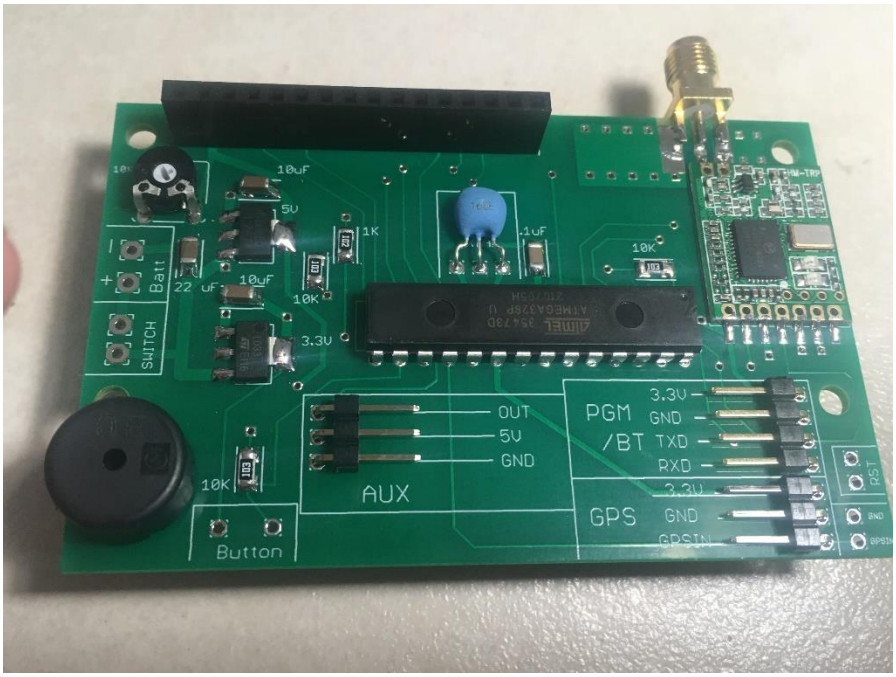
Eggfinder LCD
Users Manual

Rev 2.05a



California Proposition 65 Warning

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

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

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

The MSDS can be found at

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

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

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

Important Regulatory Information

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

It is intended to be used ONLY for educational and experimental use in Class II/III amateur High Power Rockets which are classified as aircraft by the Federal Aircraft Administration (CFR 14 §101.25), and which must by FAA and NFPA regulations be operated at least 1,500' away from any populated buildings. Although unlikely, this device may cause interference with consumer devices that run on the unlicensed 902-928 MHz band, and therefore must not be used in residential areas.

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

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

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

Important Links:

FCC Part 15 (governing unlicensed intentional emitters)
http://www.ecfr.gov/cgi-bin/text-idx?SID=adb12f74b498e43ec453f7899e9ef0fd&node=47:1.0.1.1.16&rgn=div5

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

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Before You Start…

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

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

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

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

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

The Eggfinder LCD receiver can be used with any of the Eggtimer Rocketry telemetry products: The Eggfinder TX and Mini GPS tracking transmitters, the Eggtimer TRS and Quasar combination dual-output altimeter and GPS tracking transmitters, and the Eggtimer Telemetry Module for real-time telemetry from Eggtimer altimeters. Depending on the device, it may display GPS-derived coordinate data and navigation directions, and when used with altimeters it can display real-time altitude, velocity, channel status, flight phase status, and other flight data.

There are also a few options available for the Eggfinder LCD receiver to enhance your telemetry and or tracking experience…

Eggfinder LCD-GPS Module

The LCD-GPS Module adds internal GPS capability to the Eggfinder LCD receiver. It makes the LCD receiver a single-device tracking solution… you don't need a phone/tablet/PC or anything else on the ground to retrieve your rocket. In addition to the GPS coordinates, you also get the distance to your rocket, its compass point in relation to your, and an arrow and bearing to your rocket. Follow the arrow and it will take you right to your rocket… it's about as easy as it could be.

