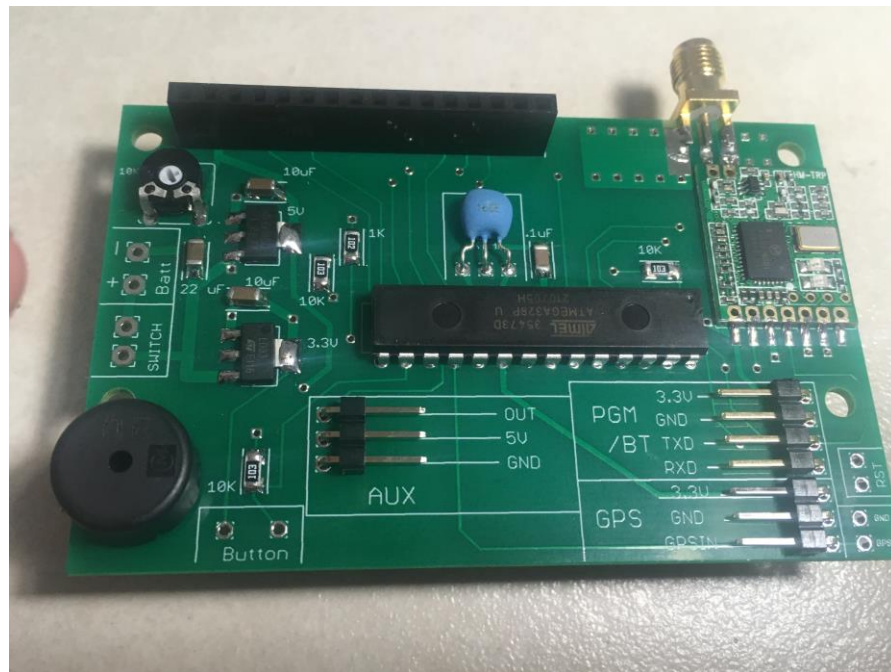


Eggfinder LCD Assembly Manual

Board Rev B5 Firmware Version 2.02Q



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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. Nonetheless, 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](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](http://www.Eggtimerrocketry.com) and download the latest Release Notes.
- Go to our web site at [www.Eggtimerrocketry.com](http://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 Eggtimer GPS Tracker! The Eggtimer 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 Eggtimer, 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 Eggtimer LCD receiver is different than the standard "dongle" Eggtimer 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 Eggtimer 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 quite 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 jeweler'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)

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.

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. If in doubt, DON'T SOLDER... send us an email or give us a call, and we'll be happy to answer any questions that you may have.

Assembling your Eggfinder LCD Board

Important Note:

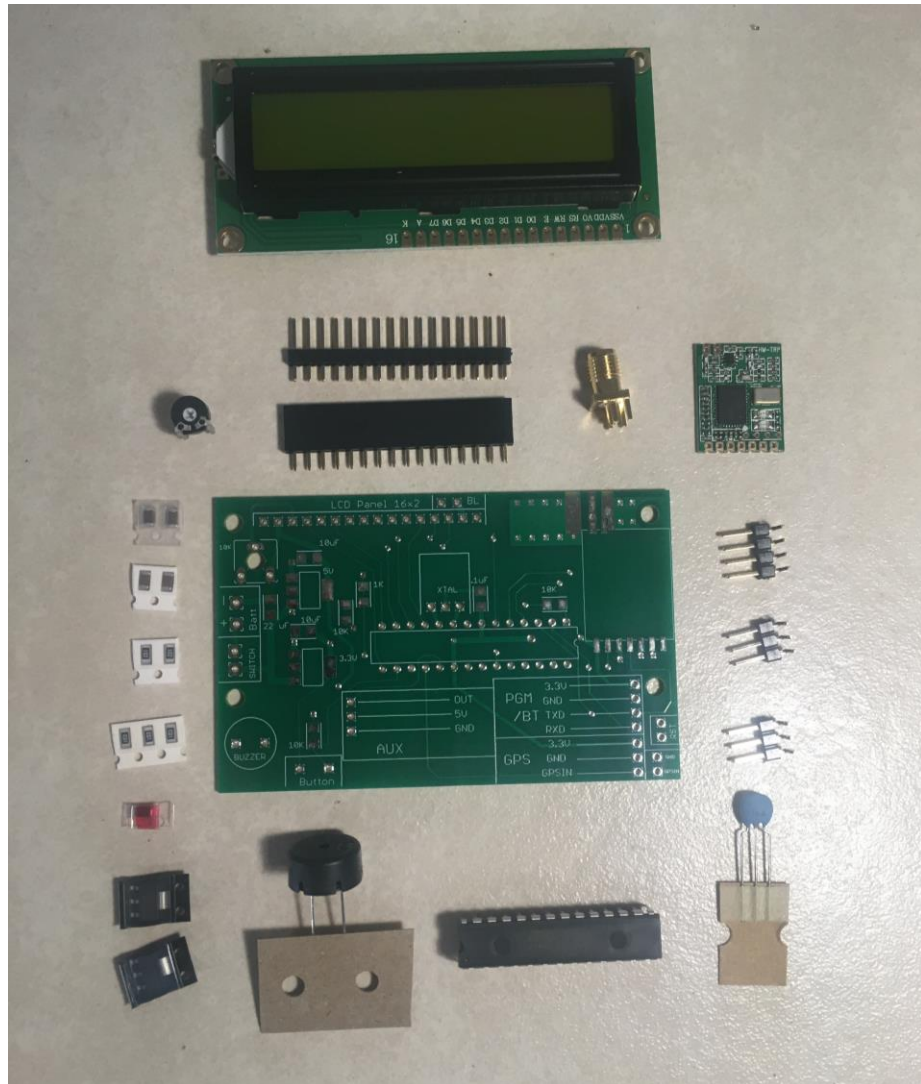
We STRONGLY recommend that you drill/cut the case **BEFORE** building the board. This is because the recommended procedure is to use the bare PC board as a drilling template, and it's very difficult to do this once you've built the board. See the "Mounting the Board in the Case" section. If you're using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

