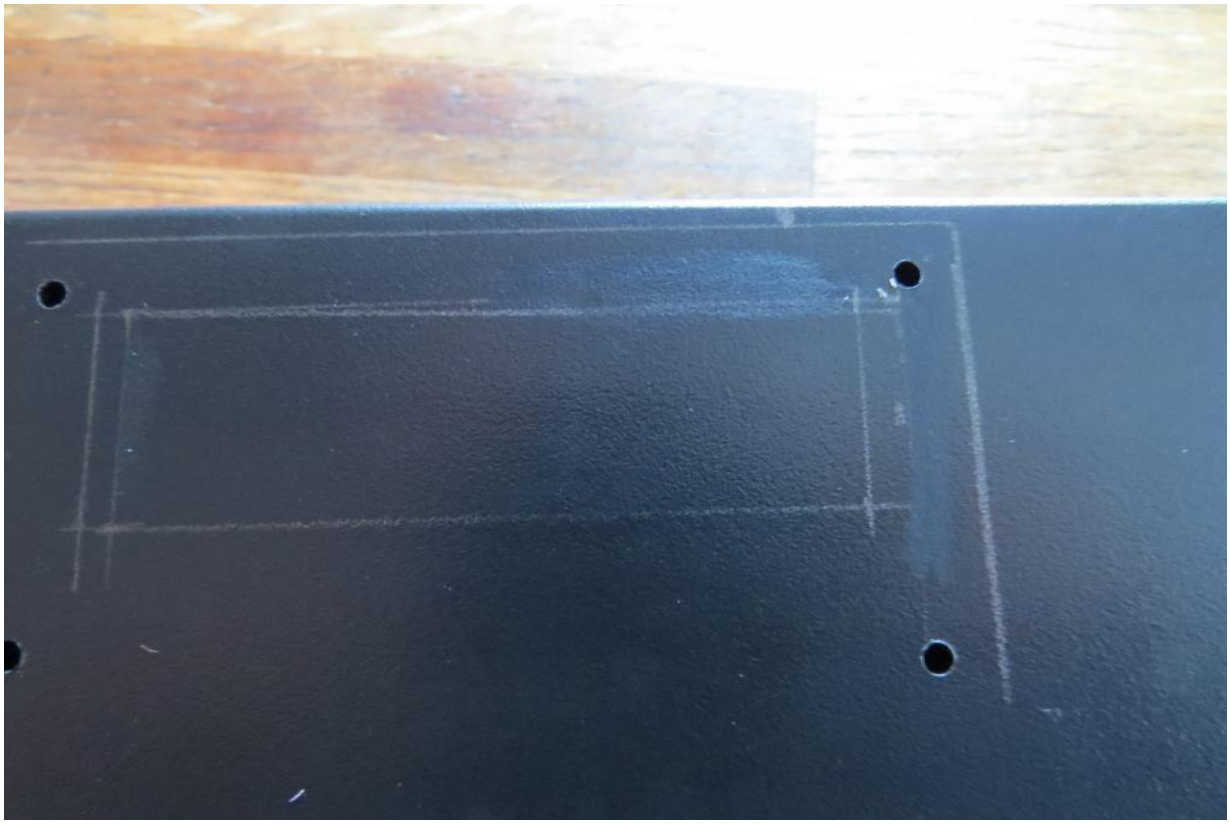
__ Drill/Cut the Case Top

Put the case top in front of you so that it's positioned horizontally (long side left and righ). Position the bare PC board on the case top so that the top edge is ¼" from the top of the case top, and the right edge is 2" from the right edge of the case top. Make sure it's square to the case top, then tape it down with some masking tape.

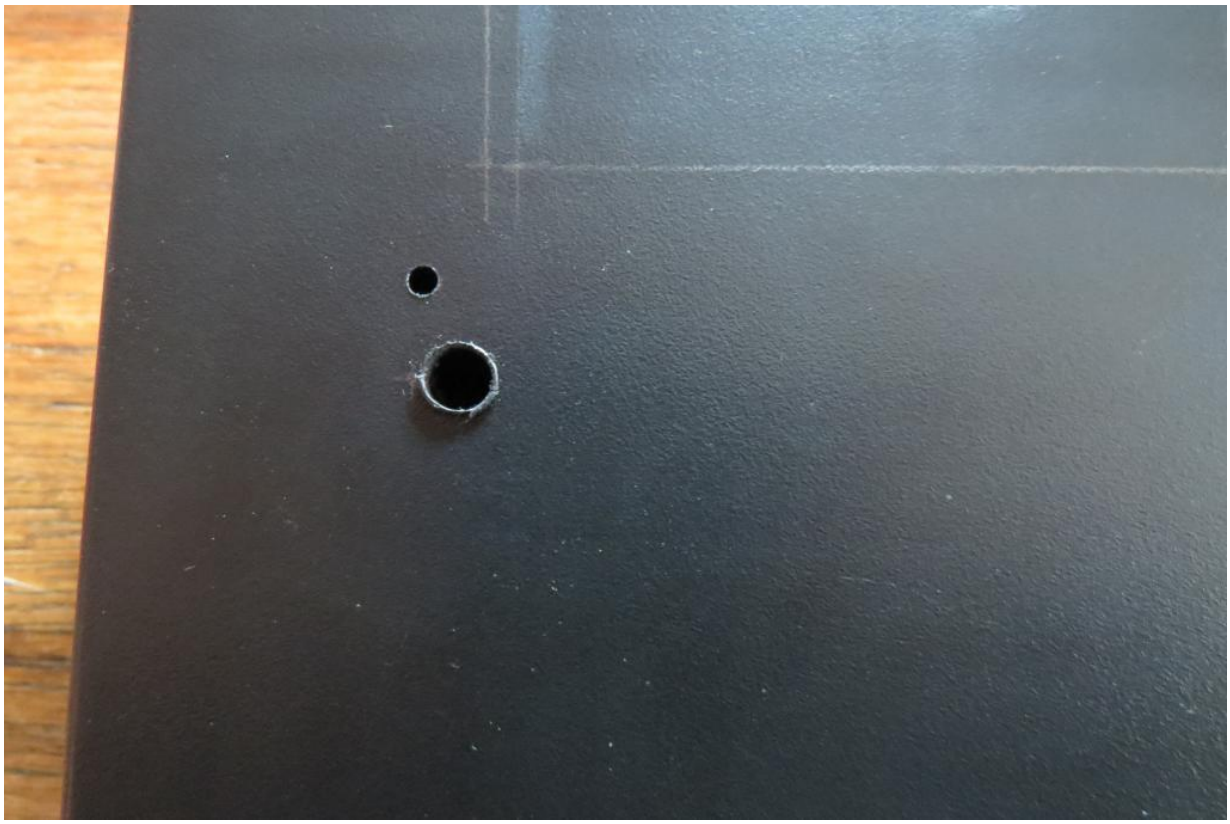
With a sharp #2 pencil, trace the outline of the PC board, then mark the four mounting holes on the case top. Make sure that these lines and marks can be seen clearly. Mark a vertical line at the antenna lead, it's the middle of the three adjacent vertical pads near the right edge of the board. Remove the board from the case top.