Eggtimer Voice Module

The Eggtimer Voice Module adds a spoken voice to your telemetry and GPS tracking functions. If you're using it for GPS tracking, it will "tell" you the compass point and distance when you're on the Compass screen. On the Navigation screen, it will speak your distance and the bearing to your rocket. If you're driving to your rocket on one of those long recoveries that seem to happen often with HPR flights, you can keep your eye on where you're going, and not have to look at the LCD display.

If you're using the LCD receiver for telemetry with the Eggtimer Telemetry Module or an Eggtimer TRS or Quasar, it will speak your real-time altitude during flight, along with deployment events and your apogee. You can keep an eye on your rocket during flight and know when deployments happen, and how high it went… very cool!

Bluetooth Module

Some people like to use third-party graphical applications with their Android device to get a real-time map/track of their flight. The Eggfinder LCD receiver supports the addition of a BT06-type Bluetooth module, which can be used with Android software such as GPS Rocket Locator or Rocket Track to obtain a track. You can have the best of both worlds… the GPS coordinates (and your distance/bearing if you have the LCD-GPS Module), along with a real-time track. If you lose your Bluetooth connection, you still have the data on the LCD display, so you haven't lost your rocket. It's good to have a backup…

Meet the Eggfinder LCD Receiver

The Eggfinder LCD receiver receives the data from your Eggfinder GPS transmitter, and decodes the GPS data into readable (and usable) form. You get the GPS coordinates, the GPS altitude, the number of satellites in view, and a timer that shows how long it's been since your last valid fix (which ideally should be no more than a few seconds). With the addition of the LCD-GPS module, you can also get the compass heading of your rocket, its distance from you, and an arrow and bearing that point to your rocket.

If you are using the Eggfinder LCD with your Eggtimer Telemetry Module, it will show you whatever telemetry your altimeter can provide… typically real-time altititude, velocity, time of flight, and milestone data such as apogee and maximum velocity. You can also get status information such as deployment channel status, battery voltage, and temperature.

With the optional Eggfinder Voice Module, your rocket's altitude and status will be called out with a synthesized voice, and if you are using the Eggfinder LCD-GPS module to track your rocket it will call out the direction and distance (i.e. "23 degrees left, 680 feet"). If you're using your Eggfinder LCD receiver with an Eggtimer Telemetry Module, it will call out your real-time altitude during flight (i.e. "Twenty Seven Hundred Feet") at programmed intervals.

Once you familiarize yourself with the display and its options, it's pretty easy to use… there's only one button. You change options/screens by tapping the button, and you select them by holding the button for 3 seconds or more. Easy peasy.

You can also "pair" your Eggfinder LCD receiver to an Eggfinder TX, Mini, or Eggtimer Telemetry module so that it changes the frequency/ID settings on both of them at the same time.

Configuring Your Eggfinder LCD

You can configure the following parameters on your Eggfinder LCD:

- Device Type – Configures the Eggfinder LCD specifically for the transmitting device
- Display Units: Altitude and Distance can be displayed in either Feet or Meters.
- GPS Coordinates: Can be displayed in Degrees, Degrees:Minutes, or Degrees:Minutes:Seconds to match your navigation device/app.
- Frequency: Can be set to any Eggfinder frequency (903-925 MHz by 2 MHz)
- ID Code: Up to 8 codes can be used (Note: The original Eggfinder TX version B4 boards only supports ID Code zero).

Note: Be sure to turn OFF your transmitter after you program your Eggfinder LCD receiver.

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

```
Status:  915 0
G:D  U:F  8.0V
```

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

```
Programming Mode
Receiver Config
```

This menu configures the following parameters:

Device
Units
Voice Period
GPS Display Units (for GPS-enabled devices only)

If you tap the button, you will see the next programming menu:

```
Programming Mode
Frequency/ID
```

This menu will allow you to set the Frequency and ID (if supported) of your LCD receiver.

