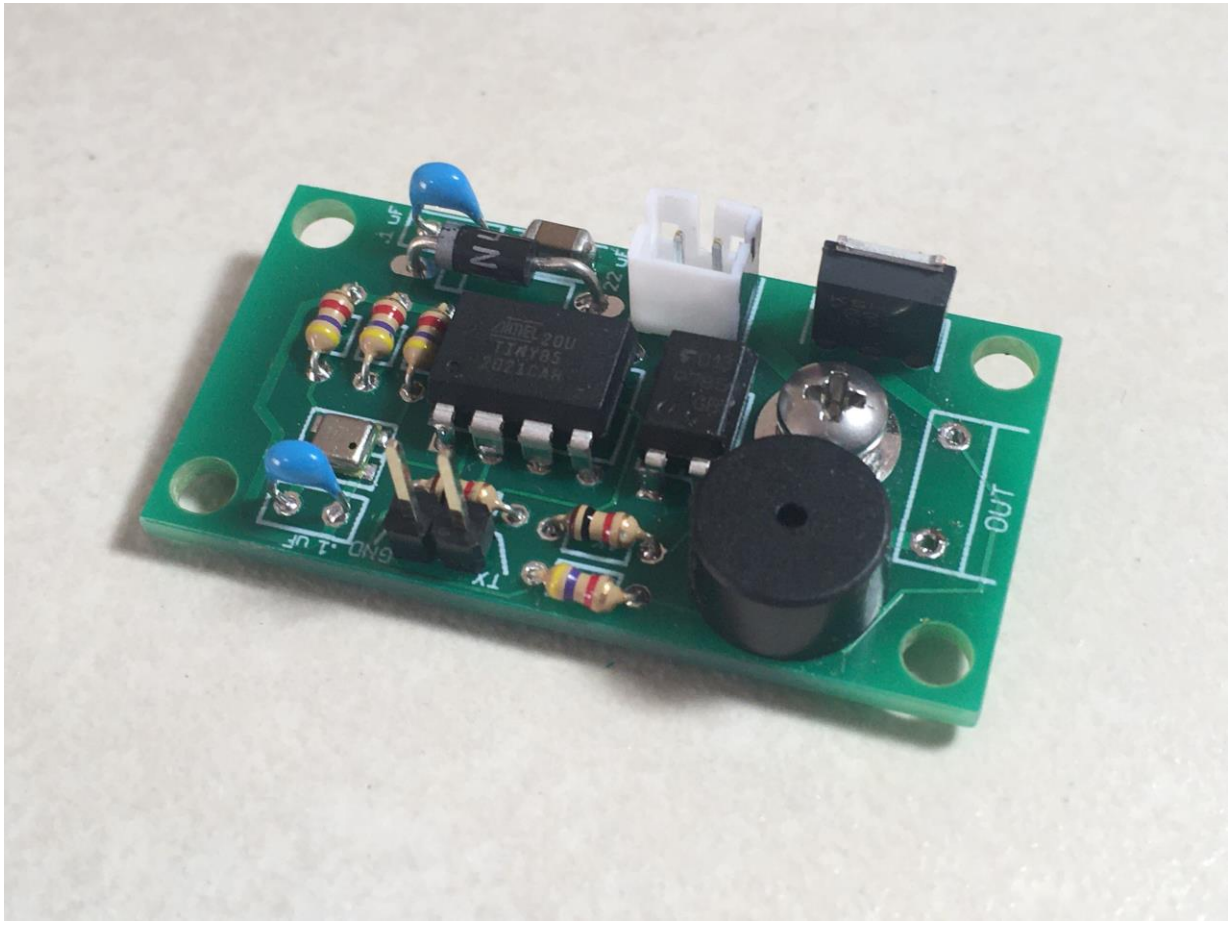
Eggtimer Apogee Assembly Manual

Board Rev D7



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 Apogee 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.

Before You Start…

• Check the parts against the Packing List in the kit, and let us know right away if anything is amiss.

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

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

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Thanks for buying an Eggtimer Apogee. The Apogee is a single-output deployment controller, designed to get your parachute out at apogee. It also beeps out your apogee after every flight. It's an ideal companion for the Jolly Logic Chute Release™, which is a great piece of equipment but can't get the nose cone off or tell you how high your rocket went. The Eggtimer Apogee takes care of these shortcomings.

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 Apogee, 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!).

About Soldering Your Apogee…

Assembling your Apogee isn't that hard, almost all of the parts are through-hole parts and are easy to solder. We provide the solder for you, and tell you what kind of soldering iron you need to use, so you can 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 Apogee uses mostly through-hole parts, and the few surface mount (SMT) parts that we use are large by SMT standards, and are easily within the realm of being hand-solderable. In order to help make your assembly successful, we have included about 1m 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 about using extra flux with this board: The solder that comes with the kit is Kester 245 63/37 .020", it uses a water-based "no-clean" flux. If you wish to use extra flux with the board, it MUST be compatible. You want a liquid (not paste) water-based no-clean flux. Kester 951 is ideal, if you can get it. Chip-Quik sells little 2ml tubes for about $2 each (unfortunately they sell them in 6-packs, you can't just get one) which works very well. If you decide to add flux, you must use only a tiny amount. A few drops will suffice for the entire board. DO NOT use Rosin Core flux (except as noted), or you will make a mess of the board and possibly damage components. We have built many kits without using any additional flux
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without any issues, the board is pre-tinned to make solder adhesion easier so in general you should not need to use additional flux.

For soldering components on a board like the Apogee, 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 a small conical tip. It should be just a bit smaller than the width of the processor's pads.