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...

<u>Qty</u>	<u>Description</u>
___ 1	Circuit board
___ 1	Hope RF HM-TRP-900 RF module
___ 1	1602 16x2 LCD Display
___ 1	Atmel ATMEGA328P-PU Processor
___ 1	LD1117-33 3.3V voltage regulator (the markings end in "33")
___ 1	LD1117-50 5V voltage regulator (the markings DO NOT end in "33")
___ 1	16.000 MHz ceramic resonator (brown or blue part with three leads)
___ 1	1206-size 1K ohm resistor (marked "102")
___ 3	1206-size 10K ohm resistors (marked "103")
___ 1	10K ohm trimmer potentiometer
___ 1	1206-size .1 uF capacitor (brown, unmarked in a paper tape)
___ 2	1206-size 10 uF electrolytic capacitors (brown, in a clear plastic tape)
___ 1	1206-size 22 uF electrolytic capacitors (brown, in a plastic tape with a RED stripe)
___ 1	12mm Round Pizo Buzzer

- 1 16-pin header strip
- 1 16-pin socket strip
- 1 4-pin right-angle header strip
- 2 3-pin right-angle header strips
- 1 RP-SMA board connector
- 1 900 MHz Antenna
- 1 Push button with wires
- 1 Coil of .020" 63/37 No-Clean solder wire



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!

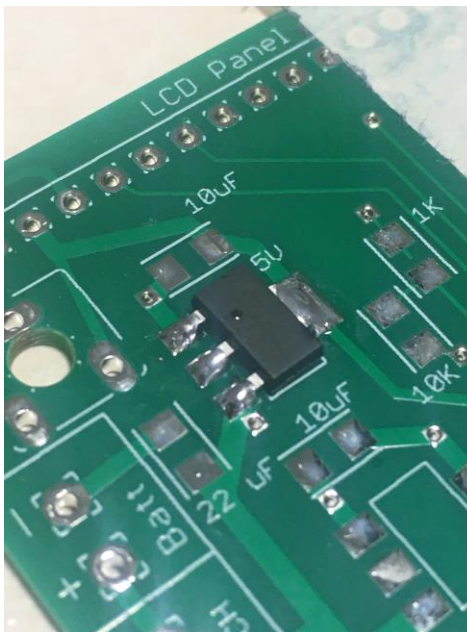
The Eggfinder Limited Warranty does not cover damage to parts while attempting to desolder them because you inserted something incorrectly. We spent a lot of time making sure that the assembly instructions were clear, but once again if you have any questions about the assembly procedures drop us a line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

OK, so let's get started...

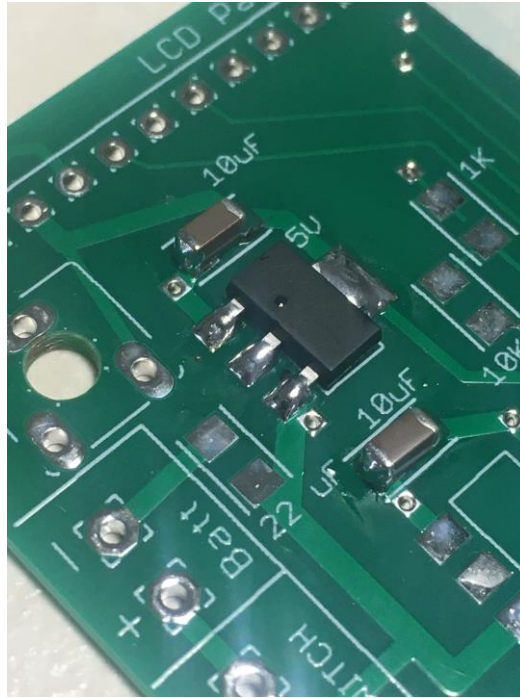
— Mount the 5.0V Voltage Regulator

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.