And if you tap it again, you'll get

```
Programming Mode
Both Menus
```

This selects both menus… simple enough.

To select the menu, hold the button down for about 3 seconds, then release it.

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

When the final screen has been saved, you will see

```
OK
Reset to Continue
```

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

Configuration Screens:

Device Configuration:

```
Programming Mode
Dev:  TX/Mini
```

Possible Values:
TX/Mini – (the default) Display coordinate/compass/navigation data
Quasar – Select for an Eggtimer Quasar GPS/altimeter
TRS – Select for an Eggtimer TRS GPS/altimeter, uses the "pairing" screen (see below)
Quark/EZ-DD – Select for an Eggtimer Quark or the Eggtimer EZ-DD altimeter with the Eggtimer Telemetry Module
Quantum/ION – Select for an Eggtimer Quantum or ION with the Eggtimer Telemetry Module
Proton – Select for an Eggtimer Proton with the Eggtimer Telemetry Module

Units Configuration:

```
Programming Mode
  Units: Feet
```

Possible Values:
Feet – Display GPS Altitude and distances in FEET
Meters – Display GPS Altitude and distances in METERS

Voice Period:

```
Programming Mode
Voice Period:4
```

Possible Values:
2-10 – (4 is the default)
The number of seconds between spoken altitude readings, if you have the Eggfinder Voice Module. The default value of 4 should be good for most flights, for model rocket flights under 1,000' you may want to turn it down to 2, for very high flights (over 10,000') you may want to increase this value if it appears to be too chatty.

GPS Coordinates Configuration:
(skipped for Eggtimer Telemetry Module use)

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

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

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

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

Frequency Configuration:

```
Programming Mode
Freq:  915
```

Possible Values:
903-925, by 2's (903, 905, etc…)
Note: This will vary by region… see the International Notes at the end of this guide.

ID Configuration:

```
Programming Mode
ID:  0
```

Possible Values:
0-7

Note: Original Eggfinder TX transmitters version B4 and below (cir. 2014) do not support frequency programming, and were shipped with an ID of zero. If you have one of these, set your LCD's frequency to whatever was shipped with the TX, and set the ID value to zero. All Eggtimer TRS's, Eggfinder Mini's, and Eggfinder TX transmitters B6 and above support both frequency and ID configuration, as do all versions of the Eggtimer Telemetry Module.

To program the frequency/ID on an Eggfinder TX or Mini GPS transmitter, or an Eggtimer telemetry module, you will use the 3-pin pairing cable that's included with those devices. Connection instructions are in the User's Guide for those devices. When you program your LCD receiver when paired to those devices, it will also program the device at the same time, so they will have matching frequency/ID's. Note that paired devices MUST be on the same band… you cannot program a 70cm Ham device with a 900 MHz LCD receiver, or a 900 MHz device with a 70cm Ham LCD receiver.

The Eggfinder Power-On Messages

When you first turn on your Eggfinder LCD receiver, you will see a screen that shows you the current version of the firmware:

```
Eggfinder LCD
Ver 2.05a
```

You will then see a screen that shows you the current frequency/ID, the GPS coordinate units , the distance units, and the battery voltage.

```
Status:  915 0
G:D  U:F  8.0V
```

The data elements are:

915 0 : Frequency/ID (some bands do not support the ID setting)
G:D : GPS coordinate (D: Degrees, D:M : Degrees/Minutes, D:M:S : Degrees/Minutes/Seconds)
U:F : Units for distance (F: Feet, M: Meters0
8.0V : Battery voltage

If you are using the internal LCD-GPS Module in your receiver AND you have the Device parameters set to a transmitter that sends out GPS data (TX/Mini/TRS/Quasar), you will see this screen… (if you do NOT have the LCD-GPS Module, then you can skip this section.)

```
LCD-GPS Found
Acquiring Fix..
```

The display will remain on this screen until a GPS fix of 4+ satellites is acquired for the internal LCD-GPS module. Generally, this will take under a minute assuming that you're outdoors. Note that if you are testing, you may not be able to get a fix indoors… we recommend that you take your unit outdoors for testing.