Note that soldering the screw-switch nut onto the PC board requires a larger iron and/or tip. We recommend a 25W iron with a "standard" tip for that, or if you have a temperature-controlled iron use one of the larger tips that comes with it. There's a picture of the tips that we use in the instructions, if you match it you'll be fine.

General Assembly Information

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

___ Low-wattage soldering iron, 15W or less, with a fine conical tip (1/32")
Or a temperature-controlled soldering station

___ Larger soldering iron, 25W-40W (for soldering the screw switch nut ONLY),
or a larger tip for your soldering station (1/8" or 3/16" spade recommended)

___ 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
Or a tip cleaning mesh "sponge" (recommended)

___ A 3x-5x lighted magnifier… unless you have Superman's eyes

___ A jeweler's loupe or small 10x magnifier, for inspecting the solder joints

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

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

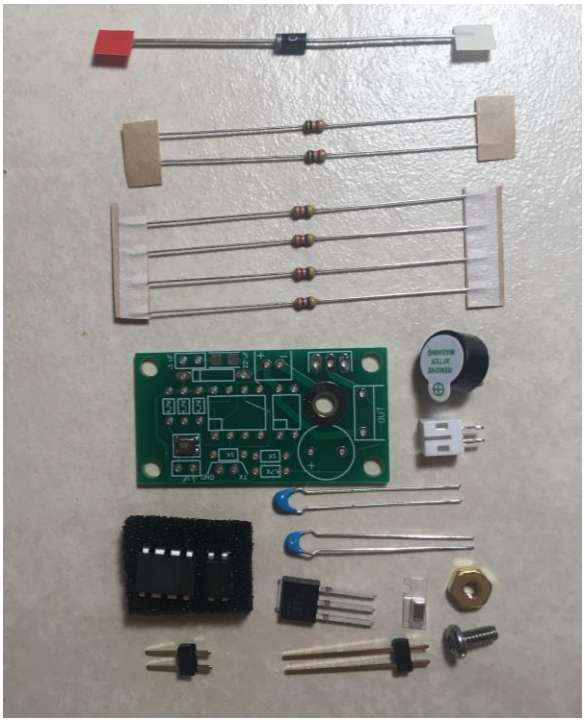
Each installation step has a check-off line, we strongly recommend that you check them off as you go, and that you perform the steps in sequence. We have listed the steps in order to make it easiest to assemble the Apogee, deviating from them isn't going to make your life any easier. Each step is pictured, so you can see exactly what you need to be soldering. Looking at the pictures as you go will help prevent you from soldering the wrong thing, or putting something in the wrong way.

Assembling your Apogee

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. (Yes, we ARE human and sometimes make mistakes… if you are missing something, let us know immediately so we can send you whatever you need). You should have the following parts, check them off as you sort them…

	Qty	Description
__	1	Circuit board with pre-mounted barometric pressure sensor
__	1	ATTINY85 Processor (8-pin chip)
__	1	TLP785 Optoisolator (4-pin chip)
__	1	KSH122ITU Darlington Transistor (package with three leads)
__	1	1N4001 Diode (black with a stripe at one end)
__	1	Buzzer
__	2	1K ohm 1/8W resistor (bands are brown-black-red)
__	4	4.7K ohm 1/8W resistor (bands are yellow-purple-red)
__	2	.1 uF through-hole capacitors
__	1	22 uF 1206-sized capacitor (brown, unmarked)
__	1	2-pin JST-PH battery connector
__	1	2-pin header strip
__	2	#4 screw, 1/4” (one is a spare)
__	1	#4 brass nut
__	1	Coil of .020” 63/37 No-Clean solder wire



Note that some of the components are static sensitive, so you should avoid sources of static electricity while you are handling them. We recommend that you assemble the Apogee 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 Apogee, 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 Apogee 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 not making any noise 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 like the processor. ***The Eggtimer Apogee 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.

There are several different resistors, so make sure you get the right ones in the right place. They are marked on the boards, but once again you need to make SURE that you have them in the right place before soldering. Unsoldering parts on a small circuit board like the Apogee isn't a lot of fun, even if you have a vacuum desoldering tool. It's hard to get all the solder off, and easy to lift a pad off the board. Trust us, we've been there before…

It is very important that you assemble the Apogee 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.

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 Eggtimer Apogee 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… but first you have some decisions to make.

Install the Screw Switch Nut (if you're using it)

The Eggtimer Apogee comes with a built-in screw switch, for most builds you will probably want to use it. It's designed to be used with the Eggtimer Apogee Easy Mount, and is easily adaptable to most nose-cone and small mid-mounted AV bay sleds (typical of "starter" AV bay kits like the ones sold by Madcow Rocketry and LOC). However, for some builds you may decide that you cannot use the built-in screw switch. No problem, it's easy to add a switch later… skip these steps and see the Appendix at the end of this document.

Note: We have you installing the screw switch nut first because it requires more heat and thus a larger soldering iron than the rest of the parts. Installing it now prevents overheating other nearby parts, and possibly creating solder bridges. Although it may be possible to add it later, we do not recommend it…

__ Install the screw switch nut

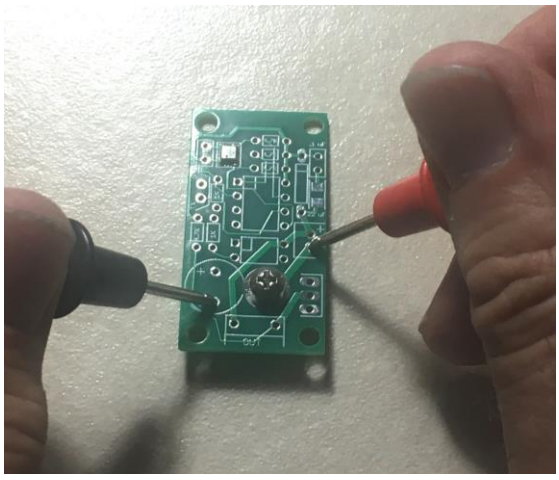
For this procedure ONLY, we recommend using a larger soldering iron tip, a 1/8" or 3/16" spade tip works best. See the picture below for a comparison of the tips. We also recommend using a larger soldering pencil, 25W should be fine. If you have an adjustable soldering station, we recommend turning up the heat a bit from the recommended setting of 680F; 720F is a good starting point.