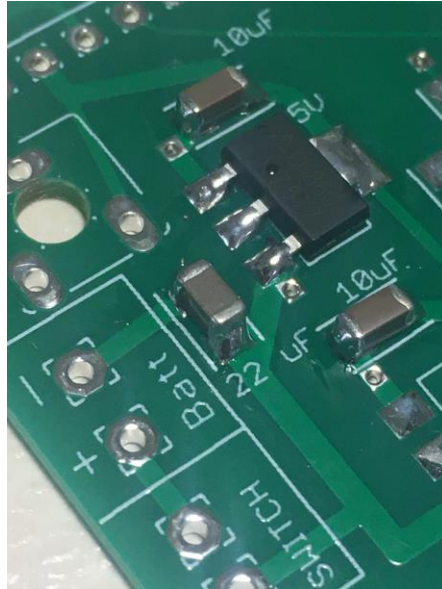
One by one, solder the three small three small leads to the pads, using enough solder to cover the pad and get a good "tenting" on the leads without creating solder "blobs". Wait at least 30 seconds between each pad to prevent the chip from overheating.



— Mount the Two 10uF Capacitors



— Mount the 22 uF Capacitor

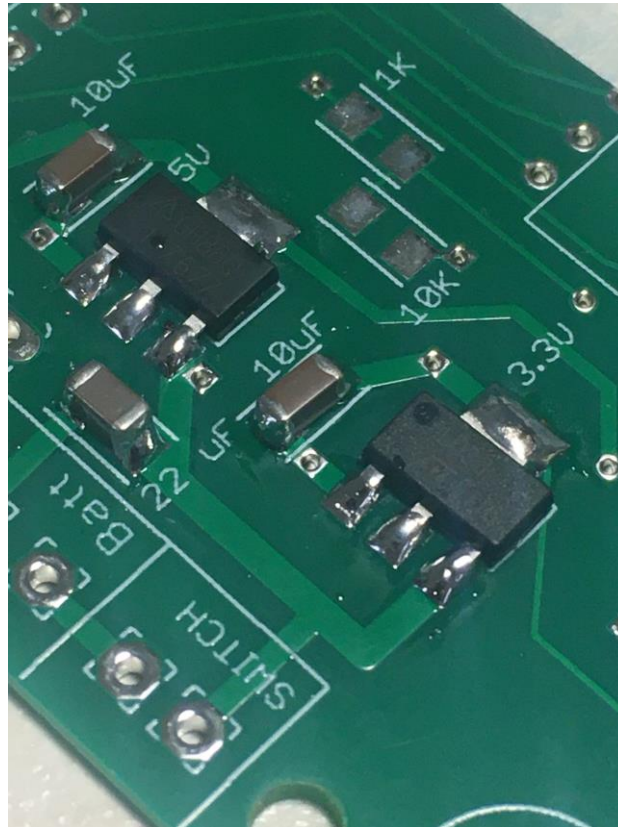


— Mount the 3.3V Voltage Regulator

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.

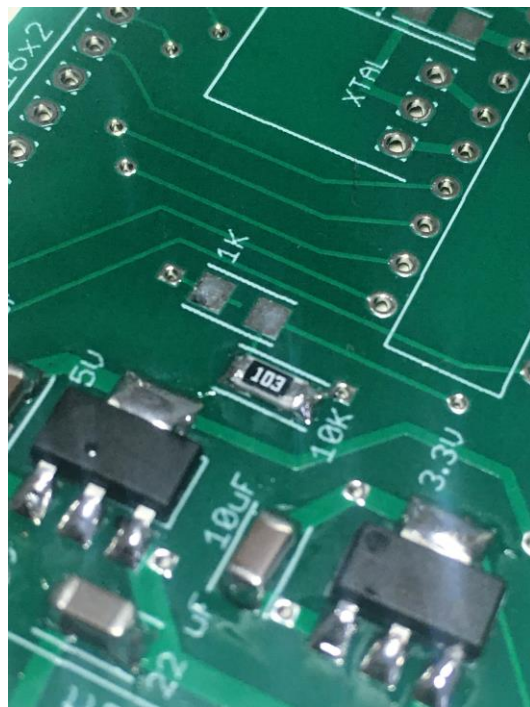
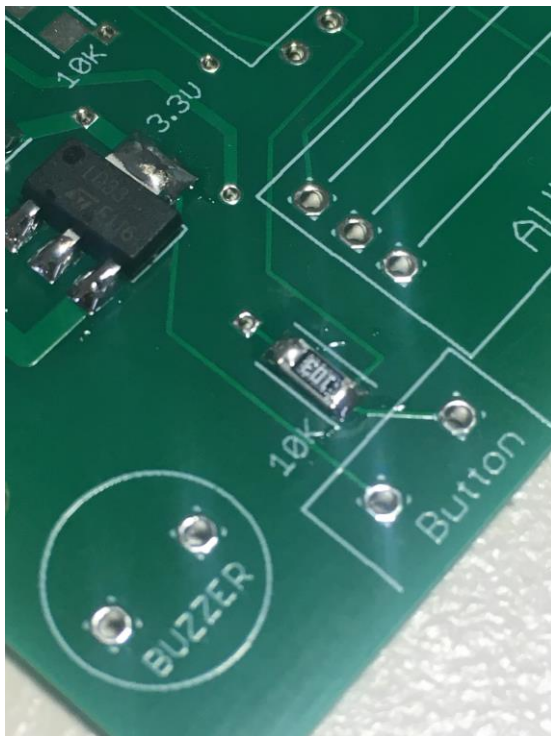
Hold your soldering iron on the pad for another 5 seconds, then remove it and wait at least 10 seconds.