After enough satellites have been found to acquire a fix, you'll see

```
GPS Fix…
```

You'll see that screen for several seconds, then you'll see

```
Waiting for
Rocket GPS Fix
```

At this point, it's waiting for your transmitter… read on.

Using Your Eggfinder LCD with an Eggfinder GPS-enabledTransmitter

Note: This applies to using the Eggfinder LCD receiver with the Eggfinder TX or Eggfinder Mini GPS transmitters, and also the Eggtimer Quasar. Instructions for using the Eggfinder LCD receiver with the Eggtimer TRS Flight Computer are located in the Eggtimer TRS User's Guide… it's a little bit different. For instructions on using the Eggfinder LCD receiver with Eggtimer altimeters and the Eggtimer Telemetry Module, please skip to the section titled "Using Your Eggfinder LCD with the Eggtimer Telemetry Module".

Also, if you have the Eggfinder LCD-GPS Module option for your Eggfinder LCD receiver, please read the User's Guide for it after you have read the Eggfinder LCD User's Guide, it covers the additional navigation capabilities you get with that option.

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

KEEP THE ANTENNA AWAY FROM ANYTHING METALLIC!

Enough said…

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

A typical Eggfinder LCD Coordinate display looks like this:

```
33.12345 s8
-116.64738 1326
```

The first number on the top (33.12345) is the Latitude, the number of degrees above the equator (or below the equator, if negative). The ranges is 0-89.99999. It is taken out to 5 decimal points, accurate to about 3 feet. Note that you can also display the coordinates in Degrees:Minutes, or Degrees:Minutes:Seconds. We recommend that you use the Degrees setting if you can because it's the most accurate, but the others are available if the application on your handheld device requires one of them.

The second number on the top (s8) is the number of satellites that are being used in the GPS coordinate fix, from zero to 09. In this example, it's "8". The "s" lets you know that this field is being used for the number of satellites. This field is also used for a Fix Timer that lets you know if you've lost signal from your transmitter; more on that later.

On the second line, the first number **(-116.64738)** shows the Longitude, the number of degrees East of the Prime Meridian (or West, if the number is negative). The range is 0-179.99999. It is taken out to 5 decimal positions, accurate to about 3 feet. You can also display this number in Degrees:Minutes or Degrees:Minutes:Seconds if you select those display options.

Finally, the number at the end of the second line **(1326)** is the last reported GPS altitude. The default units are Feet, but you can also configure it to display in Meters. Now, it would be very nice if this number was updated in real-time during your flight so you could use it to find out your apogee and how quickly it's coming down, but unfortunately that's not the case. GPS is designed primarily for lateral/surface navigation in relatively slow-moving vehicles, so unless you have sophisticated GPS equipment beyond the capabilities of consumer-grade GPS units it's not going to do a very good job of resolving altitude in real-time for something fast-moving like a rocket. It DOES work well if the GPS unit doesn't move vertically very much, so you WILL get a "base" altitude while the rocket sits on the pad, and you should get a reasonably good reading while the rocket is coming down under parachutes, particularly with higher flights in which the rocket has a lot of time to descend so the GPS receiver has time to lock onto the satellites.

Now, you may be wondering what good this number is if it's not terribly accurate. We have found that, as inaccurate as it is, it IS a good indication of whether your rocket has landed or not, as long as you're in range. In general, you will pick up the altitude at about 600' AGL or so, and you'll be able to see it drop until it either stabilizes or you lose the signal (typically somewhere below 100' AGL unobstructed assuming you're still within 3 KM range). Clear-view ground range is typically about ½ KM, more with an external antenna, so if you get a fix and it's at or near your launch ASL altitude then you can be sure it's on the ground even if you can't see it. You will also find that the altitude number is more likely to be accurate at higher altitudes, typically above 10,000' AGL.