Install the screw switch by inserting the screw into the large hole in the middle of the front of the board (the side with all the markings), and threading the brass nut onto the screw so that it contacts the ringed pad that you just tinned; finger-tight is fine. Tape the board down to your worktable so that the side with the nut faces up, we recommend using low-tack paper masking tape so the adhesive won't stick to the board.

Heat up the nut with your iron for several seconds, and apply some solder. If it doesn't melt, withdraw the solder and hold the iron there until it does. Once the solder starts to melt, go around the nut with your soldering iron applying solder so that you have a fillet of solder around the nut. It is VERY important that the solder is nice and shiny all the way around the nut, if you have a cold solder joint here you're not going to get a good contact, and it also won't be a good mechanical connection so when you unscrew the screw it will probably cause the nut to rotate too… you definitely do not want that!

Once you're satisfied with the solder joint, allow the nut to cool for approximately 5 minutes, then turn the board over and back out the screw about two turns.

Test the screw switch by setting your DVM to continuity mode, and touch the probes to the pad on the buzzer that is not marked and the "-" pad of the BATT connector pads. See the picture below. There should NOT be continuity… if there is, then you used way too much solder on the nut and some flowed through the hole, you'll have to unsolder the nut and clean up any solder with desoldering wick. There should not be any solder in the walls of the hole.. it's not plated, so it acts as an insulator.



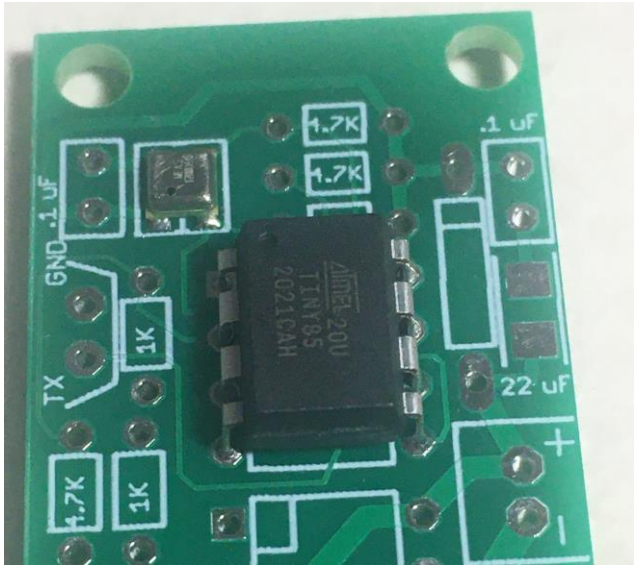
Now, close the screw firmly (but do not force it… don't use gorilla force!), then check the continuity between the "-" pad on the BATT connector and the pad on the buzzer that is not marked… you SHOULD now have continuity.

Remove the screw and set it aside. From this point on, you'll be using the smaller iron and/or smaller tip… if you have a soldering station, we recommend that you turn the heat down to 680F if you turned it up.

Assembling the Rest of the Board…

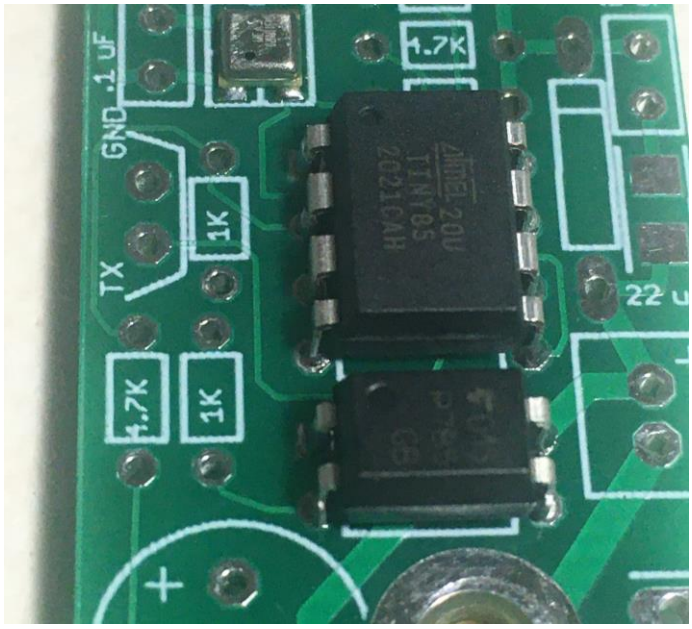
___ Locate the processor spot on the board, you will notice that there is a "notch" on the silkscreen outline. This MUST match with the "Pin 1" side of the processor. If you look at the processor, you will see an indent, dot, triangle, or bar at one end of the package. That side is the one that must be matched up with the notch on the board.

___ Insert the processor into the holes on the board. You may have to bend the leads against a table first to square them up with the holes. With a small piece of masking tape, affix it to the board. Turn the board over and solder the eight pins into the pads. Remove the masking tape.