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



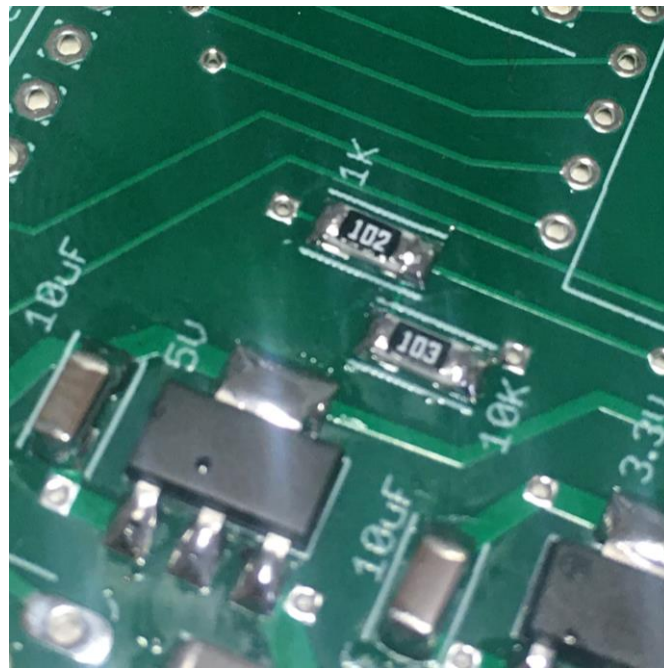
— Mount two 10K (103) Resistors

Locate the two 10K resistors on the right side of the board, marked “103” on the board. One is next to the round “Buzzer” marking near the corner of the board, one is just to the right of the 5V regulator. Solder them into place.



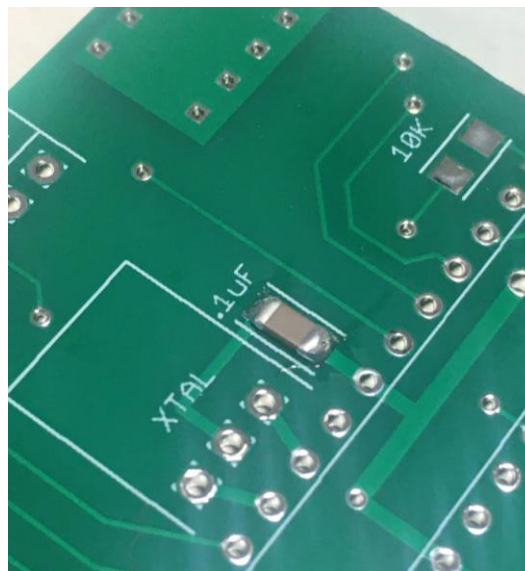
— Mount the 1K (102) Resistor

Locate the 1K resistor, marked “102” on the board, just to the right of the 103 resistor that you just mounted by the 5V regulator. Solder it into place.



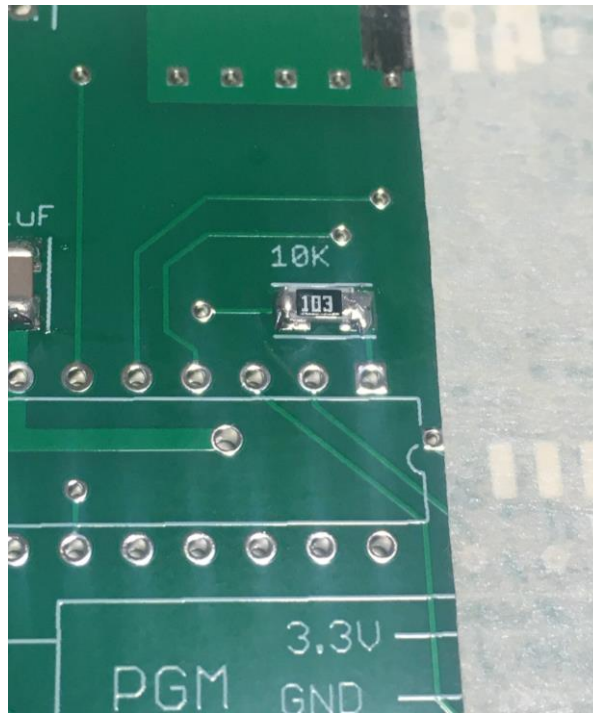
— Mount the .1uF capacitor

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 one 10K Resistor

Locate the 10K resistor on the far right side of the board, marked "103". Solder into place.