Note: You're done with the bare PC board now, so if you can't wait you may now start building your Eggfinder LCD board. But since you've got your tools out anyway, you might as well finish up with the case…

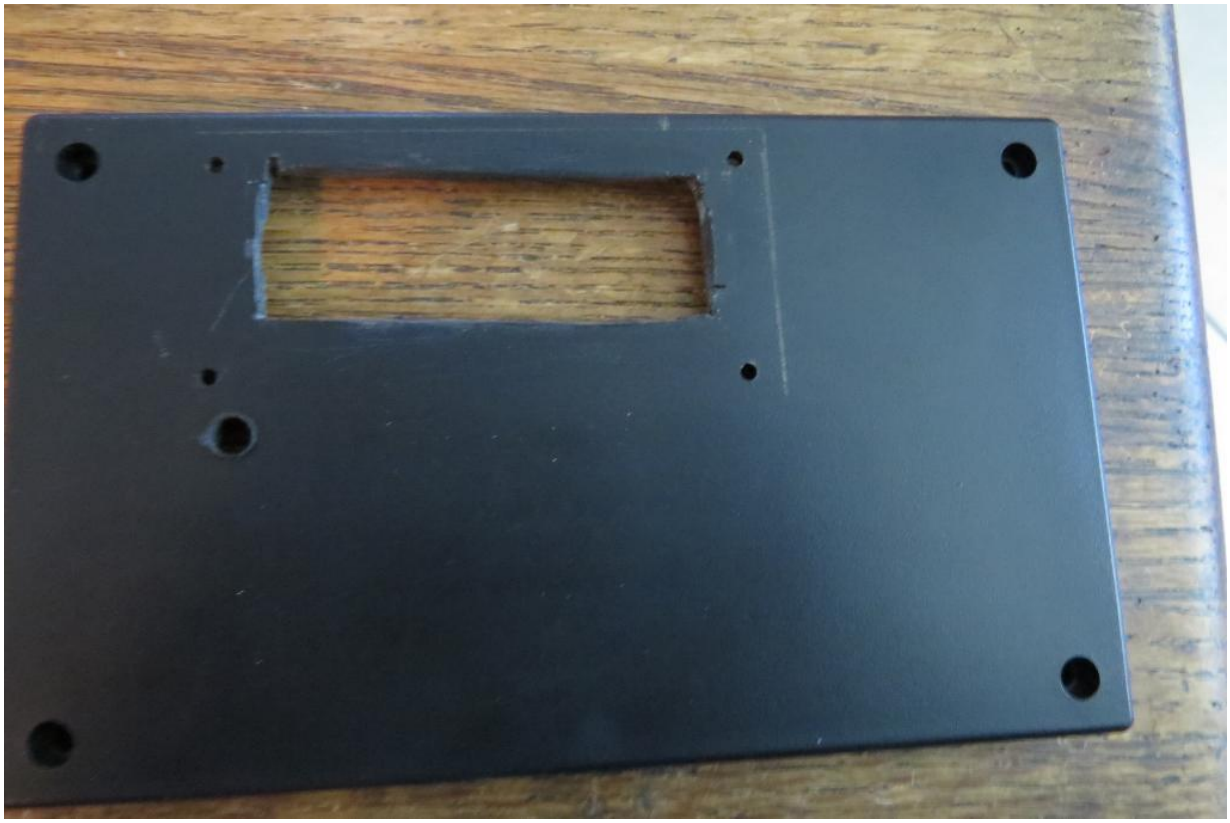
Mark a rectangle 2 5/8" wide x ¾" high, with the top edge ¼" from the top of the board outline that you marked earlier, and the right edge ¼" from the right edge of the board outline. This is the "window" for the LCD display.



With a 1/8” drill bit, drill out the four mounting holes. Cut a ¼” sound hole 5/16” below and 1/8” to the right of the bottom-left mounting hole.

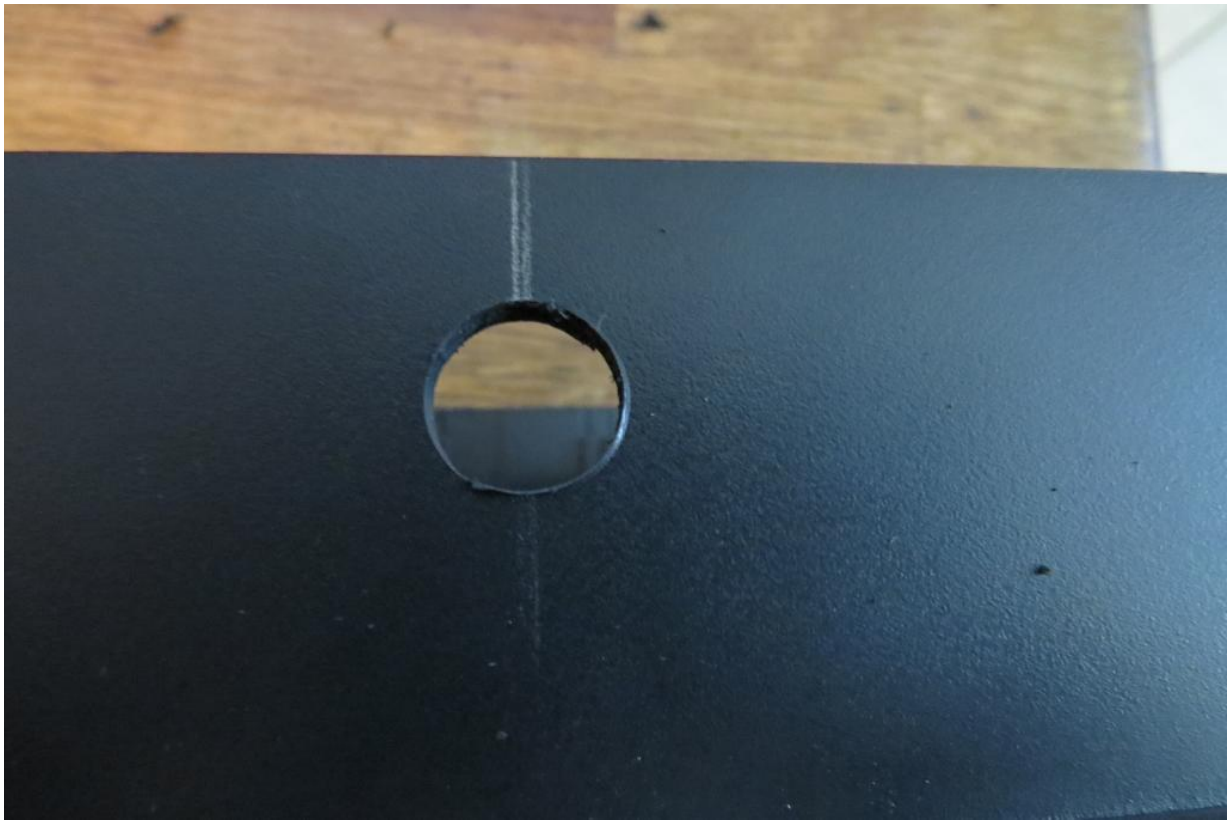


You will now need to cut a hole for the LCD window. The ideal way to do this is with a router or roto-zip tool on a table, but a rotary tool with a cutting bit works fine too. If you have none of the above, you can also drill a hole in one of the corners and use a small coping saw or X-Acto saw, but that's going to be more work. Regardless, after you have cut out the window, take some fine sandpaper and sand the edges smooth. We guarantee that other people will want to see your Eggfinder LCD, so you might as well take your time and make it look nice.