About those Beeps… and the Fix Timer Too

The Eggfinder LCD receiver has a beeper that is used to provide status information on your transmitter. Normally, you will hear a short beep every second or so when your LCD receiver is receiving valid GPS data from the transmitter. However, if you lose the GPS signal, which is normal right at launch due to velocity/acceleration limits on commercial GPS chips, you may hear (or not hear…) other sounds. This is what they mean:

Beep Summary

One or Two Short Beeps Every Second: Receiver is getting valid data from the transmitter

Two short beep-beeps every 3 seconds: Receiver is getting data from the transmitter, but it's not valid GPS fix data

No sound: No valid transmission is being received from the transmitter. Note that this is a normal occurrence for a short period of time immediately after launch.

The Eggfinder LCD keeps a Fix Timer of how long it's been since you received a valid fix from your transmitter, it's not unusual in flight to lose the signal right at launch or for a second or two in flight during certain events (such as an energetic parachute deployment). In addition to the beeps, the Coordinate and Compass displays will show you how long it's been since the last valid fix, displayed in the Satellites in View field with a slightly different format.

They look like this:

!nn – No valid Fix for nn seconds (i.e. "!17" for 17 seconds since a valid fix)
>99 – No valid fix for greater than 99 seconds (you'll almost certainly see this after landing)

So, in our example, the Coordinate display would look like this if you have lost the fix for 17 seconds. Note that the GPS coordinates and altitude are the last values received.

```
33.12345 !17
-116.64738 1326
```

Again, it is normal to lose the fix for short periods of time during a rocketry flight, the display will be updated as soon as a valid fix is received. Because of this, the Satellite in View display won't switch over to the Fix Timer display until you've lost a fix for 5 seconds in the Coordinate screen, or 10 seconds for the Compass screen (it's longer in the Compass screen because there's a short time-out while the internal LCD-GPS Module is read, if you have one).

After landing, you will probably lose the fix, particularly with the 900 MHz units since that band doesn't propagate well over the ground… generally the ground range is a few hundred yards, maybe ¼ mile at best over flat terrain. The last coordinate displayed should be very close to your landing spot. You'll see the ">99" Fix Timer display, but that's irrelevant in this case.

Using the Eggfinder LCD Data

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

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

Note that if you are using the LCD-GPS Module with your LCD receiver, you do NOT need to use a phone for navigation… that function is provided in the Navigation display on your LCD

receiver. See the Eggfinder LCD-GPS Module guides for specifics on the display… if you do NOT have the LCD-GPS Module, you won't see the Navigation display.

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

Coordinate Memory Save

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

This allows you to turn it off and save battery life if you find that the rocket landed some distance from you and it's going to take awhile to get to it. To recall the last saved coordinate, power-cycle the LCD receiver, and at the "Waiting for Fix" display hold the button down for 3 seconds then release it. The last received coordinates will display, along with the ">99" in the Fix Timer field that lets you know that it's "stale" data. If you receive a valid fix while the saved data is being displayed, the LCD receiver will start receiving packets normally, displaying the real-time coordinates, Satellites in View, etc., and of course it will save every 10th fix after that

Navigating with the Compass Screen

In addition to computing the latitude & longitude from the GPS, it can also calculate the compass heading and distance from a fixed point that you "set". If you aren't using the LCD-GPS module, it can't give you that information from where you "are", but it can tell you what those values are from a starting point… typically, this would be your launch pad. Note: If you have the LCD-GPS module, please refer to the LCD-GPS Module User's Guide for differences between this screen and the one with the GPS module installed.