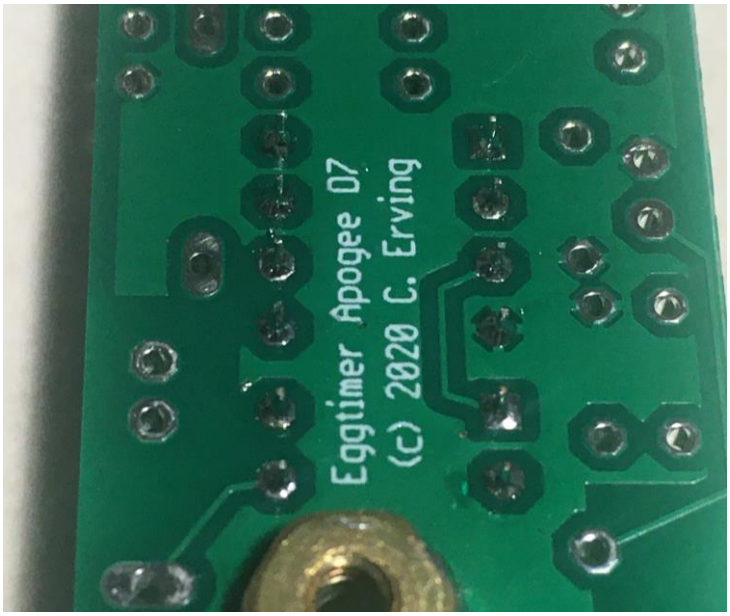
___ Locate the spot for the optoisolator, it's the 4-pin part just below the processor. Note that there is a notch marked on the silkscreen, this corresponds to the Pin-1 mark on the optoisolator chip. This MUST match with the "Pin 1" side of the optoisolatr. If you look at the optoisolator, you will see an indent, dot, triangle, or bar at one end of the package. That side is the one that must be matched up with the notch on the board.

___ Insert the optoisolator into the holes on the board. You may have to bend the leads against a table first to square them up with the holes. With a small piece of masking tape, affix it to the board.

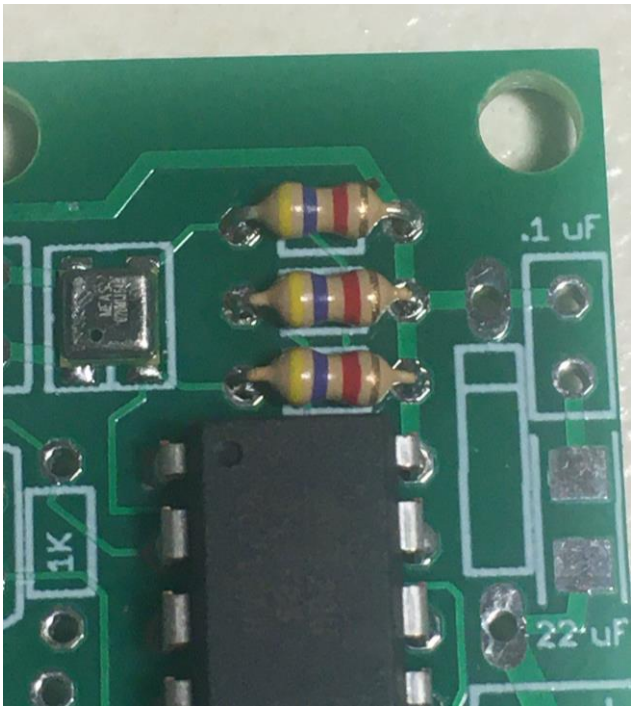


Turn the board over and solder the four pins into the pads. Remove the masking tape.

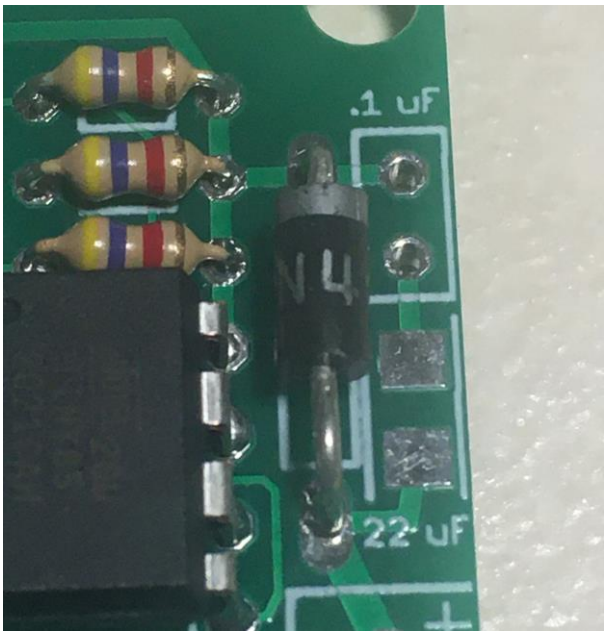
Check the pins for the processor and the optoisolator… the joints should be nice and shiny, with a nice small fillet of solder around the pins and no “blobs”. It should look just like the picture below.



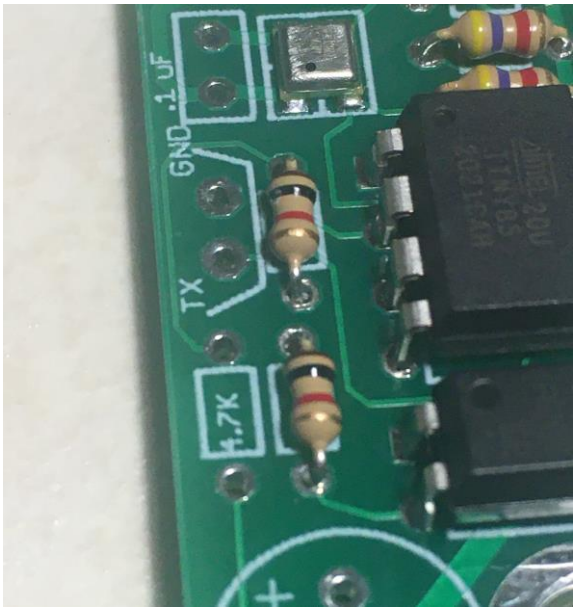
___ Locate the three 4.7K resistors at the top of the board, just above the processor. These resistors can be identified by the color bands… yellow-purple-red. Bend the leads close to the body, then insert them into the board. Use a piece of masking tape to hold them down, then turn the board over and solder the leads to the pads. Clip the leads off close to the board, then remove the masking tape.