__ Drill the Case Bottom

Place the case top on the case bottom. Locate the mark that you made for the antenna, and draw a vertical line on the case bottom meeting it. Make a mark on this line 11/16" below the case seam, then drill a 1/16" pilot hole there. If you are going to use the wire antenna, drill a 1/8" hole over the pilot hole; if you are going to use an external antenna, drill a ½" hole over the pilot hole. A ½" spade bit works fine, you don't need to use an expensive twist drill bit for this. Remove the case top.



Now you need to drill a hole for the battery box switch. Drill a pilot hole in the bottom of the case bottom, 1" from the left edge and 1" from the bottom edge. Drill it out to ½" with a spade bit.

You are now finished with hacking up the case. If you are doing this before building the board (as recommended) you can start building it now, and come back here to mount the board into the case after you've tested it.

__ Cut the Spacers

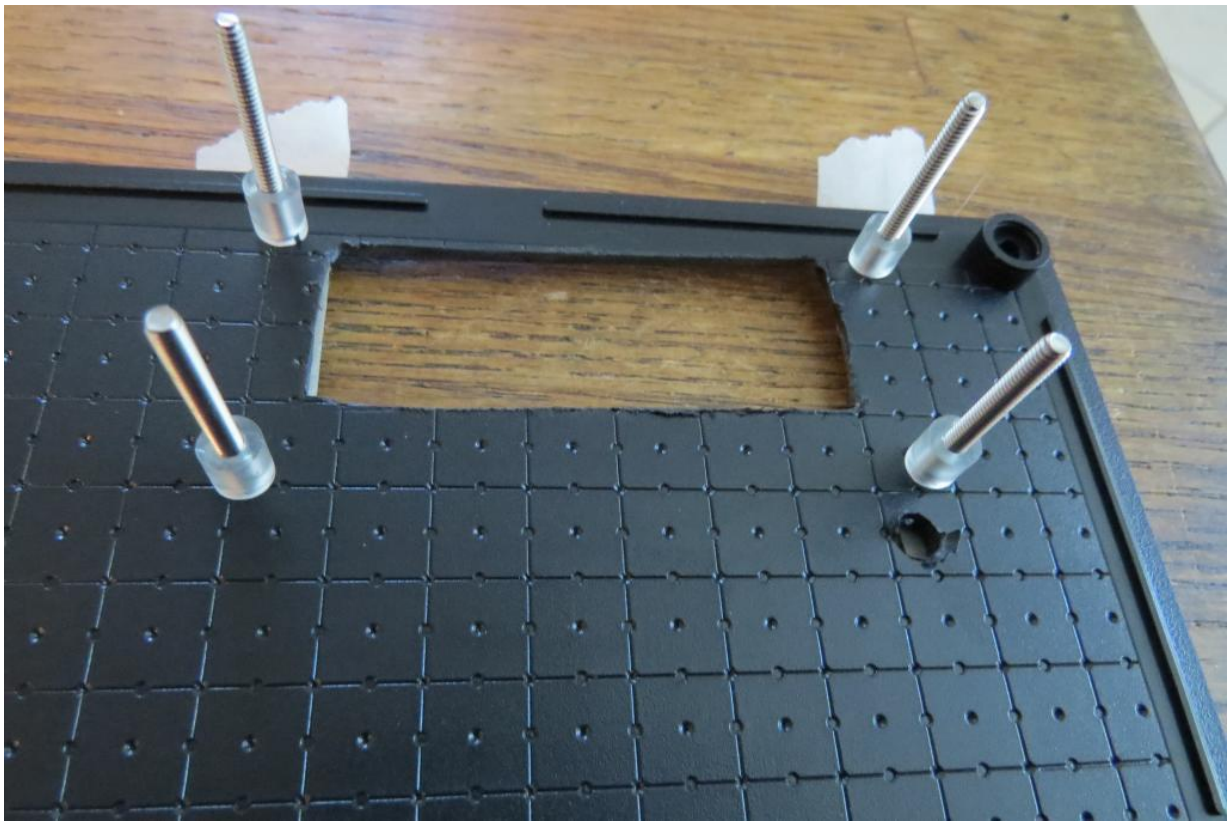
With a sharp hobby knife or single-edged razor blade, cut the vinyl tubing as follows:

4 pieces, ¼"
4 pieces, 7/16"
4 pieces, 1/8"