To display the Compass screen, hit the button. You will see something that looks like this

```
COMPASS:216    s8
D/F:1110     1326
```

The top number on the left is the compass point from the "home" point, which will be either the locatin from where you first pressed the button if you do not have the LCD-GPS Module, or your actual real-time location if you do have the LCD-GPS Module.

The bottom number on the left is the rocket's distance from the "home" point, to the nearest 10'. If you configured your LCD to display in meters, you will see "D/M:" instead, to let you know that the reading is in meters.

The “s8” on the upper right corner is the Satellites in View, which we have spoken about previously. It will display the Fix Timer here instead if you’ve lost the fix for 10 seconds or greater.

The number on the bottom-right is your last altitude, similar to that on the Coordinate screen. All caveats apply… if it’s from your GPS transmitter then it’s going to be an ASL number and you can expect it to lag a bit, if it’s from an Eggtimer TRS or Quasar GPS/altimeter then it’s the AGL altitude and is likely to be pretty accurate.

Many times, especially if your rocket goes well out of sight, upper level winds can take your rocket in a different direction than what the winds on the ground may be. This screen is great for tracking your rocket in the air during flight, it will tell you how far away it is, and what compass direction it’s at, so you know where to look, or at least which way it’s going.

If you have the LCD-GPS module, the compass point is relative to your location, since it “knows” where you are. If you do not have the LCD-GPS module, it’s in relation to a “home point” that you set the first time that you enter the Compass screen… read on.

The first time that you press the button sets the home point, so you should not press the button until you reach the place that you want the compass and distance calculated from. For example, if you want to set the home point as the launcher, wait until your rocket is on the rod/rail before you press the button to enter the Compass screen. If you want the home point to be your work table, press the button there. If you want the home point to be a particular observation point, press it when you get there. You get the idea…

The Navigation Screen

If you have the LCD-GPS Module, there is another screen that you will see if you press the button from the Compass screen. It displays navigation information, that you can use after your rocket lands

```
L:12 ↑↑↑  !63
Dist:1110
```

The top number is how many degrees left or right you need to go from the direction that you are moving to get to your rocket; it is not accurate until you start moving. We recommend that you use the Compass screen to get the initial direction to start going, and then use this screen from there. Note that in the Navigation screen the LCD-GPS has priority over the received data from your rocket’s transmitter, since the rocket is probably not going to be moving much compared to you. The degrees/arrows work best when you are moving in a relatively straight direction… if you move in a circular or zig-zag pattern it’s going to have a hard time determining which way you are moving and the degrees/arrows are likely to be thrown off by that.

The arrows are a quick directional indication… there are 8 quadrants, if you follow the arrow it will more or less take you to your rocket… using the L/R number will take you right to it.

The “DIST” figure is the distance to your rocket… same as the Compass screen.

Note that the direction and distance are from your current location to the last received GPS location from the transmitter… it should be valid, or close to it. This is updated every 5 seconds based on your current location, however you need to be moving for it to update, AND you should be moving in a straight line. If you’re not, then the vector that’s generated every 5 seconds is not going to be valid, and you’re going to get a good direction reading. If you think you’re not moving in the right direction, keep going straight for about 15 seconds or so… then the direction vector should be valid.

The number on the upper right is either the Satellites in View (precede with an “s”… i.e. “s8” for 8 satellites), or (more likely) the Fix Timer, since you normally go into the Navigation screen after landing where you probably don’t have a signal from your GPS transmitter. In this example, it’s been 63 seconds since your last fix.

You’re likely to see some large Fix Timer values while you retrieve your rocket, since you probably won’t receive a signal from your GPS transmitter on the ground until you get fairly close to it (within a few hundred yards). Once you do get close enough, you should hear the familiar “beeping” sounds that mean that you’re picking up a signal, and the Satellites in View display should show instead of the Fix Timer.

For more information, see the Eggfinder LCD-GPS User’s Guide.