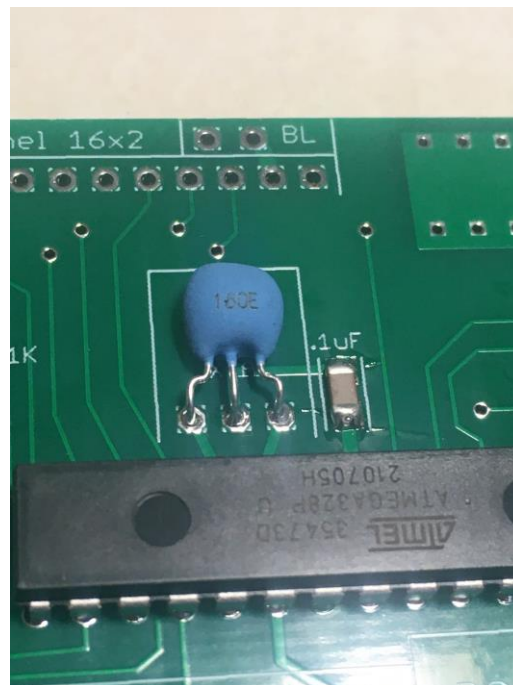
___ Mount the Atmel ATMEGA328P-PU Processor

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 than 28. If it looks good, turn it back over and finish soldering the rest of the pins.



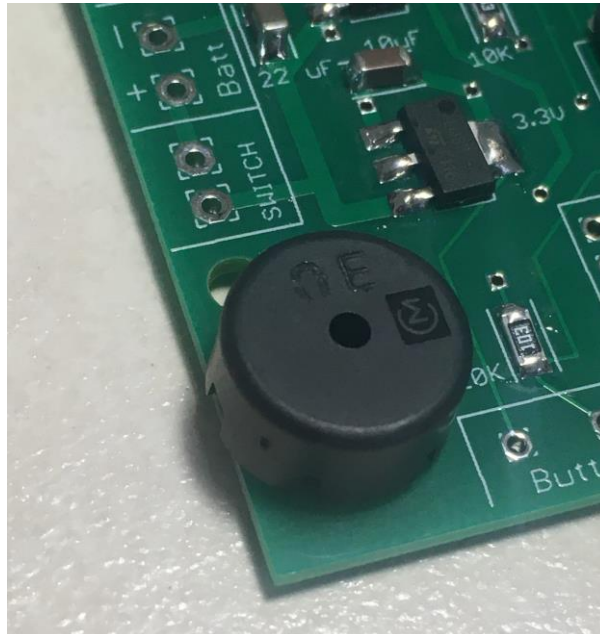
— Mount the 16.00 MHz resonator

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.



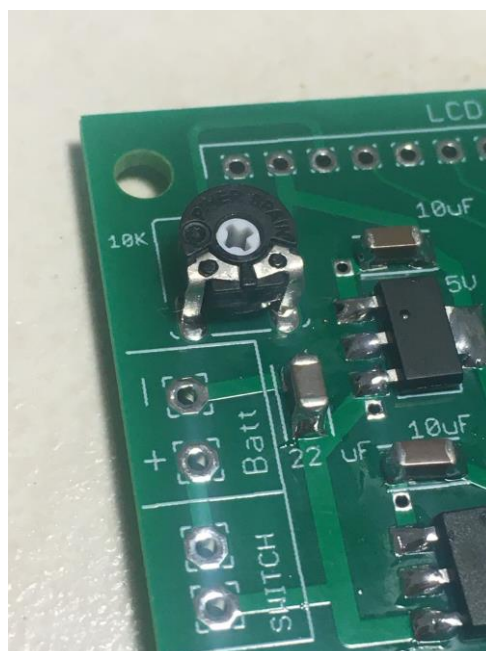
___ Mount the pizo buzzer

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

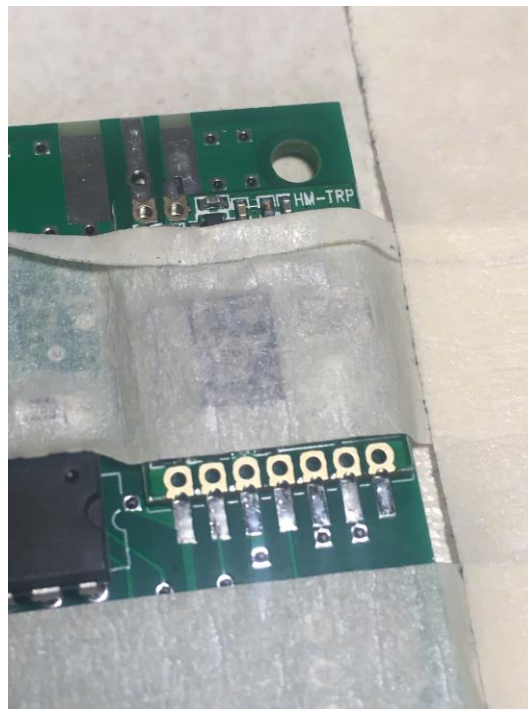
You will be surface-mounting the Hope RF radio module to the board, the pads are relatively large and spaced relatively far apart, so if you didn't have any trouble with the voltage regulator you won't have any problems with the RF module either.