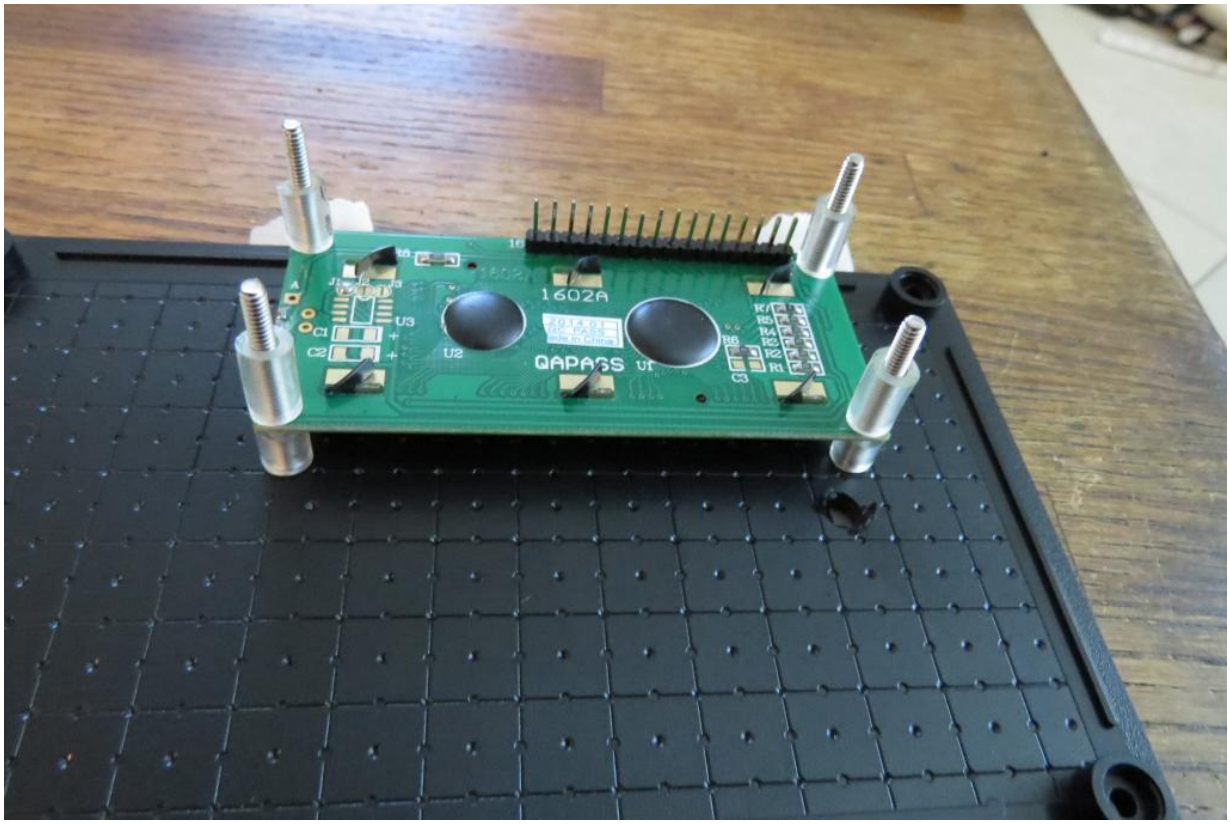
__ Mount the LCD Module

Put the four #4 machine screws into the holes that you drilled for them from the top of the case, and put a piece of masking tape over the heads to temporarily hold them in place. Turn over the case top and place it on a table, then slide the four ¼" pieces of tubing onto the screws.

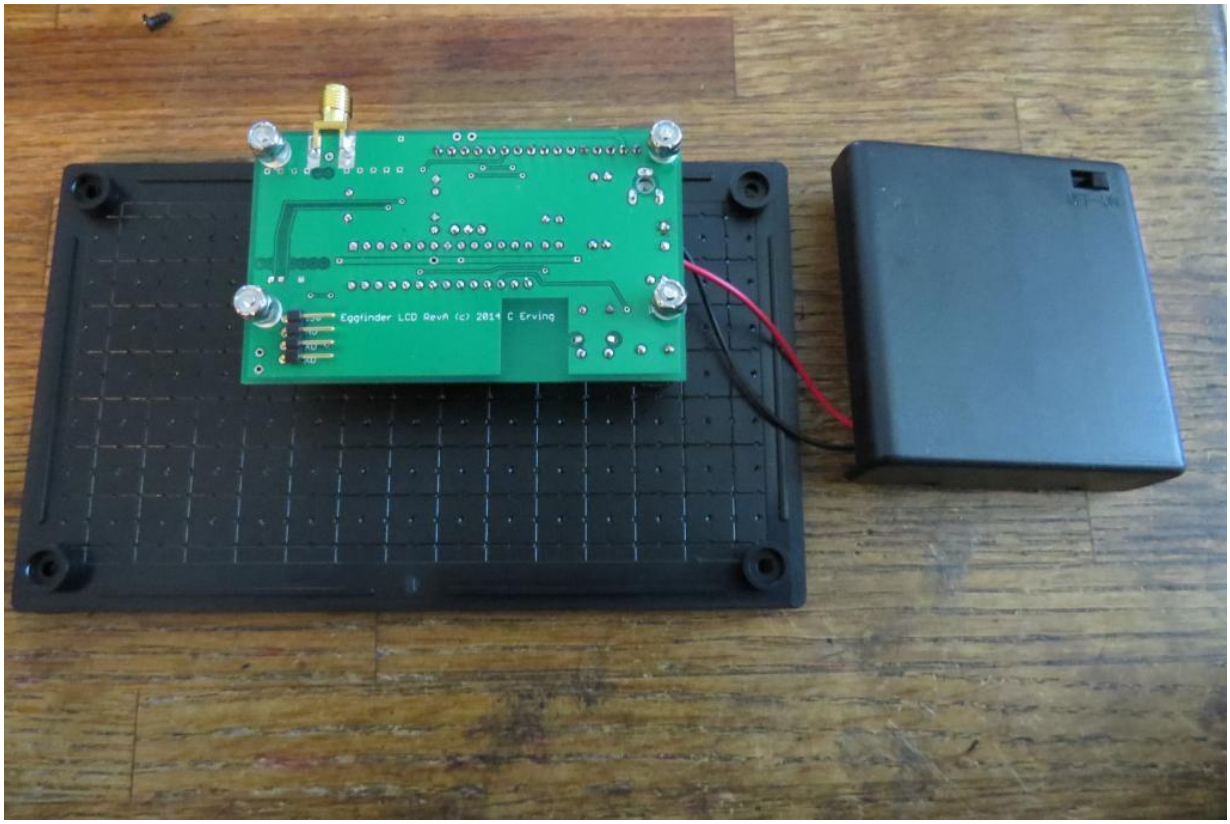
Slide the LCD module over the screws, so that the header strip is at the top of the case top (nearest the edge). Slide the four 7/16" pieces of tubing over the exposed screws.



Now, carefully slide the Eggfinder board onto screws, and firmly press the 16-pin header socket on the Eggfinder board into the LCD panel's header. If everything was cut and positioned properly, the board should rest nicely on the pieces of tubing.

