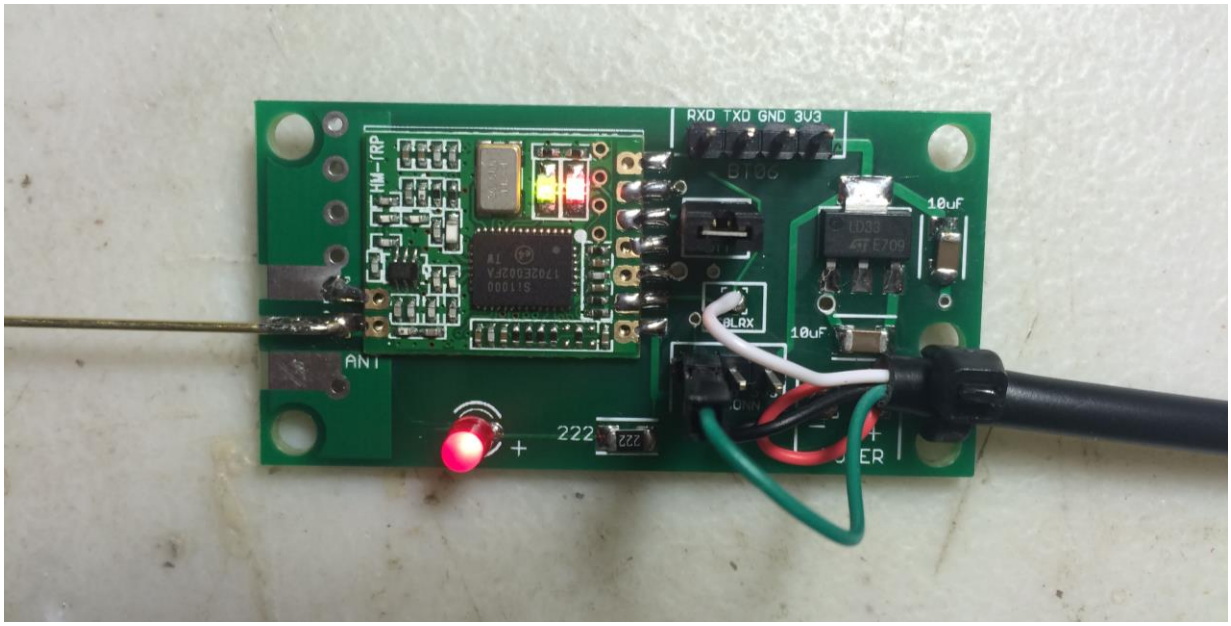
Eggfinder RX
Assembly Manual

RX Board Rev C5



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.

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. 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=adb12f74b498e43ec453f7899d9df0fd&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…

• If you bought a Starter Set (both Eggfinder TX and RX kits), make sure that both of them are on the same frequency (it's marked on the package label). If they are not, do not open the kits; contact us immediately so we can send you a replacement kit and a no-charge return label.

• 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!).

There are actually two separate Eggfinder boards, the Eggfinder transmitter that goes into your rocket, and the Eggfinder RX board that receives the data from your Eggfinder transmitter and displays it on your computer or tablet. They are similar in that they both have a radio module and power supply, but only the transmitter board has a GPS module. We recommend that you build the receiver board first, because you'll need it to tell if the transmitter is working, and they're simpler too.

About Soldering Your Eggfinder…

Assembling your Eggfinder 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, there are two "modules", the GPS module and the RF module, that could potentially be damaged by the heat of surface-mounting them 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 12" 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.

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 needle 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

___ Some double-stick foam tape ("Servo" 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.

Assembling your Eggfinder RX Board

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. Note that the Eggfinder RX can be purchased either with a USB "dongle" cable option, or a handheld Bluetooth option. Many of the parts are the same, but a few are different so make sure you're checking off the right option.

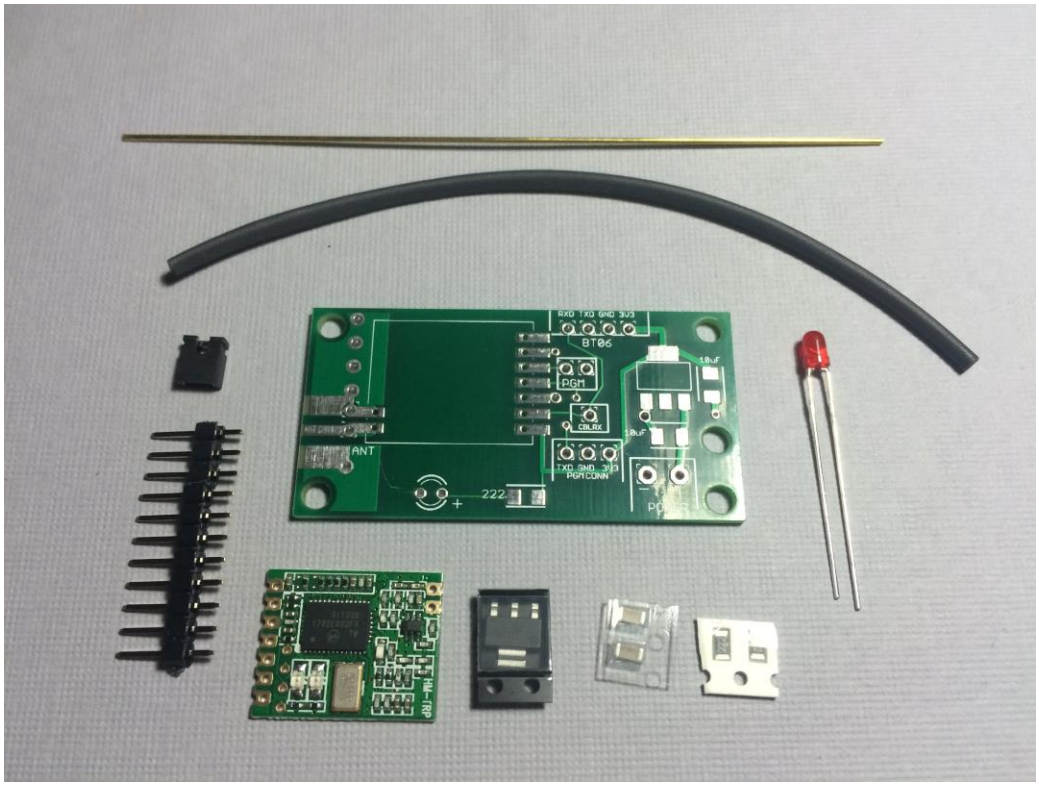
	Qty	Description
__	1	Circuit board
__	1	Hope RF HM-TRP-900 RF module
__	1	LM1117-33 3.3V voltage regulator
__	1	3mm Red LED
__	1	2.2K ohm 1206-size resistor (marked "222")
__	2	10 uF 1206-size ceramic multilayer capacitors (brown, no markings, in clear plastic carrier)
__	1	3-pin header
__	1	8-pin header
__	1	1/32" Brass Antenna wire (4")
__	1	1/16" Heat Shrink Tubing (4")
__	1	Coil of .020" 63/37 No-Clean solder wire