Using Your Eggfinder LCD with the Eggtimer Telemetry Module

In addition to decoding the GPS tracking data from an Eggfinder GPS transmitter, the Eggfinder LCD receiver can also decode the data from an Eggtimer Telemetry Module connected to a supported altimeter, giving you real-time flight information. Note that you can not use your Eggfinder LCD to receive BOTH GPS tracking data and telemetry data at the same time; you have to configure it for the transmitting device that you're going to be using. If you want to use an Eggfinder GPS transmitter and an Eggtimer Telemetry Module in the same rocket, you will need a separate LCD receiver paired to each transmitter, and we recommend that you set the Eggfinder GPS transmitter and the Eggtimer Telemetry Module to different frequency/ID channels.

Telemetry data is sent out by the altimeter every two seconds. The information that you receive on the display depends on the altimeter… here is a matrix of what you can get from each altimeter with an Eggtimer Telemetry Module connected:

	Quark (Pre-D3)	Quark or EZ-DD	Quantum or ION	Proton
Realtime Altitude	X	X	X	X
Realtime Velocity			X	X
Realtime Accleration				X
Deployment Status		X	X	X
Channels Enabled/Disabled			X	X
Elapsed Flight Time			X	X
Flight Phase		X	X	X
Apogee		X	X	X
Max Velocity			X	X
Temperature			X	X
Battery Voltage			X	X

In general, you'll get real-time altitude, flight status, apogee, and deployment channel status from all of the altimeters, with the Quantum, ION, Quasar, and Proton you'll also get real-time and maximum velocity.

Details on the specific displays for the Eggtimer Telemetry Module are found in the Eggtimer Telemetry Module Assembly and Users Guide… please refer to that document for details.

Optional Hardware Mods

Using a BT-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 BT-06 Bluetooth module. Note that this only works with an Android device… Apple does not provide remote GPS/Bluetooth Serial support.

First, you'll need to get a BT-06 Bluetooth module. We sell them, and they're guaranteed to work with your Eggfinder LCD receiver… plus they come with the required 4-pin cable to connect it.

Now that you got your BT-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 BT-06 module.

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

3.3V	_____
GND	_____
TXD	_____
RXD	_____

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

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

__ Bend the cable back against the bottom of the board, then underneath itself in an "S" curve. Plug the cable into the 4-pin connector on the board, making sure that the cable isn't twisted and that the cable pins match up with the pins on the BT-06 module (i.e. top pin from the BT-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 BT-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 BT-06. The pairing code for all BT-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 GPS transmitter, then turn on the Eggfinder LCD receiver.

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

__ Once it's paired, you should start seeing the light on the BT-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. We recommend GPS Rocket Locator or Rocket Track; they're free and do 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 work fine, as do push-on push-off switches). Simply wire the terminals of the switch to the two pads near the top of the LCD module header labeled "BL". Mount the switch in the case appropriately. Turn on the Eggfinder LCD, flip the switch, and the backlight should come on. Note that the backlight draws a fair amount of power, so you should make sure it's turned off when you don't need it.

Installing the Eggfinder Voice Module

The optional Eggfinder Voice Module adds a spoken audio capability to your Eggfinder LCD screens. This allows you to concentrate on your rocket instead of having to look at the screen… if you're like us, the second you take your eyes off the rocket you've lost it. Having the EVM call out your rocket's compass direction/distance, the direction you have to go, or the altimeter telemetry data is a big help in knowing what your rocket is doing and where it is.

The actual data that is called out is dependent on the transmitting device, and the screen that you're in. For specific installation and use instructions, see the Eggfinder Voice Module Assembly and User's Guide, it will tell you which information is called out for the various Eggtimer altimeter models.