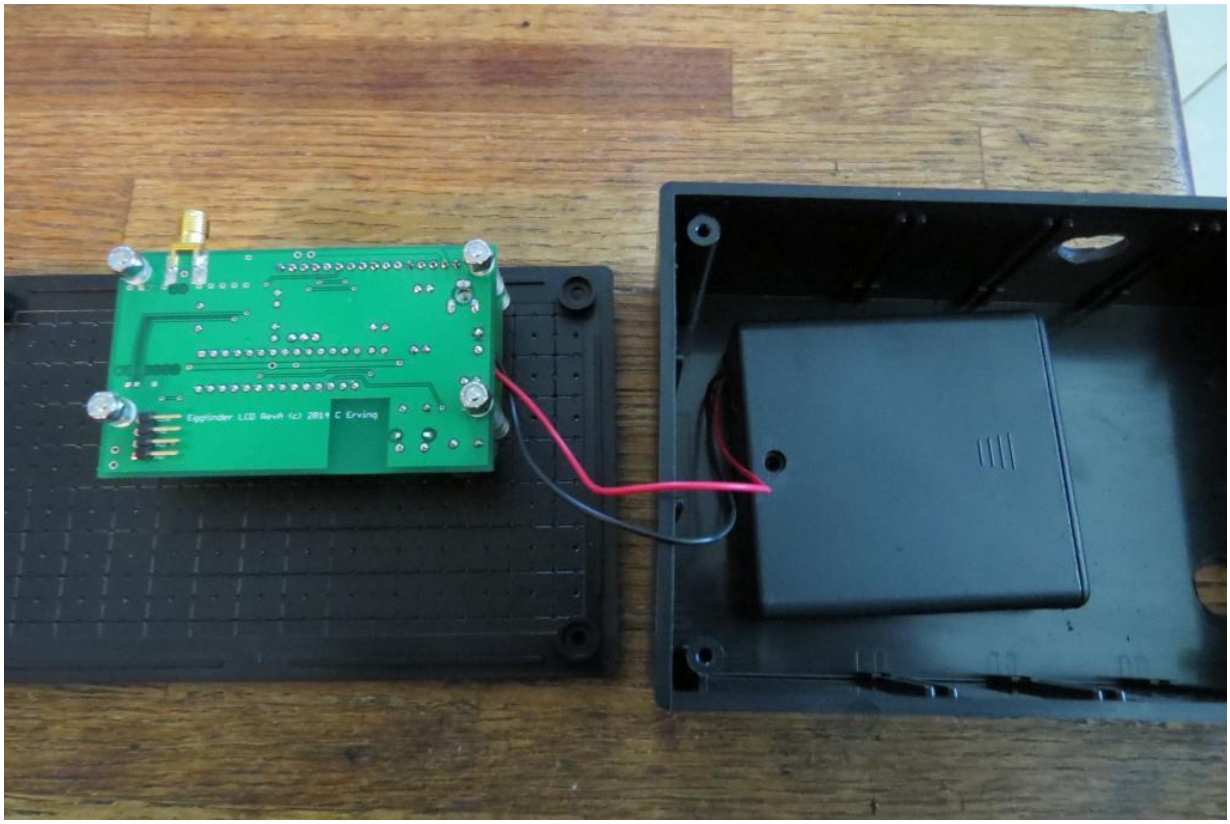


Slide the four 1/8” pieces of tubing onto the exposed screw ends, on the back side of the Eggfinder PC board, then hand thread the locking nuts onto the screws. Once you have all four nuts on, remove the masking tape from one screw, hold the nut with some pliers, and tighten the screw until it’s firmly mounted against the case top. The tubing will “give” just a little as you tighten it, this is fine; it helps provide some shock resistance for the display. Don’t over-tighten, just enough so there’s no play is fine. Similarly, tighten the other three screws.



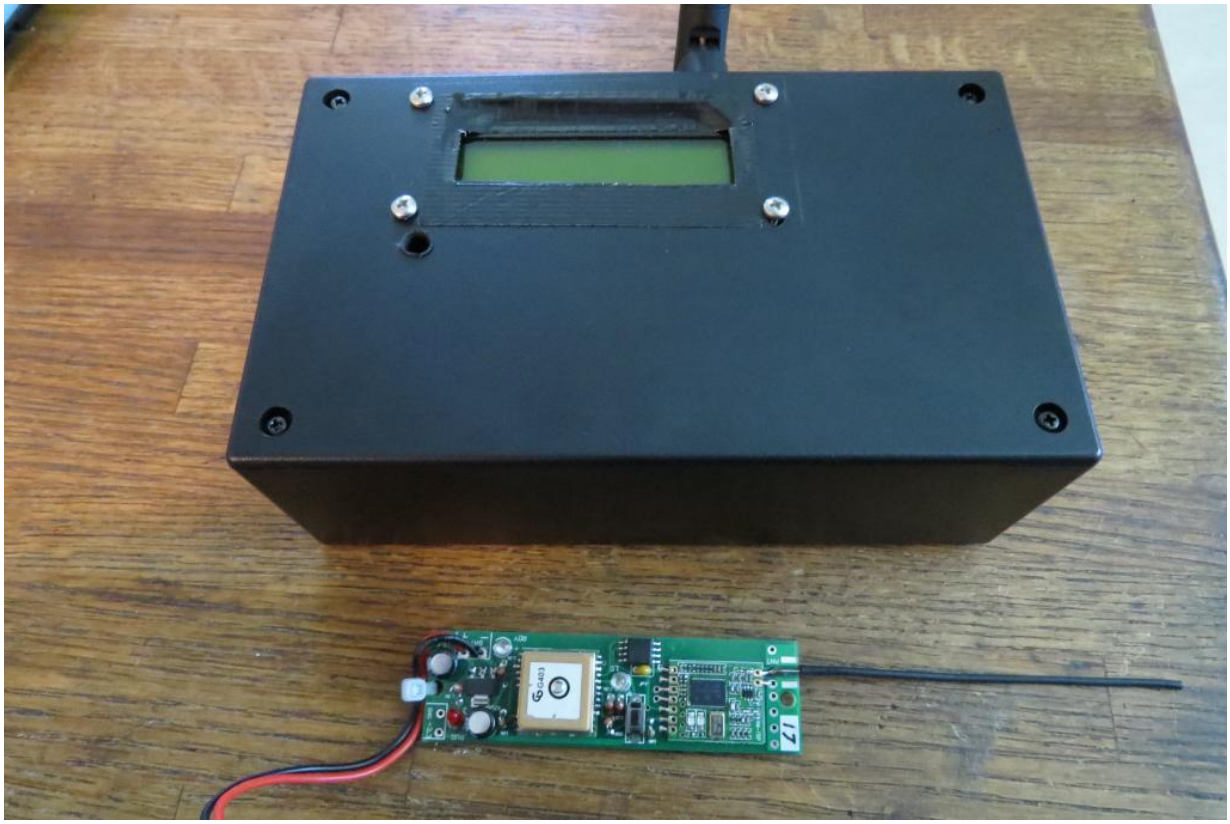
__ Mount the Battery Box

Check-fit the battery box in the bottom of the case so that the slide switch is accessible from the opening that you cut in the bottom. Mark the edges of the battery box on the bottom of the case using tape or a marker. With some double-sided servo tape, tape the battery box to the case bottom. Note that servo tape is very strong and sticky, so once you place it you will have a difficult time removing it… make sure that it's correct before you put it in place!



__ Final Assembly

Slide the end of the antenna/RP-SMA into the hole that you cut, slide the case top into the recess in the case, then secure the case top to the case with the four included screws. Turn on the switch and make sure that it's still working… if you tested it first like we recommend, that shouldn't be an issue.



Congratulations, you are now the proud owner of a fully-functioning and very handsome Eggfinder LCD receiver!

Troubleshooting

If your Eggfinder LCD doesn't work after assembly and testing, take a deep breath, get out a beverage to clear you mind, and start troubleshooting…

Check Your Solder Joints

The very first thing you should do is to check out all of the solder joints under a lighted magnifier, or with a 10x jeweler's loupe or magnifier. The most common reason for things not working are solder bridges, i.e. putting too much solder on the pads and shorting two adjacent pads together. You can also get into problems by bridging pads with "vias" on the board, the smaller holes that don't have any components soldered to them. Most of the holes and the pads are very small, so it doesn't take much solder to get a nice "tented" solder joint. If you get a solder bridge, heat it up and use a solder wick or a vacuum bulb to remove the excess; afterwards, we recommend resoldering the joints. Note: NEVER use "canned air" or compressed air to "blow away" excess solder. The resulting splatter will almost always cause more damage than the original solder bridge.

Another thing to look out for is "cold" solder joints, they look dull and blobby compared to a nice shiny "tented" solder joint. Cold solder joints won't conduct well; at the low power that the Eggfinder RX uses this could easily keep things from working. If you have a cold solder joint, heat it up and put just a little bit of solder on it, the main idea is to get a little more flux

on the joint. If there's too much solder, use a fine solder wick or (preferably) a vacuum bulb to remove the excess, then heat it up and resolder the joint.