If you purchased the USB cable option…

__	1	USB-TTL Serial Cable
__	2	Small zip ties

If you purchased the Bluetooth option…

__	1	BT06 Bluetooth module
__	1	4-pin cable



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 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.

Eggfinder RX 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!

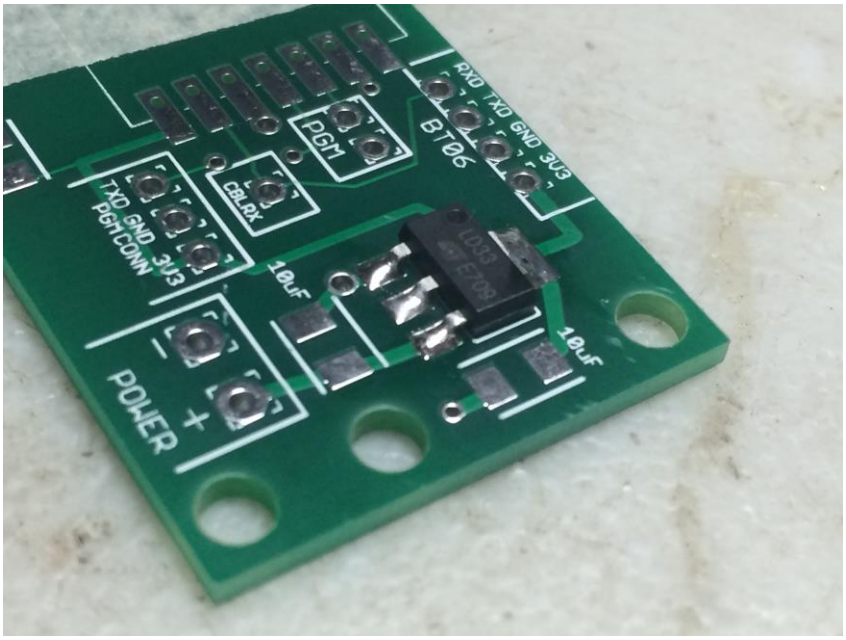
The Eggfinder Limited Warranty does not cover damage to parts while attempting to desolder them because you inserted something incorrectly. We spent a lot of time making sure that the assembly instructions were clear, but once again if you have any questions about the assembly procedures drop us a line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

OK, so let's get started…

__ Mount the the Voltage Regulator

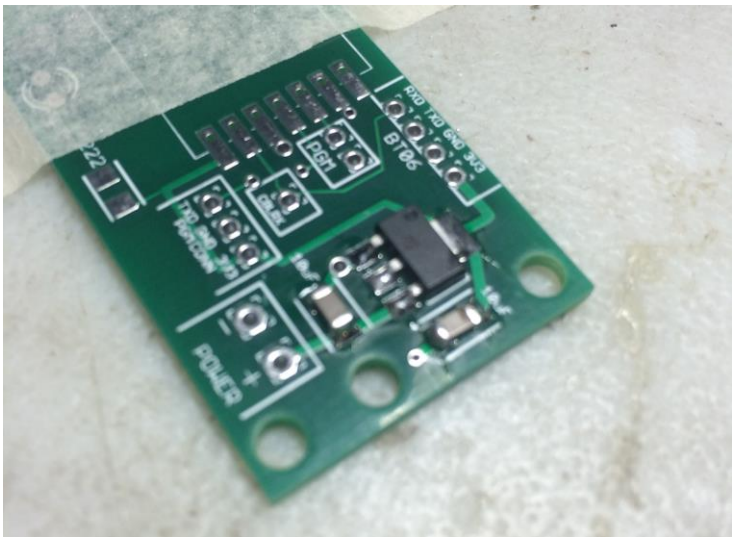
Locate the large pad and the three small pads for the voltage regulator. Heat up the pad with your soldering iron and melt a small amount of solder on the large pad, just enough to cover it. Place the voltage regulator IC in place, and hold it down, then heat up the large pad on the voltage regulator 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 15 seconds between each pad to prevent the chip from overheating.



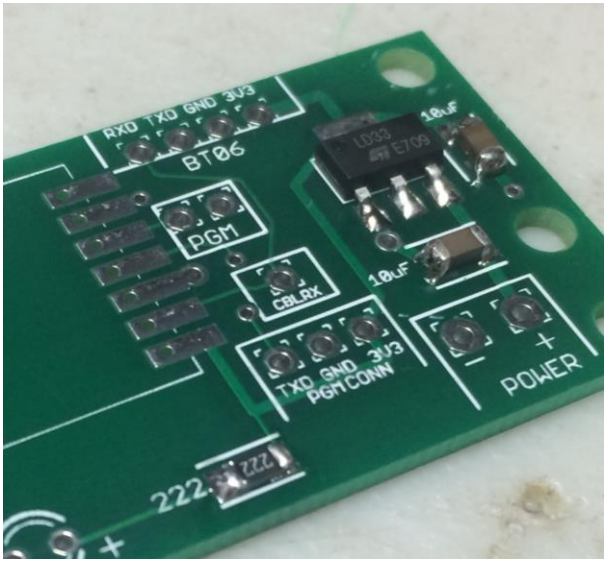
___ Mount the 10 uF capacitors

Locate the two 10 uF capacitors on the board, on either side of the voltage regulator. Mount them as you did the resistor… tinning one pad, heating it up with the resistor in place, and finally soldering the other pad. Inspect the solder joints to make sure that there's good coverage on the pads and that the solder wicks up the side/end of the capacitors.