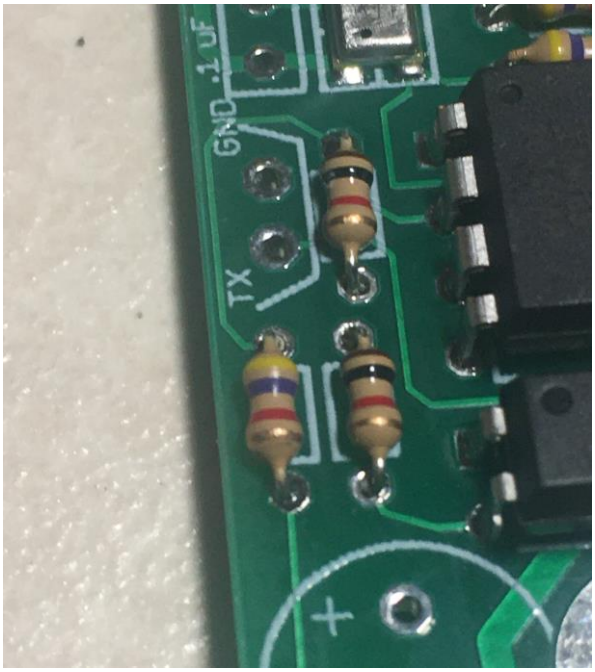
___ Locate the spot for the 1N4001 diode, just to the right of the processor. Note that it is polarized… there is a stripe at one end of the part. This stripe MUST match the stripe marked on the board, at the top side of the silkscreen. If you put it in backwards, your board will not power up, so be sure to get it right. Bend the leads to fit the pads, insert the diode into the holes, then use a piece of masking tape to hold the part onto the board. Turn the board over and solder the diode leads to the pads, then clip the leads off close to the board. Remove the masking tape.



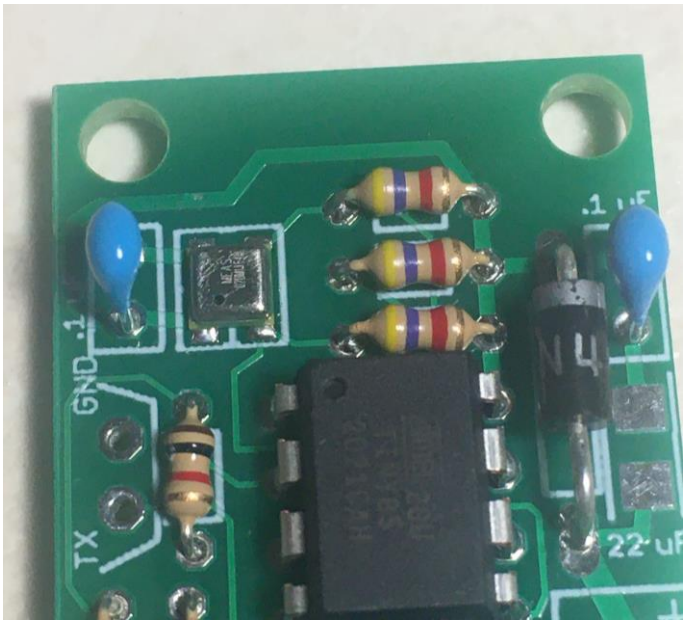
___ Locate the spots for the two 1K resistors (brown-black-red) just to the left of the processor and the optoisolator. Bend the leads close to the body, then insert them into the board. Use a piece of masking tape to hold them down, then turn the board over and solder the leads to the pads. Clip the leads off close to the board, then remove the masking tape.



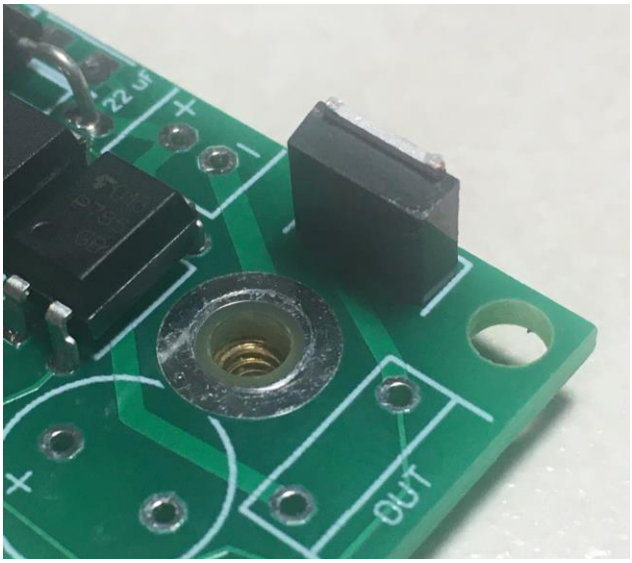
___ Locate the spot for the 4.7K resistor (yellow-purple-red) to the bottom-left of the optoisolator. Bend the leads close to the body, then insert them into the board. Use a piece of masking tape to hold them down, then turn the board over and solder the leads to the pads. Clip the leads off close to the board, then remove the masking tape.