Check Your Component Polarity

Most of the through-hole components aren't polarized, with some notable exceptions. The outline of the parts is silk-screened on the board, so you should be able to see readily if you have a component soldered in backwards. Some of the components are not symmetrical (i.e. the voltage regulators) so they would be difficult to install backwards, too. Components that are polarized AND symmetrical are:

• The processor. Whatever you do, DO NOT install this component backwards… it will be virtually impossible to remove and you will almost certainly damage the board trying to do so.

• The electrolytic capacitors, the side marked "-------" should be OPPOSITE the side marked "+" on the board. The "---" side on all three electrolytic capacitors should be on the RIGHT side.

If you inserted a component incorrectly, you will have to carefully unsolder it, clear any solder residue from the holes, and resolder it. If you find that a component was soldered incorrectly, you will have to use a vacuum bulb or vacuum desoldering tool to unsolder it. We cannot stress enough that you need to check the orientation of the parts ***before*** you solder them. The Eggfinder Limited Warranty does not cover damage to a component while attempting to unsolder it, so make take your time and make sure you get it right before you solder.

Check Your Battery Wiring

Make sure that the RED wire on the battery box is on the "BATT +" pad, the BLACK wire is on the "BATT –" pad

If It Still Doesn't Work…

There is, of course, always an outside chance that you have a bad component. We test each PC board and the surface mounted components before they leave us. Nevertheless, it is always possible that something may be wrong; there may be a bridge on the PC board itself, etc. If you have gone through all of the troubleshooting steps and the board still doesn't work, let us know at support@eggtimerrocketry.com . A high-resolution picture (5 megapixel or better) of both sides of your circuit board and a description of the problem would be very helpful…

Troubleshooting Tips (in approximate order of likelihood)

LCD doesn't come on

- Contrast needs to be adjusted on 10K trimmer pot
- Battery box wired incorrectly
  (RED wire should be on BATTERY + pad, BLACK should be on BATTERY -)
- Bad solder joint on voltage regulator
- Voltage regulators reversed (the 3.3V regulator is the one marked "33")
- Bad polarity on electrolytic capacitors
- Bad solder joint on electrolytic capacitors
- Incorrect polarity on electrolytic capacitor(s)
- Bad solder joint on the processor
- Bad solder joint on the 16-pin header on the LCD
- Bad solder joint on the 16-pin socket

LED on the RF MODULE doesn't flash

- No matching Eggfinder TX board transmitting (are they on the same frequency?)
- Frequency not configured to match the Eggfinder TX board
- Bad solder joint on the RF Module
- Solder bridge on the RF module pads
- Bad solder joint on the processor

Can't get a GPS Fix

- Frequency not matched with Eggfinder TX transmitter.. reprogram it.
- Poor satellite signal (try it outdoors)

Configuring Your Eggfinder LCD

You can configure the following parameters on your Eggfinder LCD:

- Display Units: Altitude can be displayed in either Feet or Meters
- GPS Coordinates: Can be displayed in Degrees, Degrees:Minutes, or Degrees:Minutes:Seconds
- Frequency: Can be set to any Eggfinder TX frequency (909-925 MHz by 2 MHz)
- ID Code: Up to 8 codes can be used with an Eggtimer TRS Flight Computer

Note: Be sure to turn OFF your Eggfinder TX transmitter BEFORE you program your Eggfinder LCD receiver. The frequency may not "take" if you leave the transmitter on, even though the display will show that it has been changed.

Configuring your Eggfinder LCD is easy. When you see the status screen:

```
Status:  915 0
G:D  U:F  6.3V
```

HOLD the button down for about 2 seconds, then release it. You will then see the first of the configuration screens.

To change parameters, PRESS AND RELEASE the button for less than one second. The value will cycle to the next value, and you will hear a short beep. When the parameter is what you want, HOLD THE BUTTON for over two seconds then release it. You will hear a long beep to confirm that your selection is being saved, then the next screen will display. Repeat the procedure for the other screens, until you're done. If you want to keep the value that's displayed, just hold the button for over two seconds so that it saves the displayed value.

When the final screen has been saved, you will see

```
OK
Reset to Continue
```

At this point, you need to turn off the power, then turn it on. It will start up with the new configuration, and you will be ready to go.

Configuration Screens:

Units Configuration:

```
Programming Mode
  Units: Feet
```

Possible Values:
Feet – Display GPS Altitude and distance to rocket in FEET
Meters – Display GPS Altitude and distance to rocket in METERS

GPS Coordinates Configuration:

```
Programming Mode
GPS Fmt: D
```

Possible Values:
D – Display GPS Coordinates in DEGREES and fraction of degrees (5 decimals)
Example: 34.12345, -115.19283

D:M – Display GPS Coordinates in DEGREES:MINUTES and fractions of minutes (2 decimals)
Example: 34:07.40, -115:11.57 (the ":" separates the Degrees and Minutes)

D:M:S – Display GPS Coordinates in DEGREES:MINUTES:SECONDS
Example: 34:07:24, -115:11:34 (":" separates Degrees, Minutes, and Seconds)

Frequency Configuration:

```
Programming Mode
Freq:  915
```

Possible Values:
909-925, by 2's (909, 911, etc…)

ID Configuration:

```
Programming Mode
ID:  0
```

Possible Values:
0-7

Note: This only applies to the Eggtimer TRS Flight Computer. If you are using the Eggfinder LCD receiver with an Eggfinder TX transmitter, you MUST set this to ZERO. Any other value will not work, and you will not receive the signal from the Eggfinder TX!

Using Your Eggfinder TX/LCD System

Note: This applies to using the Eggfinder LCD receiver with the Eggfinder TX or Mini. Instructions for using the Eggfinder LCD receiver with the Eggtimer TRS Flight Computer are located in the Eggtimer TRS User's Guide.

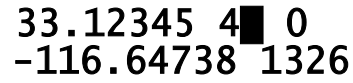
The first step in using your Eggfinder system is to mount the TX board in your rocket. See the Eggfinder User's Guide for information on that, we won't go over it again here, except to repeat our mantra:

KEEP THE ANTENNA AWAY FROM ANYTHING METALLIC!

Enough said…

OK, we assume you've already tested the TX and the LCD, so you have an idea of how they work. We'll go into the display in detail first, before we talk about how you can use the data to find your rocket.

A typical Eggfinder LCD display looks like this:



The first number on the top is the Latitude, the number of degrees above the equator (or below the equator, if negative). The ranges is 0-89.99999. It is taken out to 5 decimal points, accurate to about 3 feet. Note that you can also display the coordinates in Degrees:Minutes, or Degrees:Minutes:Seconds. We recommend that you use the Degrees setting if you can because it's the most accurate, but the others are available if the application on your handheld device requires one of them.

The second number on the top is the number of active satellites, from zero to 9. In this example, it's "4". If you get really lucky and there are more than 9 active satellites in view, you will see a "*" in it's place.