___ Mount the 2.2K Resistor (labeled "222")

Locate the 2.2K resistor, just above the voltage regulator. LIGHTLY tin only ONE pad. With tweezers, place the resistor in place, and heat up the tinned pad with the soldering iron until the solder flows. Hold the heat in place for about 3-5 seconds, then remove the soldering iron. Hold the resistor in place for about 5 seconds, then remove the tweezers. Carefully solder the other pad in place… you don't need a lot of solder, just enough to cover the pad. Be careful not to hold the iron in place too long, or you may melt the other solder pad too, and the resistor will lift up when you withdraw your iron. Inspect the pad with a magnifying glass to make sure that the solder covers the pad and wicks up to the resistor's pad… if it looks a little light, heat it up and add a little more solder.



___ Mount the RED (PWR) LED

Insert the RED LED into the holes for the PWR LED on the top of the board, making sure that the LONG lead is in the hole maked "+". LEDs are polarized, if you put it in backwards it will not work, so double-check! Turn the board over and solder the leads to the board. Trim the leads flush. Save the leads, you'll need them for the next step.

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!

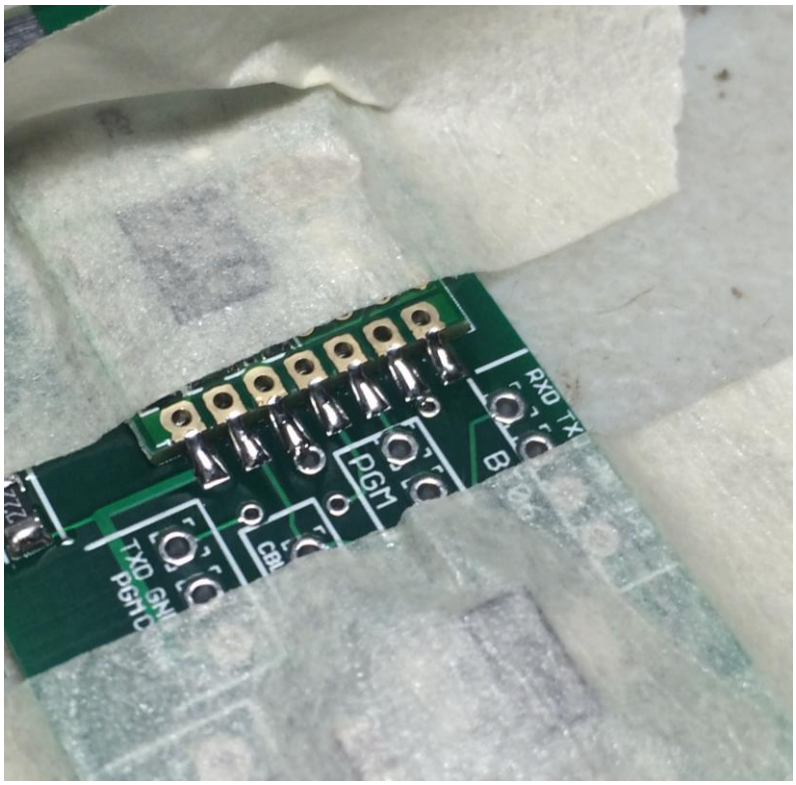
__ Cut another piece of masking tape about 2" long and about ½" wide.

__ 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

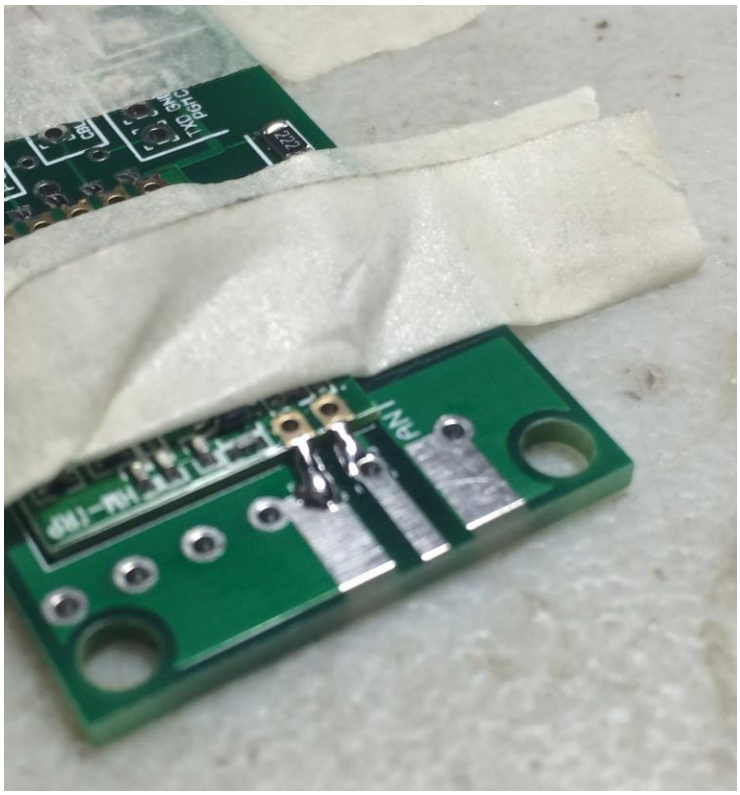
the module, they should line up with similar holes on the board. Use the cut-off leads from the LED in the upper-right and lower-left corner pads to position the RF module.

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 second pad from the top-right 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. Remove the LED wire that you had previously inserted in that pad. Solder the BOTTOM 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 put a positioning wire in that pad, remove it before soldering).