___ 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

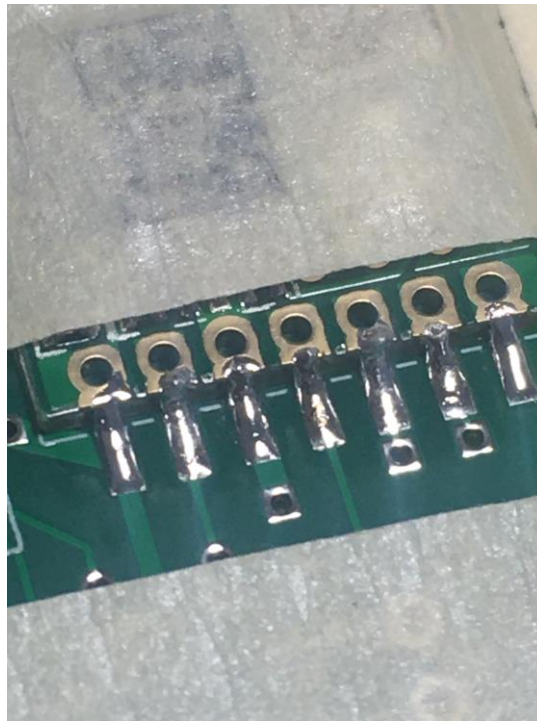


___ Solder the BOTTOM RIGHT pad of the Hope RF module to the board. Make sure that the board is properly positioned after you solder this joint; if it moves, heat up the solder joint

and move the board slightly so that it is properly positioned. Wait 30 seconds after soldering before continuing. **DO NOT OVERSOLDER!** You only need enough solder so that the pad on the RF module is connected to the pad on the PC board. If you oversolder, you may accidentally bridge the pads underneath the RF module, and potentially ruin it.

___ Solder the TOP LEFT pad of the Hope RF module to the board, this is the one next to the ANT terminal. Again, **DO NOT OVERSOLDER!** Wait 30 seconds before soldering anything else.

___ Solder the remaining pads to the board, waiting 30 seconds between pads to prevent the module from overheating. Do not oversolder the pads... you only need enough solder to connect the pads on the RF module to the pads on the PC board. (Yes, we said this before... but it bears repeating. It's one of the most common reasons why the LCD receiver doesn't work after powering it on.)



Mounting the Remaining Components

___ Mount the RP-SMA Antenna Connector

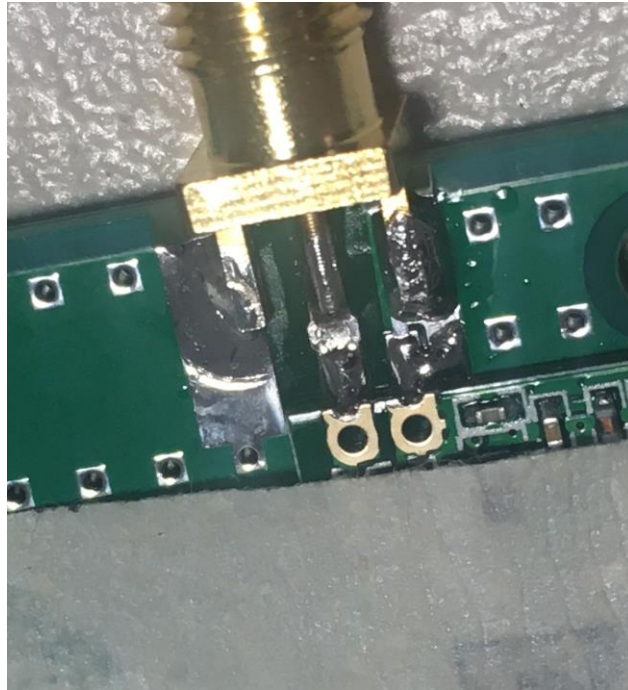
If you look at the connector, you will see that there are two sides, separated by the thickness of the PC board. The TOP side has three pins, the BOTTOM side only has two (there is no center pin). Inside the outside-threaded connector is a pin; this is why it's called a "reverse" connector, normally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



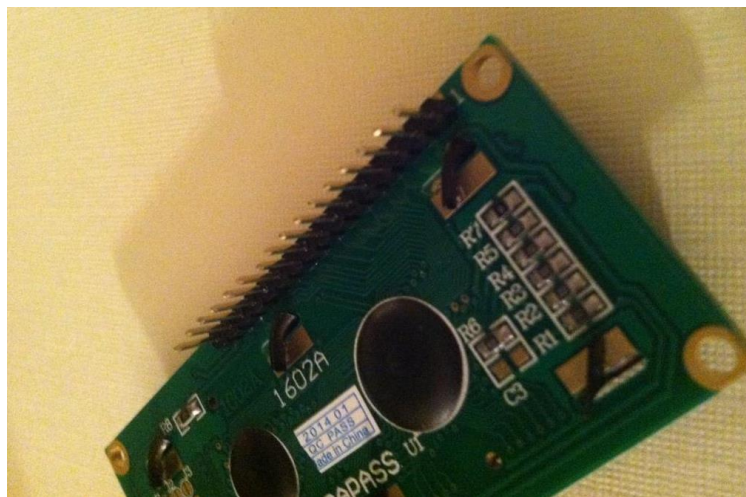
— Mount the 16-pin Socket Strip

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.