The block character after the number of satellites is a bar graph that represents the Horizontal Dilution of Precision (HDOP). This is a number that is derived mathematically from the position of the satellites vs. an "ideal" position that would produce a fix of the highest precision. 1 is excellent, 2 is good, 3 is OK, 4 is fair, 5 or 6 is so-so, and anything higher means that your fix's resolution may not be so great. Rather than showing you another boring number, we use a bar graph; it it's nearly to the top, that's good, it there's only a few bars, not so good. The reality is that with 4 or more satellites, it's almost always below 3.0 unless you happen to get unlucky and have a brief span of time in which the satellites are all mostly overhead. Even when that happens, if you wait a few minutes one usually shows up over the horizon and has a very good effect on the HDOP.

The final number on the top display is the number of elapsed seconds since the last fix. If you're getting constant data, this is going to be a zero, and you will hear a nice beep every second or so. Once your rocket launches and you lose GPS lock under boost, the beeps will go away, and you'll see the counter start incrementing. Typically, in 5-20 seconds depending on the speed of your rocket you'll start hearing the beeps again, and the position will update. When that happens, the timer will reset to zero again.

On the second line, the first number shows the Longitude, the number of degrees East of the Prime Meridian (or West, if the number is negative). The range is 0-179.99999. It is taken out to 5 decimal positions, accurate to about 3 feet. You can also display this number in Degrees:Minutes or Degrees:Minutes:Seconds if you select those display options.

Finally, the number at the end of the second line is the last reported GPS altitude. The default units are Feet, but you can also configure it to display in Meters. Now, it would be very nice if this number was updated in real-time during you flight so you could use it to find out your apogee and how quickly it's coming down, but unfortunately that's not the case. GPS is designed primarily for lateral/surface navigation, so unless you have sophisticated GPS equipment beyond the capabilities of consumer-grade GPS units it's not going to do a very good job of resolving altitude in real-time. It DOES work will if the GPS unit doesn't move vertically very much, so you WILL get a "base" altitude while the rocket sits on the pad, and you MAY get a reasonably good reading while the rocket is coming down under main chute after it slows for awhile. You may not get a usable reading while it's under drogue, however, depending on how fast it's coming down and how much it twists (that reduces the satellites' signal strength).

Now, you may be wondering what good this number is if it's not terribly accurate. We have found that, as inaccurate as it is, it IS a good indication of whether your rocket has landed or not, as long as you're in range. In general, you will pick up the altitude at about 600' AGL or so, and you'll be able to see it drop until it either stabilizes or you lose the signal (typically somewhere below 100' AGL unobstructed assuming you're still within 3 KM range). Clear-view ground range is typically about ½ KM, more with an external antenna, so if you get a fix and it's at or near your launch ASL altitude then you can be sure it's on the ground even if you can't see it.

Using the Eggfinder LCD Data

There are several things you can do with this data, but you will need one other tool to use them… a GPS-enabled smartphone. Now, just about everybody has one of these nowadays, and you don't even need to have cellular data coverage to use it to find your rocket. (You DO need it if you want to display a pretty map of your launch site, but most launch sites don't look like much anyway, so unless you have some roads that you can use as a reference they probably aren't going to help you much anyway.)

The general idea is that you are going to enter the GPS coordinates into your smartphone navigation app, create a waypoint (some apps don't require you to do this), and tell it to navigate to those coordinates or waypoint. The internal GPS in your smartphone will track your current location on the ground as you approach the rocket's location, and tell you which

direction to go and how far it is. All you need to do is to follow the track, and voila! your rocket will be there.

As you approach the rocket, or if it never goes out of range, the beeper on the Eggfinder LCD will beep once per second to let you know that it's getting a fix from the Eggfinder TX transmitter. In the event that your rocket isn't quite where the initial coordinates said it was (i.e. because it got dragged on the ground by the wind, or a well-meaning fellow hobby rocketeer picked it up for you…) you'll be able to tell, because the coordinates in the display will change. Trust us, we've had this happen… many times!

Coordinate Memory Save

Nothing would be worse than having the GPS coordinates on your display disappear because the batteries went dead, or if it accidentally got turned off. To help prevent this potential catastrophe, the Eggfinder LCD automatically saves every 10th valid fix into non-volatile memory. In addtion, if you lose the coordinates for over 10 seconds, it will automatically be saved into the LCD's memory too.

This allows you to turn it off and save battery life if you find that the rocket landed some distance from you and it's going to take awhile to get to it. To recall the last saved coordinate, power-cycle the LCD receiver, and at the "Waiting for Fix" display hold the button down for 3 seconds then release it. The last received coordinates will display, along with the "**" in the time-from-fix field that lets you know that it's "stale" data. If you receive a valid fix while the saved data is being displayed, the LCD receiver will start receiving packets normally, displaying the real-time coordinates, HDOP, etc., and of course it will save every 10th fix after that.

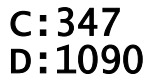
Heading/Distance Display

Many times after you launch a rocket, you'll find that it goes in one direction and ends up landing in another. This is typically due to winds aloft that carry it away after the parachute comes out at apogee. If the rocket goes out of sight, it can be difficult to track, since you're looking in one direction when it's actually going in another direction.

To make it easier to track, the Eggfinder LCD has a heading/distance feature. The way it works is that you set a "home" waypoint, typically the location of the rocket on the pad, and when the rocket is moving it calculates the heading (in compass degrees) and distance from the pad using the received GPS data. This is strictly in relation to the pad… as you move your receiver it's not going to change, so it's not meant to be used for actually finding your rocket (although you **could** use it for that as long as you followed the compass heading from the pad). While the rocket is in flight, the heading/distance will change, so you can easily see which direction it's going.

To set the home waypoint, you must have received a valid fix on the pad. (You wouldn't launch unless you had one anyway, right?) Press the button and hold it for two seconds, then release it. You'll hear a beep, that means that the home waypoint has been set.

To toggle view the heading screen, simply press the button and release it. The display will flip between the "normal" screen and a slightly different screen that looks like this:



On the top line is the compass heading of your fixed home point (usually the pad) to the rocket, indicated by the "C:". The number following it is the heading in degrees, from zero to 359. This is an absolute compass heading… zero is North, 90° is East, 180° is South, and 270° is West. That represents the compass heading of your rocket in relation to the pad, **not** from the LCD receiver. In this example, the compass heading is 347 degrees, which is 13 degrees to the left of North.

On the bottom line, instead of altitude you will see the distance from the pad to your rocket, indicated by a "D:". Note that the default units is feet, but you can change it to meters in the Eggfinder LCD's setup screens. In this example, your rocket would be 1090' from the pad.

The home waypoint is saved in memory along with your transmitter's last GPS reading, so if you turn off the power and recall the memory (by holding the button down when you do **not** have a fix) you will see the heading/distance display from the last received valid GPS location. If you obtain a fix after that, you will see the compass heading and distance from that saved home point (i.e. your pad) to the rocket.

Quick-Start Function

Normally, if you turn on your Eggfinder LCD it cycles through several screens, to give you an opportunity to change the program parameters and pair with an Eggtimer TRS Flight Computer. This is fine… if that's what you want to do. However, sometimes you just want to turn it on and have it get a fix with your Eggfinder TX or Mini using the parameters that you've already set up, or you may have your Eggtimer TRS set up and you just want it to auto-arm when powered up like most other flight computers do.