Eggfinder RX Antenna Options

The Eggfinder has pads for either a permanent "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 RX 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 10,000' 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 3 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 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).

Building the Stick Antenna

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

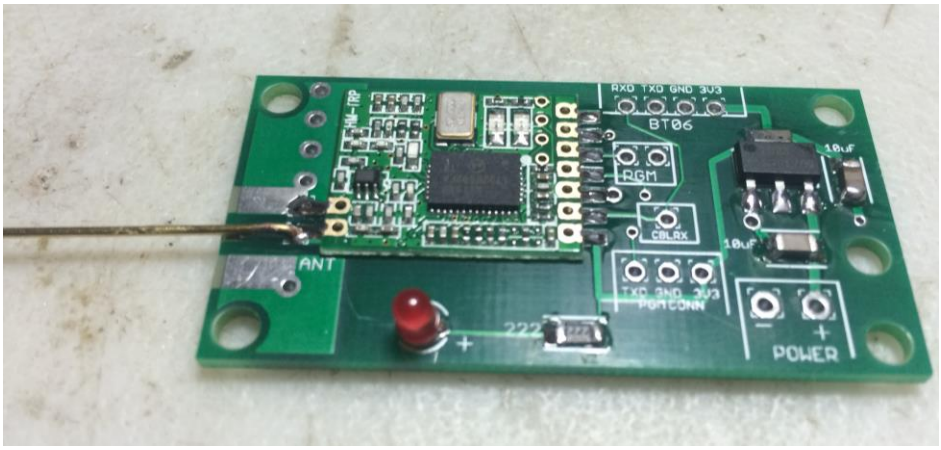
___ Put some masking tape on the two pads on either side of the antenna, to prevent solder from getting on the pads.

___ 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.

___ Slide the heat-shrink tubing over the antenna wire, then with a heat gun on low shrink it to the wire. Cut it to the end of the wire.



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 RX 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 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 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.

Finishing Up

___ Mount the Headers

Cut the 16-pin header strip as follows:

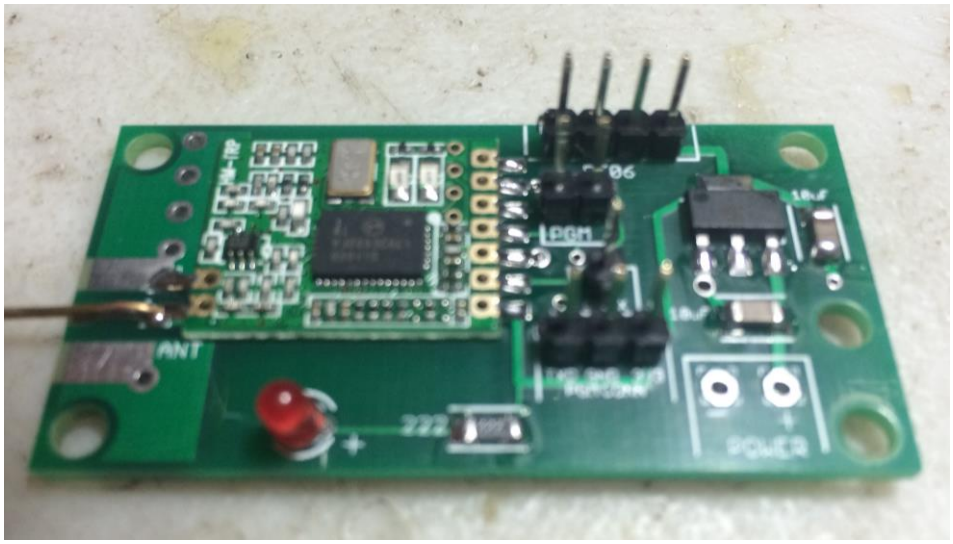
__ 1 – 4-pin header

__ 1 – 2-pin header

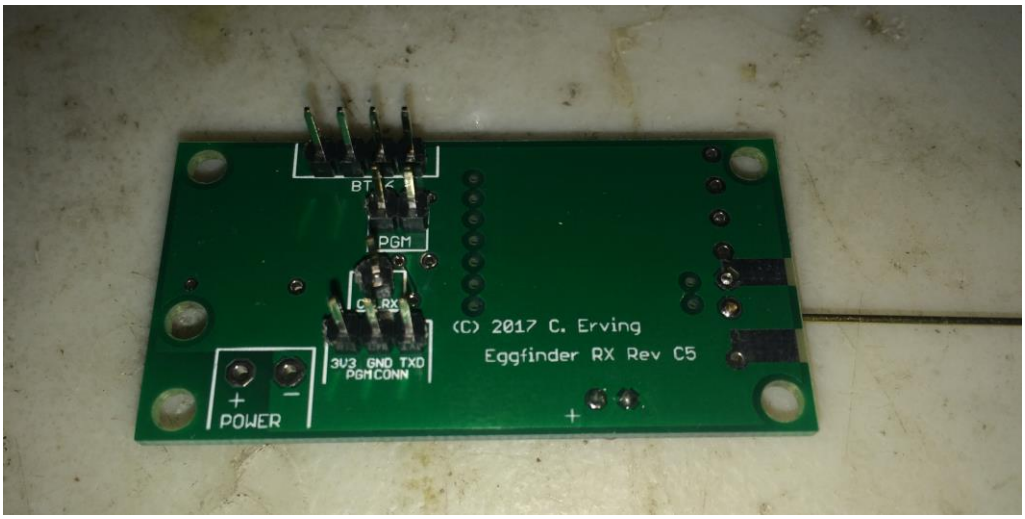
__ 1 – 3-pin header

__ 1 – 1-pin header

Locate the spaces on the board for the headers. If you are building the USB cabled version, the headers will be mounted on the TOP of the board, on the same side as the voltage regulator.



If you are building the Bluetooth version with the case, they will be mounted on the BOTTOM side of the board, opposite the other parts. This is because the board will be mounted in the case with the RF module facing out, so the headers need to face inwards so they're accessible once the board is mounted.