Final Assembly

These steps will be dependent on how you are going to mount your LCD Receiver in YOUR case...

You will need to have access to the 4-pin header in order to connect the Eggtimer USB -Serial cable for firmware updating, or if you are going to use the Bluetooth module with it. The two 3-Pin headers are for the optional modules... one is for the LCD-GPS module, the other is for the Eggtimer Voice Module. If you are NOT going to use either one of those, you can leave them off if you wish.

In order to have easy access to the headers, you should mount them on whichever side of your case is exposed when you open it up. In the case of the Eggtimer “ugly black box” case, that is the BACK side of the board, because the board attaches to the front of the case. Likewise, if you have the Black Aero V1/V2 cases (which are just a little bit larger than the board and have a removable handle), you will also be mounting the headers on the BACK side of the board. If you have the newer Black Aero V3 case (which is quite a bit larger than the board and has spaces for the LCD-GPS Module and Voice Module), you need to mount the headers on the FRONT of the board, since it screws onto the back of the case.

In addition, you will need to figure out where you want the battery connector and a switch to go. If you purchase the optional Eggtimer case, it comes with a battery box/switch combo; follow the instructions for the case. If you purchase the Black Aero cases, these parts are provided. If you are making your own case, you are on your own... you’ll have to figure out where to mount the battery connector, power switch, and push button.

A Note About Power

The Eggfinder LCD receiver is designed to run on 6V or more, we recommend using either the 4xAA battery box that comes with the Eggfinder case package, or a 2S LiPo battery if you’re using another case. We recommend at least a 500 mA AH LiPo battery pack; larger is better, if you get one that’s 1200 mA AH or larger it should last an entire flying weekend. If you are using the Bluetooth option, we strongly recommend that you use a LiPo battery rather than the 4xAA battery box; it draws a lot of current, almost 100 mA.

The LCD-GPS and the Voice Module options both use up some power, however their drain is significantly less than the base LCD receiver. What DOES take up a lot of power is the backlight... over 300 mA! If you only fly during the day, we recommend that you skip the backlight option. It IS very handy for night launches, however... just use it sparingly.

— Decide Which Side to Mount the Headers and Switches

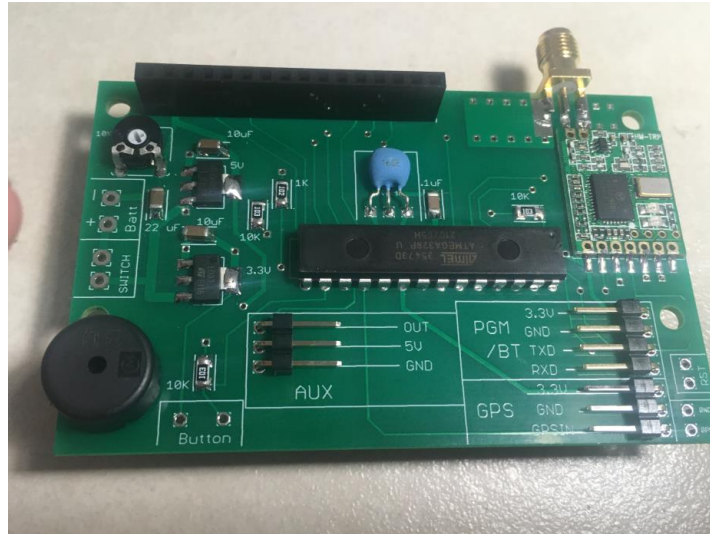
Per the instructions above, test-fit the assembled board to this point and decide where the headers and switches will go.

___ Mount the 4-Pin header

Fit the 4-pin header on the appropriate side of the board, and tape it into place with some paper masking tape. Turn the board over and solder the pins, then remove the tape.

___ Mount the Two 3-Pin Headers

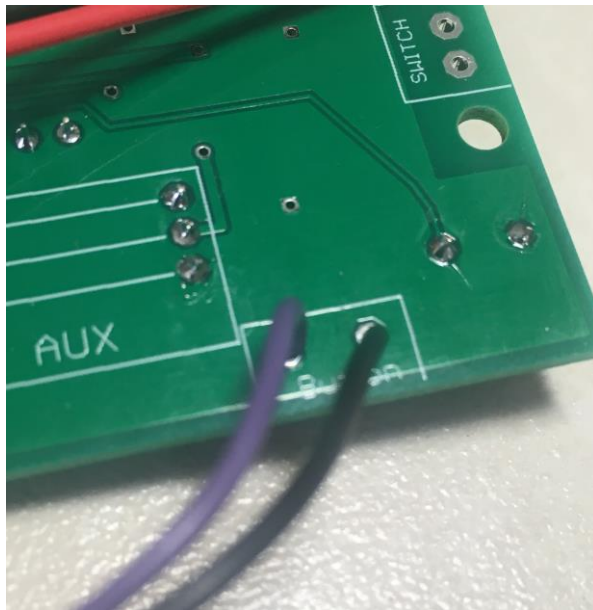
Fit the two 3-pin headers on the appropriate side of the board, and tape it into place with some paper masking tape. Turn the board over and solder the pins, then remove the tape.