The Eggfinder LCD has a "Quick Start" function that immediately goes to "Waiting for Fix" while skipping the other screens. To activate it, hold down the button with the power OFF, then turn the power ON. Release the button after the long beep stops, and it will immediately go into "Waiting for Fix". From this point on, it behaves exactly the same as if you got into that screen the long way.

Optional Hardware Mods

Adding an HC-06 Bluetooth Module

Although the LCD display makes using the Eggfinder LCD a snap, if you want to be able to provide a real-time track feed into your laptop/tablet/phone from the Eggfinder LCD you'll need to use an HC-06 Bluetooth module. Conveniently, we have provided both a physical spot to mount the HC-06, as well as a connector to connect it to the board.

First, you'll need to get an HC-06 Bluetooth module. We recommend that you look on eBay, search for "HC-06 Bluetooth"… you'll find a lot of them, they are generally under $10. Make sure you get one that already has the right-angle 4-pin connector; they will usually come with a 4-pin header-header cable too. Make sure you do NOT get the raw module without the carrier board; you won't be able to connect it to your Eggfinder LCD.

Now that you got your HC-06 module, here's how to mount/connect it:

__ If you have already mounted the board/LCD in the case, remove the module from the case, and separate the board from the LCD module.

__ Plug one end of the cable into the pins on the HC-06 module.

__ Turn the HC-06 module over, you will see markings next to the pins. Record the color of the cable for each pin, so you can makes sure that you match them up to the pins on the board later.

3.3V	_____
GND	_____
TXD	_____
RXD	_____

__ With some double-stick tape (not included), mount the HC-06 module on the top of he board in the space provided just below the processor, so that the pins face the right edge of the board (the side with the RF module).

__ Mount the LCD/board onto the case top (see the previous assembly instructions).

__ Bend the cable back against the bottom of the board, then underneath itself in an "S" curve. Plug the cable into the 4-pin connector on the board, making sure that the cable isn't twisted and that the cable pins match up with the pins on the HC-06 module (i.e. top pin from the HC-06 goes to "3.3V", second pin to GND, etc. Make sure you match the colors of the cable up to the same pins on the bottom of the board as they were on the HC-06 module.

Now, you'll need to test it. In general, you will need to load the Bluetooth-serial driver for your device, and "pair" it with the HC-06. The pairing code for all HC-06 modules is "1234" (that should be easy enough to remember!). In the case of an Android device, you'll need to install the Bluetooth GPS software, which will allow the internal GPS in the Android device to be replaced with the remote GPS over the Bluetooth serial connection.

__ Turn on your Eggfinder TX transmitter, then turn on the Eggfinder RX receiver.

__ Turn on your laptop/tablet/phone, go to Bluetooth Devices (Windows) or install Bluetooth GPS (Android), and pair it to the HC-06 using the "1234" pairing code.

__ Once it's paired, you should start seeing the light on the HC-06 blinking as data is transmitted through the Bluetooth connection. If you do NOT see the light blinking, chances are that you have the cables crossed up; turn off the Eggfinder LCD receiver and check your cable connections.

At this point, you'll need to install some kind of mapping software on your device, see the Eggfinder User's Guide for suggestions and general instructions on using mapping software with the Eggfinder system. If you have a Windows laptop, we recommend MapSphere; it's free and it does a very good job.

Installing a Backlight Switch

The black-on-yellow reflective LCD display is designed to be highly readable in outdoor lighting conditions, and reasonably readable indoors with decent lighting. However, some of you brave souls may attend launches that have night-flight waivers. (If you've never seen a "sparky" motor at night, you should try to attend one of these launches… it's really cool!) Besides lighting, having a GPS tracker makes it MUCH easier to get your rocket back, but you'll need to be able to see the display at night. The Eggfinder LCD module has a built-in yellow backlight, which is normally not connected, but can be easily enabled.

To enable the backlight, you will need a small single-pole single-throw switch, and a little bit of wire. Micro-size toggle switches (such as #275-645 from Radio Shack) work fine, as do push-on push-off switches). Simply wire the terminals of the switch to the two pads near the top of the LCD module header labeled "BL". Mount the switch in the case appropriately. Turn on the Eggfinder LCD, flip the switch, and the backlight should come on. Note that the backlight draws a fair amount of power, so you should make sure it's turned off when you don't need it.

Installing a RP-SMA Connector for an External Antenna

If you decide to install a RP-SMA connector for an external antenna on your Eggfinder LCD board rather than using the "stick" antenna, you will need to follow the directions below.

For each board on which you want to install a connector, you will need:

___ RP-SMA board-edge connector, straight, .062" (1.5mm) board thickness
(Linx Wireless part number CONREVSMA003.062 or equivalent)

You can get these from Eggtimer Rocketry, and you can also get them from electronics distributors such as DigiKey, Mouser, and Future Electronics. They're under $5 each in small quantities.

If you look at the connector, you will see that there are two sides, separated by the thickness of the PC board. The TOP side has three pins, the BOTTOM side only has two (there is no center pin). Inside the outside-threaded connector is a pin; this is why it's called a "reverse" connector, normally outside-threaded connectors have a socket in them and the matching connector (with inside-threads) has a pin.

___ Slide the RP-SMA connector on the edge of the board, so the three pins on the top line up with the pads on the top of the PC board. With some masking tape, tape it into place on the bottom of the board so it won't move, leaving the pins and pads on the top untouched.

___ Solder ONE of the side pins on the top side to the pad on the top of the board. (Note: You may find that the solder that comes with the Eggfinder LCD kit is too fine for soldering these large pins to the board; if that is the case, use some "conventional" .032" 60/40 rosin-core solder for the outside pins, but you DO need to use the included solder for the center antenna pin.) Let it cool for at least 30 seconds.

___ Check the connector to make sure that it is straight. If it has gotten a little crooked, heat up the solder joint and gently move the connector into place.

___ Solder the other two pins to the pads on the top of the board.

___ Turn the board over, remove the masking tape, and solder the remaining two pins to the pads on the bottom of the board.

Installing an External Push Button

Probably the most useful addition to the Eggfinder LCD is to add an external push button. If you are going to be using it with an Eggtimer TRS Flight Computer, it's virtually a necessity, because you use the Eggfinder LCD to program and arm the TRS. If you're not using a TRS, it makes programming the frequency of your Eggfinder TX or Mini more convenient, and it's also useful for using the heading/distance display.

First, you'll need to get a push button. You need a normally-open single-pole momentary button (this is the most common type). We recommend that you spend a few dollars and get a good one… don't get the real cheap ones, they "bounce" and will cause you problems (even though we try to filter out switch bounces).

Find a suitable spot on the case to mount the push button, so that it does not interfere with the PC board or the battery box. We've seen them mounted just about everywhere, including the back. Once you mounted it, solder a wire approximately 6" long to each terminal of the switch. Solder the other ends of the wires to the two pads marked "SW", on the Eggfinder LCD's circuit board just above the little tactile push button.

Turn on your Eggfinder LCD, and try a few functions that require the switch… it should work just fine. Button it up and you're all done.