Insert the headers into the appropriate pads, we recommend that you use some masking tape to hold them in place. Turn the board over and solder all the pins. Don't oversolder… you only need enough to ensure that there's a good connection.

Assembly of your Eggfinder RX 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.

Now, you'll need to mount the USB cable or battery box etc., depending on which option you purchased…

Eggfinder RX USB Serial ("Dongle") Option

The purpose of the Eggfinder RX board is to receive the radio-encoded GPS data stream from your Eggfinder transmitter, and to convert the radio signal into a serial data stream that can be fed into your laptop or tablet. If you have the USB option, your kit includes a USB-Serial cable that powers the board from a standard (Type A) USB port, and provides a serial port for use with most laptop computers and tablets with a USB port. It works very well with the software setup described in the Eggfinder Users Guide.

Mounting the USB-Serial Cable

__ Clip the leads of the USB-Serial cable just behind the little sockets

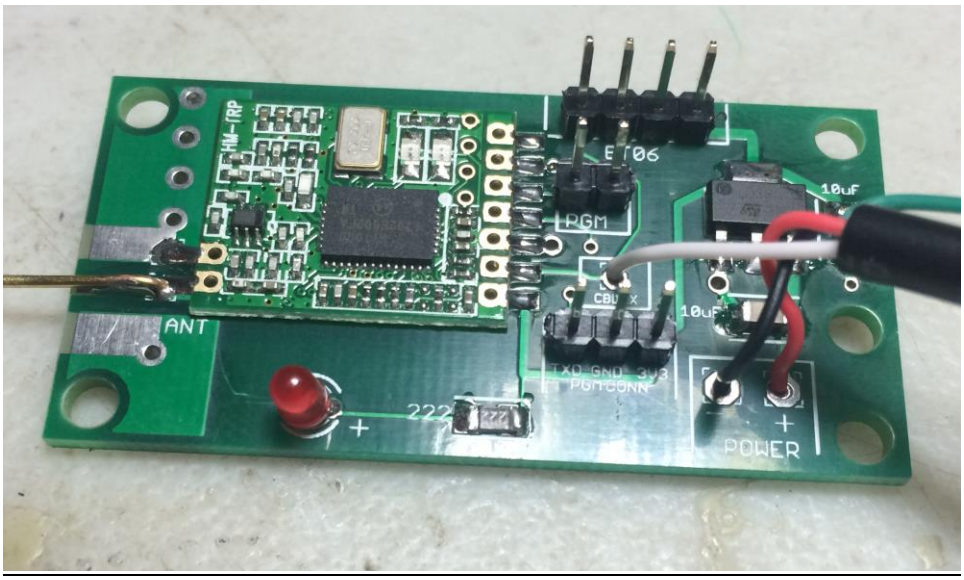
__ Strip 1/8" from the BLACK, RED, and WHITE wires. Tin the bare ends.

__ Clip the GREEN wire off close to the cable jacket (it won't be used)

__ Solder the tinned wires into the pads on the board as follows:

BLACK - "-" pad at the bottom of the board
RED – "+" pad (NOT the pad marked "3.3V" next to the RF module!)
WHITE – RXD (next to the RF module)

__ Using a zip tie through the two holes near the voltage regulator, tightly attach the cable to the board, about ¼" from the end of the cable. Trim the excess zip-tie flush.



Eggfinder RX Bluetooth Option

If you bought the Eggfinder RX with the Bluetooth option, instead of the USB-Serial cable you have a Bluetooth module and a case and hardware to convert it to a handheld Bluetooth receiver. This works very well with Bluetooth-enabled navigation programs such as Rocket Locator for Android.

If you purchased the optional case for Eggfinder RX, completing assembly consists of finishing the case, then mounting the pieces into the case. We recommend that you do this AFTER you have tested the Eggfinder RX with your transmitter… it makes things easier to troubleshoot.

__ Solder the two wires on the battery box to the two pads marked "BATT" on the board. The RED wire needs to go to the pad marked "+", and the BLACK wire goes on the pad marked "-". Double-check this before you proceed!

INSERT PICTURE HERE

At this point, the assembly of your Eggfinder RX board is complete. Time for testing…

Testing Your Eggfinder RX

To test your Eggfinder RX, you will need a working Eggfinder transmitter on the same frequency. If you haven't changed the frequency on your RX yet, or if the Eggfinder transmitter and RX were not shipped on the same non-default frequency, see the appendix at the bottom so you can change it to match your transmitter, then come back here. How you test will depend on whether you have the USB cable option or the Bluetooth option.

Testing with the USB Cable Option

To begin, power up your Eggfinder TX or Mini transmitter. The red LED on the transmitter's RF module should start blinking, about once per second. Plug the USB cable from your Eggfinder RX into a USB port on your laptop/tablet, the RED LED should immediately come on indicating that you have power. After one or two seconds, the GREED LED on the RF module should begin blinking, indicating that it is receiving data from the Eggfinder TX board. If you place the boards close to each other, you will see that the LEDs on the Eggfinder RX and TX boards are in sync with each other.

In order to receive serial data on your laptop/tablet, you may need to load the cable's serial driver onto your laptop. The cable uses a Prolific PL2303TA chip, you can get the driver at:

http://prolificusa.com/pl-2303hx-drivers/

Pick the one that's appropriate for the operating system that you're using.

A good program to test the GPS operation of your Eggfinder is VisualGPS, it's a free Windows program that logs the NMEA data, shows you the approximate location of where it is on a "grid" system (not on a map, though), and shows you the satellite strength. The nice thing about it is that it will automatically pick up the serial port that's being used for the GPS data, so you don't have to figure it out.

Alternatively, you can use a simple serial terminal program (such as Hyperterminal or PuTTY) set to the serial port that's being used by your device. Simply connect to the port, and you should see the serial data feed from the GPS. You need to set the port to 9600 baud, 8 bits, no parity, 1 stop bit, and no handshaking/flow control.

Once you've confirmed that everything is working, you can turn off the Eggfinder transmitter by unplugging the battery; the GREEN LED on the Eggfinder RX module should also immediately stop blinking since no more data is being transmitted. Unplug the USB cable, and you're all done!