___ Locate the spots for the two .1 uF capacitors, on the far right and left edges of the board from the processor. Insert them into the board, and use a piece of masking tape to hold them down, then turn the board over and solder the leads to the pads. Clip the leads off close to the board, then remove the masking tape.



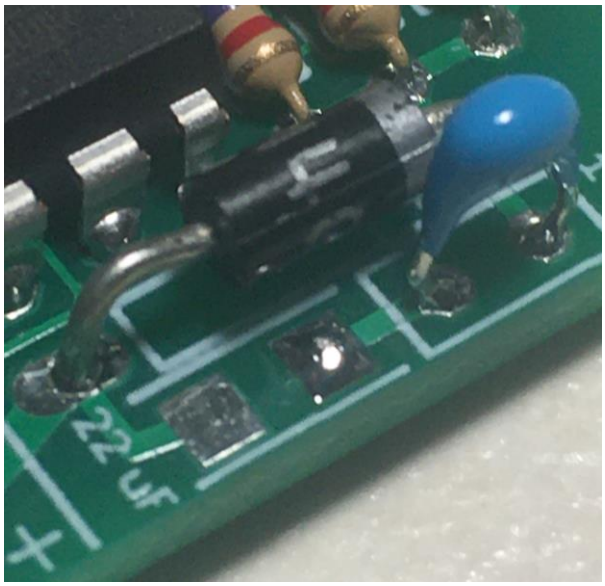
___ Locate the spot for the transistor, at the bottom-right of the board. Note that the silkscreen legend has a large "flat" mark at one end, towards the edge of the board… that mark must match the metal tab on the transistor. Insert the transistor into the board, and use a piece of masking tape to hold it perpendicular to the board, then turn the board over and solder the leads to the pads. Clip the leads off close to the board, then remove the masking tape.



___ Locate the spot for the 22 uF capacitor, just to the right of the diode. This is a surface-mount part… there are no holes. The soldering technique is slightly different, but it's really no harder… it just "different".

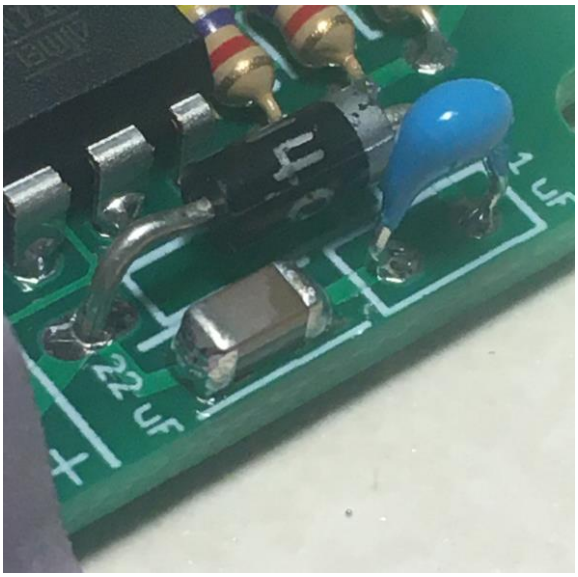
___ Tape the board down to your work table so it can't move. Don't tape over the spot for the 22 uF capacitor, though!

___ Tin the top right pad by melting a VERY SMALL amount of solder on the pad. You don't need much… just enough to coat the pad. If you get a "bubble" of solder, you've used too much… remove it with some desoldering wick and try again.



___ Holding the 22 uF capacitor with tweezers in one hand and the soldering iron in the other, gently heat up the tinned pad and place the capacitor onto the pads. Remove the iron, and wait about 5 seconds before letting go of the capacitor. If you've done it right, the capacitor should be soldered to that pad.

___ Solder the other pad to the capacitor, removing the heat and solder as soon as it flows out. If you do it right, there should be a nice fillet of solder between the capacitor and the pad. Don't hold the iron on for too long… if you do, the heat may transfer to the other pad and unsolder it, and the part may come off when you remove your soldering iron. Let the pad cool down for at least 10 seconds before continuing.

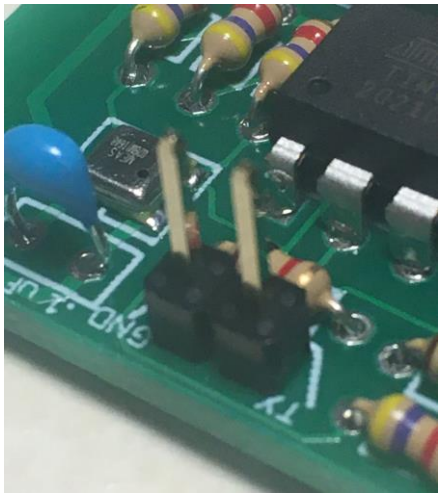


__ Go back and reheat the previously-tinned and soldered pad if you don't have a fillet of solder there.

___ Locate the spot for the buzzer, it's a circle with a "+" marking on the top pad. If you look at the buzzer, you'll see that one lead is longer than the other, and there is a "+" marking on the body of the buzzer by that lead. Insert the buzzer so that the "+" lead goes into the pad

on the board marked with a "+", tape it to the board with some masking tape, then turn it over and solder the pads. Clip the leads flush afterwards, then remove the tape. Also, if the buzzer has a label marked "Remove after washing", remove that too.

___ Locate the spot for the 2-pin serial header, marked "TX" and "GND" on the left side of the board. Insert the short side off the header through the top of the board, use a piece of masking tape to hold it upright, and solder it to the bottom of the board. Remove the tape.