___ Mount the Push Button

Test-fit the board into your case, and note where the push button will go. If your case is not pre-drilled for the push button, right now would be a good time to drill for it; it requires a 1/4" hole.

Trim the leads for the push button to about 1" longer than they need to be (a little slack is good). Strip 1/4" from each wire, and twist and tin the wires. Insert the wires into the board into the two pads marked "BUTTON" on the OPPOSITE side as the headers, tape them into place with some paper masking tape, then turn the board over and solder the wires. Trim the wires, then remove the masking tape.



— Solder Your Battery Connector Leads

If you are using your own battery connector (i.e. JST for a 2S LiPo battery), we **STRONGLY** recommend that you check the polarity of the wires. The “+” wire should be RED and the “-“ wire should be BLACK, however we have seen some with different colors (i.e. purple instead of red), and we have also seen some in which through a manufacturing error the colors were reversed. We recommend that you connect your battery to the connector and use a DVM to check the polarity **BEFORE** you solder it to the board. **CONNECTING YOUR BATTERY BACKWARDS CAN DAMAGE YOUR LCD RECEIVER BOARD, SO MAKE SURE YOU GET THIS RIGHT!**

Figure out where the battery and the connector pigtail is going to go in your case, and trim the pigtail wires appropriately. Strip about ¼” from the ends of your battery connector wires, then tightly twist them and slightly tin the tips. Insert the wires into the board into the two pads marked “BATT” on the **OPPOSITE** side as the headers so that the “+” lead is in the “+” pad and the “-“ lead is in the “-“ pad. Tape them into place with some paper masking tape, then turn the board over and solder the wires. Trim the wires, then remove the masking tape.

— Solder Your Switch Leads

If you are **NOT** using an external power switch (i.e. you have the EggTimer case with the 4xAA battery box and the slide switch), solder a piece of wire across the two pads marked “SWITCH”.

Trim the leads for the power switch to about 1” longer than they need to be (a little slack is good). Strip ¼” from each wire, and twist and tin the wires. Insert the wires into the board into the two pads marked “SWITCH” on the **OPPOSITE** side as the headers, tape them into place with some paper masking tape, then turn the board over and solder the wires. Trim the wires, then remove the masking tape.

~~~~~

Assembly of your Eggfinder LCD board 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 transmitter on the same frequency/ID. (If you're using an Eggtimer Telemetry Module, please see the Eggtimer Telemetry Module Assembly and User's Guide and follow the procedures there... this procedure assumes that you're using a GPS transmitter.)

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, connect the battery to the connector) Power on the Eggfinder LCD, you should hear a long beep then you should see:

**Eggfinder LCD  
Ver 2.02Q**

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

**Status: F:915 0  
GPS:D Alt:F 8.0V**

This is the status screen. It shows you the frequency/ID, the displayed units (F for feet), the GPS coordinate display units (D for Degrees), and the battery voltage (8.0V).

After about another 20 seconds, you may see:

**waiting for TRS**

That means that the LCD receiver is waiting for a pairing signal from an Eggtimer TRS Flight Computer. The default device setting is to listen for any Eggfinder GPS transmitter, so it's looking to see if your transmitter is an Eggtimer TRS or an Eggfinder TX/Mini. If your transmitter is an Eggtimer TRS, turn it on, after a few seconds you'll see something like:

**Eggtimer TRS 213c  
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 see a handshake from an Eggtimer TRS within 45 seconds, you'll see:

**waiting for Fix**

This means that the receiver is waiting for data from an Eggfinder GPS transmitter.

Now, you can test the connection between the Eggfinder transmitter and your LCD receiver. Assuming that they are both on the same Frequency/ID, power up your Eggfinder GPS

transmitter. We recommend that you test outdoors, because you may not get a good enough satellite signal indoors to get a GPS fix. After a few seconds, the red LED on the RF module should begin to blink. While you see the “Waiting for Fix” display, you should hear the Eggfinder LCD do a short “beep-beep” every two seconds while it’s waiting for the transmitter to acquire a satellite fix, that tells you that they two are communicating but that you don’t have a satellite fix yet. If you do NOT hear those beeps, then the transmitter and your LCD receiver are either not on the same frequency/ID, or you have an issue with your Eggfinder transmitter... see the Troubleshooting guide for your transmitter, then come back here and try the LCD test again.

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, assuming that you’re testing outdoors.

The display should look something like this:

```
33.12345 4■ 0
-116.64738 1326
```

If it does, congratulations! Your Eggfinder system is now working. Turn off the Eggfinder LCD, then disconnect the power on the transmitter. You may now mount the board in the case, consult the instructions for your case as appropriate.

## Troubleshooting

If your Eggfinder LCD doesn't work after assembly and testing, take a deep breath, get out a beverage to clear your 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.

- 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.

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. Connecting them backwards can damage your LCD Receiver board, so make sure you get it right.

## **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](mailto: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)

## 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 make 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 the 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.