Testing with the Bluetooth Option

To test the Bluetooth operation, you'll need an Android device and Bluetooth GPS (a free program). We recommend that you do this outdoors if possible, so you'll get a good GPS fix (it's very fiddly indoors… we've seen it take as long as 30 minutes).

Power on your Eggfinder transmitter, then power on your Eggfinder RX. The red LED on the Eggfinder transmitter's RF module should start blinking about once per second, and the green LED on the RX's RF module should start blinking as well. If the green LED on your Eggfinder RX's RF module isn't blinking, it's probably not on the same frequency/ID as your transmitter; go back and reprogram it to the same frequency/ID as your Eggfinder transmitter.

You should also see that the Bluetooth module's red LED is blinking. That means that it's discoverable but not connected. Turn on your Android device, then go into your Bluetooth settings. Disconnect any device that's connected, then connect to the device "BT04A"… that's your RX's Bluetooth module. You should be prompted for the passkey… it will be either "1234" or "0000" (we've seen both, so if one doesn't work try the other). Your Bluetooth module should show as Connected.

Launch the Bluetooth GPS program, and under the Settings select the connected BT04A device. After it connects, you should see GPS coordinates shortly appearing in your window. If you do not, scroll over to the "Log" window and start the log. You should see data scrolling across the window. If you do, it's working, you just havn't gotten a fix from your transmitter yet. If you do NOT, then something is wrong… check the Troubleshooting section.

At this point, you're done! Now you can go to the Eggfinder TX/RX User's Guide and learn how to track your rocket using your Eggfinder.

Troubleshooting

If your Eggfinder RX 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. Components that are polarized are:

• The LEDs, the long leads should have been inserted in the pad marked "+". Unfortunately, once you clip the leads it may be difficult to tell if you have inserted it correctly.

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 Cabling

Make sure that the RED wire on the USB cable or battery box is on the " +" pad, the BLACK wire is on the " –" pad. If you are using the USB cable, make sure that the WHITE wire is on the "RXD" pad (next to the RF module). If you're using the Bluetooth module, make sure that the colors of the 4-pin cable match the legends for the board and the Bluetooth module; since it's a 4-pin header and cable, if you get the "VCC" side correct then all of the other ones will be, too.

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)

RED PWR LED doesn't come on

- Cable wired incorrectly
  (RED wire should be on big + pad, BLACK should be on - pad)
- Battery wired backwards (for Bluetooth option with battery box)
- Check the polarity of the LED… it may be in backwards
- Bad solder joint on the RED LED or the 2.2K resistor next to it
- Incorrect battery polarity, or bad solder joint on battery connector pads
- Bad solder joint on voltage regulator
- Bad solder joint on capacitors

GREEN LED on the RF MODULE doesn't flash with Eggfinder TX transmitting

- No matching Eggfinder TX board transmitting (are they on the same frequency?)
- Bad solder joint on the RF Module
- Solder bridge on the RF module pads

Can't Receive Data from the USB Serial Cable

- Driver for Prolific PL2303TA chipset not loaded in your device
- Serial port not properly configured
  (should be 9600 baud, 8 bits, 1 stop bit, no parity, no flow control/handshaking)
- Application not using the proper serial port
  (check your device settings for the correct port)
- Cable incorrectly wired… WHITE wire should be on RXD pad next to RF module
- No fix yet… Try it outdoors

Can't Receive Data from the Bluetooth Module

- Incorrect PIN for Bluetooth (should be "1234" or "0000")
- Wrong Bluetooth module paired
  (if you see more than one named "BT04A" try the "other" one)
- Bluetooth cable not connected properly to RX board
- No fix yet…. Try it outdoors

Programming the Frequency on your Eggfinder RX

There are two ways that you can program the frequency on your Eggfinder RX, one was is using the Eggfinder LCD receiver as a programmer. Many people use the Eggfinder RX in conjunction with the Eggfinder LCD receiver as a backup, or to set up a "ground station" for real-time tracking while they use the Eggfinder LCD to navigate to the rocket, so this isn't as crazy an idea as it sounds.

We **strongly** recommend using the LCD receiver to program your Eggfinder RX, because it's guaranteed to maintain compatibility with your other Eggfinder products and to maintain regulatory compliance. However, we realize that not everybody has an Eggfinder LCD receiver too, so there is another option.

The other way is using the Hope RF HM-TRP utility with the data cable or Bluetooth module. With that method, you have to be VERY careful because their utility allows you to change parameters that may result in making your Eggfinder RX incompatible with the Eggfinder transmitters, and/or make cause it to be out of compliance with your local regulatory body.

Programming Using an Eggfinder LCD Receiver

Programming the Eggfinder RX receiver using the LCD receiver as a programmer is identical to the procedure that you use for programming an Eggfinder TX or Mini transmitter. Basically, you use the 3-pin cable that comes with your transmitter to connect the RX to the LCD receiver, then go through the programming screens on the LCD receiver… when you program the frequency on the LCD receiver, it programs the RX too.

1) Make sure both the Eggfinder LCD and the Eggfinder RX are turned OFF.
2) Connect the 3-pin cable to the programming header on the LCD receiver, so that one end is on the "3V3" pin. The "RXD" pin at the end of the header will NOT be connected to the cable.
3) Connect the other end of the 3-pin cable to your Eggfinder RX board on the LCD PGM header, making sure that the "3V3" pin matches up with the "3V3" pin on the Eggfinder LCD header (i.e. they're the same color).
4) Put the jumper across the "PGM" terminals on the Eggfinder RX board.
5) Turn ON the Eggfinder LCD receiver. When you do this, both the red and green LED's on the Eggfinder RX's RF module should come on. If they do no, turn off the Eggfinder LCD receiver and check your connections.
6) Go through the programming screens and program the frequency/ID of the Eggfinder LCD receiver. When you get the "Programming OK" screen at the end you're done… your Eggfinder RX is now programmed to the same frequency/ID as your Eggfinder LCD receiver.
7) Turn the Eggfinder LCD receiver off, disconnect the cable, and remove the PGM jumper on the Eggfinder RX board.
8) To check it, power on your Eggfinder RX receiver, then power on your Eggfinder transmitter (on the same frequency/ID as your RX). As the transmitter sends data, you should see the green LED on the RX's RF module blink. If not, go back and reprogram it… it's not right.