Battery Options…

Now is the time to solder your battery connector. The Eggtimer Apogee is designed to be used with a 1S/3.7V LiPo battery. We do not recommend using any other battery type, although a 3-cell 3.6V NiMH battery pack will also work (but they're heavier, more expensive, and harder to find so you probably wouldn't want to use one anyway). Whichever battery you decide to use, you must use the matching connector or pigtail, and solder it to the battery pads on your Eggtimer Apogee board.

The Eggtimer Apogee comes with a 2-pin JST-PH connector, which is the connector used by the 110 mAH 1S LiPo SparkFun battery that we recommend for use with the Eggtimer Easy Mount. This connector may or may not be the appropriate connector for use with other

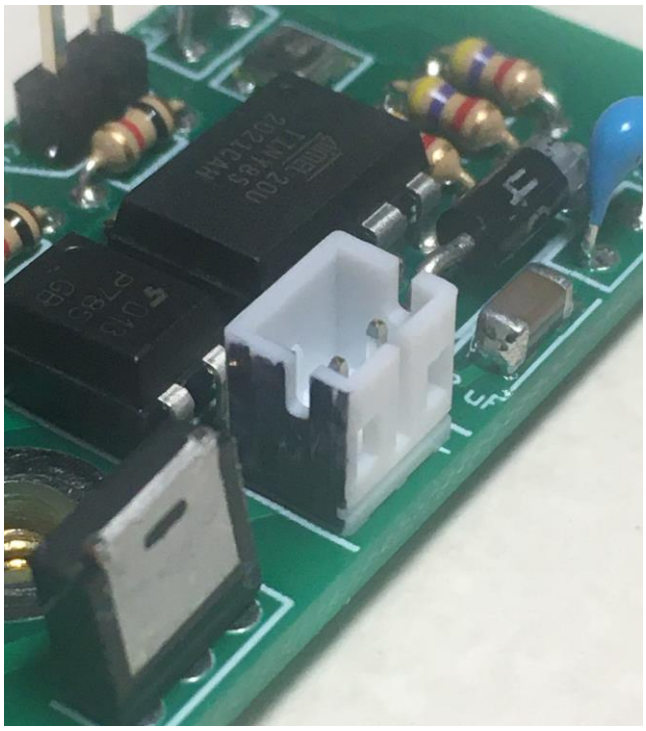
batteries, and you also need to make sure that any battery that you are using that DOES use a JST-PH connector is wired with the same polarity. In particular, batteries sold by e-Flite using the JST-PH connector are wired BACKWARDS from the SparkFun batteries… you will have to reverse the connector to ensure that it's properly oriented. We recommend that you check the polarity of your battery, regardless of manufacturer and DO NOT mix battery types, since you may damage your Eggtimer Apogee if you connect the battery backwards!

The battery pads are marked "+" and "-", you need to make sure that your connector is properly installed. We'll have you check it first, then mark the "-" side with a black Sharpie.

<u>For a battery with a JST-PH connector</u>

___ Connect the JST-PH connector to your battery. With a voltmeter, check the polarity of the pins, and mark the side of the connector next to the "-" lead with a black Sharpie marker. It wouldn't hurt to mark the "-" side of the batter, either. Remove the connector from the battery.

___ Insert the JST-PH connector into the top of the board so that the black "-" mark matches up to the "-" pad on the board. That will be side closest to the screw switch (NOT the side towards the diode). Hold it in place with a piece of masking tape, solder the pins to the bottom of the board, then remove the tape.



For any other battery pigtail (i.e. JST-XH, Molex, etc.)

___ Identify the "-" side of the pigtail, it will almost always be black wire (the "+" side will almost always be a red wire). Cut the wires to fit your sled, and strip and tin the ends of the wires.

___ If you don't know for sure the polarity of your pigtail, connect the pigtail to your battery. With a voltmeter, check the polarity of the leads, and mark the "-" side of the connector and the battery with a black Sharpie marker. Remove the pigtail connector from the battery.

___ Insert the pigtail leads into the board making sure that the "-" lead is in the "-" pad and the "+" lead is in the "+" pad. Tape the leads into place so they won't fall out, then turn the board over and solder the leads into the pads. Clip any excess wire lead off on the bottom of the board, then remove the tape.

Output Connector Options

The Eggtimer Apogee comes with two pads for wiring your output to the deployment ematch. How you wire them is largely up to your installation. If you're using the Eggtimer Easy Mount, you'll use the wires that come with your Easy Mount kit, they connect to the terminal screws built into the mount, giving you an easy way to connect your ematch. You'll simply wrap the ematch wires around the screws, tighten them, and put a piece of tape over them to prevent fouling from the powder… very easy. Refer to the Easy Mount guide for further instructions.

If you're using screw terminal blocks or some other connection to your ematches, it's going to be up to you how to wire them. We recommend that whatever you do, you should use stranded wire rather than solid wire. Solid wire is stiff and difficult to work with, even in smaller gauges, and can develop stress breaks if repeatedly bent. Stranded wire doesn't have those issues, however you do need to carefully strip and tin it to prevent nicking which may cause the strands to break off.

Assuming that you're building your own AV bay, cut the wires about 6" longer than they need to be for now, strip and tin both ends (about ¼" from end), and solder them into the pads marked OUT. Use a piece of tape to old the wires onto the board while you're soldering them.

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___ If you're using the screw switch, thread the #4 screw into the front of the board until it lightly contacts the front of the board, then back it out about one or two turns.

Congratulations, you are now done! Time for some testing….
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Preliminary Testing

Connect your battery to your Eggtimer Apogee. Turn on your switch… it you're using the screw switch, tighten it finger-tight. You should almost immediately hear a 2-second "I'm on" beep… if you do NOT, then you have a problem somewhere, go to the Troubleshooting section and figure out what what's wrong.