Eggfinder LCD Quick Start

Coordinate Screen (GPS Tracking default)

```
33.12345 s8
-116.64738 1326
```

Or…

```
33.12345 !17
-116.64738 1326
```

33.12345 – Latitude
-116.64738 – Longitude
s8 – Number of satellites in view
!17 – Fix Timer (time since last valid GPS fix was received)
1326 – GPS ASL (above sea level) altitude… best effort, accuracy is dependent on quality of fix. If you have an Eggtimer TRS or Quasar GPS/altimeter, this will be the AGL (above ground level) altitude of your rocket.

Compass Screen

Press the Button to enter the Compass screen from the Coordinate screen.

The FIRST time that you press the Button, it sets the "home" point for calculating the data (unless you have the LCD-GPS module… then it's from wherever you are, in real-time)

```
COMPASS:246    s8
D/F:1293    1326
```

Or

```
COMPASS:246    !17
D/F:1293     1326
```

Compass:246 – Compass direction of the rocket **from your home point**
If you do NOT have the LCD-GPS Module it's where you were when you pressed the button
If you DO have the LCD-GPS Module it's where you are **now**
D/F:1293 – Downrange distance of the rocket **from your LCD receiver**
You'll see "D/F:" if you have selected Feet as your units,
"D/M:" if you have selected Meters as y our units
s8 – Number of satellites in view
!17 – Fix Timer (time since last valid GPS fix was received)

Navigation Screen (with LCD-GPS Module Only)

Press the button to enter the Navigation screen from the Compass screen. Note that if you do not have the LCD-GPS module, you will not see this screen; it will cycle to the Coordinate screen instead.

Or

L:12 – The direction and number of degrees to your rocket… L12 is "Left 12 degrees"
Arrows – Points to the octant that you need to go to get your rocket
D/F:1293 – Downrange distance of the rocket **from your LCD receiver**
You'll see "D/F:" if you have selected Feet as your units,
"D/M:" if you have selected Meters as y our units
s8 – Number of satellites in view
!17 – Fix Timer (time since last valid GPS fix was received)

Note that the L/R and the arrows are in relation to the direction that you are moving… or the direction that you were just moving. It's the vector difference between your compass direction and the compass direction generated from your location and the rocket's. There's no compass, so if you turn around the bearing won't change on it's own, until you start walking/driving.

More information can be found in the Eggfinde LCD-GPS Module User's Guide.

Beep Summary

One or Two Short Beeps Every Second: Receiver is getting valid data from the transmitter
Two short beep-beeps every 3 seconds: Receiver is getting data from the transmitter, but it's not valid GPS fix data
No sound: No valid transmission is being received from the transmitter

Programming

HOLD button down (> 5 seconds) during power-on display to enter programming mode
TAP on button (< 1 second) to change menus

When in a menu,
TAP on the button to change the parameter's value
HOLD the button to select the parameter's value

Menus

Receiver Config – Changes internal receiver parameters
Frequency/ID – Changes frequency/ID
Both – Enter both menus consecutively

Receiver Config Menu

Device – Specify the device that you're connected to
GPS-enabled devices: TX/Mini, Quasar, TRS
Altimeters w/Eggtimer Telemetry Module:
Quark/EZ-DD, Quantum/ION, Proton
GPS Format – Degrees (D), Degrees:Minutes (D:M) or Degrees:Minutes:Seconds (D:M:S)
Units – Feet or Meters, for Distance and Altitude display (also velocity for altimeters)
Voice Period – How many seconds between Eggtimer Voice Module altitude call-outs
(2, 4, 6,8 or 10 seconds)

Frequency/ID Menu

Frequency: Base frequency, band-specific:
North America: 903-925 by 2 (default 915)
Australia/NZ/Brazil: 919-925 by 2 (default 921)
EU/UK: 869.425, 869.525, 869.625
Ham (70 cm): 420-449 by 1 MHz (default 433)
ID: ID code, band-specific:
North America: 0-7
Australia/NZ/Brazil: 0-7
EU/UK: None
Ham (70 cm): 100 kHz, 0-9