Programming Using the Hope RF HM-TRP Config GUI Utility

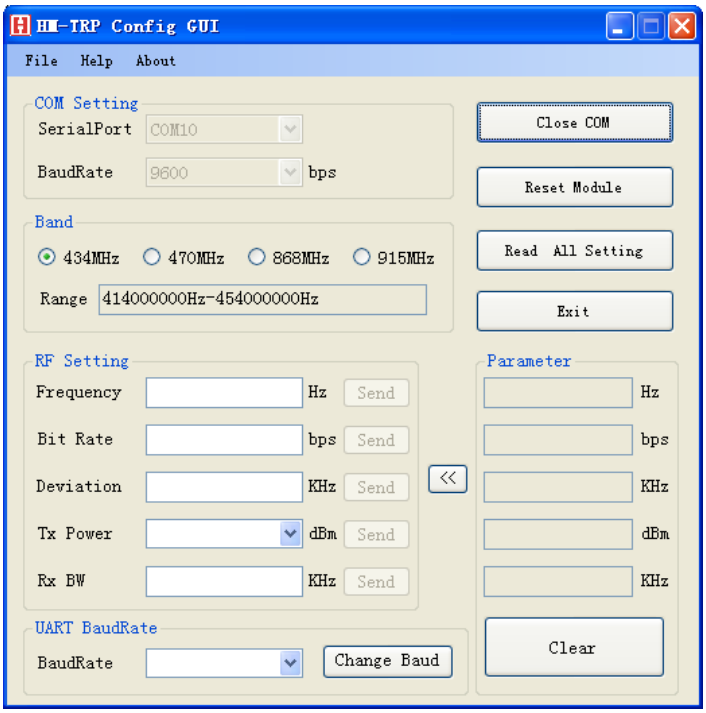
Note: Follow these instructions EXACTLY! Any deviation from them can render your Eggfinder RX incapable of connecting to your Eggfinder transmitter, or can possibly "brick" the communication port leaving it unusable.

1) Download the Hope RF HM-TRP configuration program from:

   http://www.hoperf.com/upload/rf/HM-TRP%20Setting%20GUI.zip

   Unzip the file into a suitable folder on your PC.

2) Put a jumper across the PGM pins on your Eggfinder RX board.
3) Note which COM port your Eggfinder RX's USB cable is on, or if you're using the Bluetooth option the COM port that's used by your Eggtimer data cable (they should be the same… typically they're COM2 or COM3).
4) If you're using the USB cable option on your RX, connect the unused GREEN wire to the single pin marked RXD on the RX's board.
5) If you're using the Bluetooth option on your RX, connect the Eggtimer data cable to the LCD PGM header and the single pin marked RXD as follows:
   RED – DO NOT CONNECT!
   BLACK - GND on LCD PGM header
   WHITE – TXD on LCD PGM header
   GREEN – RXD pin
6) If you have the USB cable option on your RX, plug it into the USB port on your PC. If you're using the Bluetooth option and you're programming it with the Eggtimer USB data cable, plug the cable into a USB port, AND turn on your Eggfinder RX.
7) Launch the Hope RF utility….



8) Under the "SerialPort" port box, select the COM port of your cable. If it's not listed then you need to go back and check your COM port selection.
9) Under BaudRate, select "9600".
10) Click on the "Read All Setting" button. The currently selected parameters should be brought into the "Parameter" boxes on the right, and you should see a little box pop up that says "Read OK!". If it says "Read Fail!" then your cabling is probably not correct… close everything up and go check it.
11) Consult the table at the end of this procedure to find the frequency setting that corresponds to the Frequency/ID that you want to use. Write it down.

> **Note: This utility doesn't know about your regulatory requirements, so it is possible to set your Eggfinder RX receiver to a frequency outside of your legal band. We cannot be responsible for your actions… use ONLY the frequencies that are listed in the table. DO NOT change anything else in this utility beside the frequency as listed in the table below.**

12) Click on the radio button under Band for the band that corresponds to your regulatory requirement. In general, it will be 915MHz unless you're in the UK/EU region, then it will be 868 MHz.
13) Enter the frequency in the "Frequency" box that corresponds to the value in the table. For example, if you want "921 ID 2", you'll ender "921500000". The box will turn green if the frequency is within the regulatory band.
14) Double-check the frequency value, then click the "Send" button next to it. You will see "Send OK!" if it was successfully programmed; if the value cannot be validated, it will read "Send Fail!".
15) Click on the "Read All Setting" button again. The frequency in the "Parameter" listings on the right should be the new value. If not, do #13 and #14 again.
16) Exit out of the Hope RF utility, and power off your Eggfinder RX. Remove the jumper from the PGM pins, and remove the programming cable (or the green pin to RXD if you have the USB cable option).
17) To check it, power on your Eggfinder RX receiver, then power on your Eggfinder transmitter (on the same frequency/ID as your RX). As the transmitter sends data, you should see the green LED on the RX's RF module blink. If not, go back and reprogram it… it's not right.

Eggfinder Frequency/ID Table

Frequency	ID	Hope RF Frequency	Regulatory
909	0	909000000	North America
909	1	909250000	North America
909	2	909500000	North America
909	3	909750000	North America
909	4	910000000	North America
909	5	910250000	North America
909	6	910500000	North America
909	7	910750000	North America
911	0	911000000	North America
911	1	911250000	North America
911	2	911500000	North America
911	3	911750000	North America
911	4	912000000	North America
911	5	912250000	North America
911	6	912500000	North America
911	7	912750000	North America
913	0	913000000	North America
913	1	913250000	North America
913	2	913500000	North America
913	3	913750000	North America
913	4	914000000	North America
913	5	914250000	North America
913	6	914500000	North America
913	7	914750000	North America
915	**0**	**915000000**	**North America (Default)**
915	1	915250000	North America
915	2	915500000	North America
915	3	915750000	North America
915	4	916000000	North America
915	5	916250000	North America
915	6	916500000	North America
915	7	916750000	North America
917	0	917000000	North America
917	1	917250000	North America
917	2	917500000	North America
917	3	917750000	North America
917	4	918000000	North America
917	5	918250000	North America
917	6	918500000	North America

917	7	918750000	North America
919	0	919000000	North America, AUS, NZ
919	1	919250000	North America, AUS, NZ
919	2	919500000	North America, AUS, NZ
919	3	919750000	North America, AUS, NZ
919	4	920000000	North America, AUS, NZ
919	5	920250000	North America, AUS, NZ
919	6	920500000	North America, AUS, NZ
919	7	920750000	North America, AUS, NZ
921	**0**	**921000000**	**North America, AUS, NZ (AUS/NZ Default)**
921	1	921250000	North America, AUS, NZ
921	2	921500000	North America, AUS, NZ
921	3	921750000	North America, AUS, NZ
921	4	922000000	North America, AUS, NZ
921	5	922250000	North America, AUS, NZ
921	6	922500000	North America, AUS, NZ
921	7	922750000	North America, AUS, NZ
923	0	923000000	North America, AUS, NZ
923	1	923250000	North America, AUS, NZ
923	2	923500000	North America, AUS, NZ
923	3	923750000	North America, AUS, NZ
923	4	924000000	North America, AUS, NZ
923	5	924250000	North America, AUS, NZ
923	6	924500000	North America, AUS, NZ
923	7	924750000	North America, AUS, NZ
925	0	925000000	North America, AUS, NZ
925	1	925250000	North America, AUS, NZ
925	2	925500000	North America, AUS, NZ
925	3	925750000	North America, AUS, NZ
925	4	926000000	North America, AUS, NZ
925	5	926250000	North America, AUS, NZ
925	6	926500000	North America, AUS, NZ
925	7	926750000	North America, AUS, NZ
869.425	n/a	869425000	EU/UK
869.525	**n/a**	**869525000**	**EU/UK (Default)**
869.625	n/a	869625000	EU/UK

Note: 915/0 (915000000) is the default as-shipped frequency for North America units, 921/0 (921000000) is the default frequency for AUS/NZ units, 869.525 (869525000) is the default frequency for EU/UK units.

Building the Case for the Bluetooth Option

If you purchased the case/battery box/hardware kit for the Bluetooth option, you have a nice handheld option to go with your Eggfinder RX. This makes it a lot easier to use out in the field, because you don't have to worry about messing up the wires.

First things first, make sure your case kit contains the following parts:

	Qty	Description
__	1	Case with screws
__	1	3xAA battery box with switch
__	1	Hardware kit (4x4-40 x ¾" screws, 4x #4 Nylock nuts)
__	1	4" piece of 1/8" i.d. rubber tubing

Without further ado, let's get started finishing the case and mounting your Eggfinder RX. As usual, each step has a check-off box, be sure to read through the instructions first before starting so you know what you'll be doing.

___ Download the mounting template from the Eggtimer Rocketry web site (www.EggtimerRocketry.com, under "Eggfinder Support/Documentation"). Print it and cut it out.

___ With clear Scotch tape, mount the template to the outside of the case lid so that it goes horizontally (long side SIDEWAYS), with the antenna side pointing up. The top of the template should mount ¼" from the top edge of the case lid. You can mount the module on the left side or the right side, depending on your preference. If you want it on the left side, mount the template so that it's ½" from the left edge of the case top. If you want it on the right side, mount the template so that it's ½" from the right edge of the case top.

___ With a 1/8" drill bit, drill out the four holes in the corners. With a 5/32" drill bit, drill the larger hole for the red power LED, and the other larger hole so you can see the LED's on the RF module (it's very helpful to see if you're communicating with your transmitter). Remove the template.

___ Insert the four #4 x ¾" screws through the outside of the case top. Temporarily put a piece of masking tape over the screws so they won't fall out when you turn it over.

___ Cut the rubber tubing into four pieces ¼" long and four pieces 1/8" long.

___ Turn the case lid over and set it on the table with the screws facing up. Slide a ¼" piece of rubber tubing over each screw. Slide the RX board over the screws with the antenna

(or RP-SMA connector) facing up. Slide a 1/8" piece of tubing over the screws against the back of the RX board, then lightly thread a nylon locking nut over each screw.

___ Remove the masking tape over the screw heads, then tighten the screws. You don't need to use gorilla force, just enough to "set" the board so it won't move.

___ Set the lid against the case bottom, and mark where the antenna or RP-SMA connector comes against the edge of the lid. With a small coping saw or razor saw, notch the edge of the case for the antenna or connector. If you're using the wire antenna, you need to notch about 3/8" deep by about ¼" wide; if you're using the RP-SMA connector, you'll need to notch about 1/2" deep and about 3/4" wide.

___ Mark a hole in the bottom-outside of the case bottom, xxx" from the bottom and xxx" from the left edge. Drill a 1/8" pilot hole there. Then, enlarge it using a ½" spade bit.

___ Cut two pieces of double-sided servo tape about 1 ½" long. Stick them on the side of the battery box with the switch, but do NOT block the switch! Peel off the backing, the carefully position the battery box on the inside of the case bottom so that the switch is centered in the ½" hole that you drilled earlier. Press the box in firmly.

___ If your Bluetooth module is not connected, do so now… make sure that the same color on the cable is on the "3V3" pin on both the RX board and the Bluetooth module.

___ Cut a 1" piece of double-sided servo tape, and stick it to the bottom of the Bluetooth module. Stick the Bluetooth module to the left side of the case bottom, centered.

___ Put three AA alkaline batteries in your battery box, close up the battery box lid, and turn it on. You should see the red LED on the RX board come on, and the red LED on the Bluetooth module should start blinking ("ready for pairing"). Turn it off and screw on the case top… you're done!