Let it go through it's paces… you should hear a number of beeps over the next minute or so, culminating in a beep-beep (2-second delay) that goes continuously. That's telling you that you do not have continuity on the ematch output, which you shouldn't since you didn't connect anything there yet. Turn off your switch.

Mount your Apogee into the Easy Mount (if you purchased one), or install it in your own AV bay. Now you can do a final test…

Connect an ematch or a similar resistive load (a miniature Christmas tree light bulb works great, but do NOT use the LED type), then turn the switch back on again. It should go through the same paces, but instead of the beep-beep (pause) it should start "chirping" to tell you that it's ready for flight. Trust us, once you hear that sound you won't be able to mistake it for anything else.

Turn off the switch, so far so good…

Power-Up Serial Diagnostics

The Eggtimer Apogee performs power-up diagnostics before you hear the two-second "I'm on" beep, there are two serial output pads marked TX and GND that can be used to view startup diagnostic information using the Eggtimer USB-Serial cable. This can be used to confirm that your baro pressure sensor and the continuity detection circuitry are working correctly.

The Eggtimer serial cable uses a Prolific PL2303TA USB-serial bridge chip, if you haven't installed that driver before and/or haven't used the Eggtimer cable before you can find the appropriate driver on Prolific's web site… Google "prolific PL2303TA driver". Be sure to get the right version for whatever operating system you're using.

To use the serial connector, connect the BLACK lead of the Eggtimer cable to the GND pad, and the WHITE lead to the TX pad.

If you have not done so, install a serial terminal program such as Putty on your computer. (You can find the current version of Putty at putty.org) Plug the USB connector into your computer, launch the Putty program and set it to 9600 baud, 8 bits, no parity. Power on your Eggtimer Apogee. You should see several lines of random characters on your screen immediately before you hear the "I'm ready" beep, followed by the diagnostics:

1
ASL altitude (i.e. 427 for 427' above sea level)

2
Status of output channel (0-no continuity, approx. 200 for continuity)

3
Version number (10207 = 1.02.07)

4
“104” (as in “10-4”, everything is OK)

After that you should hear the 2-second “I’m OK” beep. If you do NOT hear the beep, you probably won’t see all four of those status lines… the missing line will tell you where it’s failing. For example, if you never see the ASL altitude value, you probably have an issue related to the baro sensor… see the troubleshooting tips for that below.

Performing an Output Channel Vacuum Test

The final test test that we recommend before flying your Apogee is an output channel test. Basically, you will simulate a “flight” by pulling a vacuum and releasing it, which makes the logic think that your rocket has reached reached some significant altitude and is coming down. This performs a full-up test of every part of the Eggtimer Apogee… the baro sensor, the continuity logic, and the output drivers.

We recommend that you do this after you’ve mounted your Eggtimer Apogee either in the Eggtimer Easy Mount or your sled. It’s easier to do it that way… once you try it, you’ll see what we mean.

To test it, you’ll need a vacuum cleaner with a hose. A normal house vacuum cleaner should work fine, but shop vacuums work better because they generally pull a higher vacuum. Connect an ematch or miniature light bulb as you did before for the continuity test. We recommend that if you use an ematch that you have at least 3 feet of wire between your Eggtimer Apogee and the ematch, and you perform the test outdoors… it’s going to pop during during this test, so you want to have a little space between you and the ematch. Power on your Eggtimer Apogee, and wait for the ready-for-flight chirp.

Hold the vacuum’s hose right over the top of the board, then turn on the vacuum cleaner. Hold it for at least 5 seconds, then turn off the vacuum or gently pull the hose away. Within one second the ematch should fire. If it does, congratulations… your Eggtimer Apogee is ready for flight! After a few seconds you should hear the Eggtimer Apogee beep out the “apogee” of your “flight”… see the Eggtimer Apogee User’s Guide for further details.

If the ematch DOES NOT pop, then there may be a few reasons for it… see the Troubleshooting guide below.

Troubleshooting

If your Apogee 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. 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. Many of 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, and if you get solder splatter under the baro chip there's no easy way to fix it.

Another thing to look out for is "cold" solder joints, they look dull and blobby compared to a nice shiny "tented" solder joint. If you have a cold solder joint, it won't conduct well; at the low power that the Apogee 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 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.

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 Eggtimer Apogee Limited Warranty does not cover damage to a component while attempting to unsolder it, so make take your time and make sure you get it right before you solder.

Check Your Battery & Connector

Make sure that you are using one of the recommended batteries to test with. Make sure that you have the polarity correct: The RED wires must go to the "+" side and the BLACK wires must go to the "-" side. Your Apogee is designed so that if you connect the battery backwards it won't be damaged, but it won't work either.

If It Still Doesn't Work…

There is, of course, always an outside chance that you have a bad component. Each component is tested at the factory, but 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)

No Beeps at All When the Battery is Connected

- Check the polarity of the processor
- Check the polarity of the diode
- Bad solder joint on the processor pads
- Incorrect battery polarity, or bad solder joint on battery connector pads
- Bad solder joint on the 22 uF capacitor
- Bad solder joint on the .1 uF capacitors
- Bad solder joint on the 4.7K resistors
- Bad solder joint on the buzzer
- Buzzer polarity incorrect (do the "+" marks match up?)

If you're missing diagnostics when connecting the serial cable…

No data at all on the screen
- USB-Serial driver not properly installed
- Putty settings incorrect… check the COM port, it should be 9600 baud
- Your Eggtimer Apogee is basically dead… see above

Missing the ASL Altitude
- Bad solder joint on the 4.7K resistors
- Bad solder joint on the .1 uF capacitors
- Bad solder joint on the processor pads

Continuity value is not correct
(i.e. not zero when nothing connected, or significantly different from 200 when it is)
- Check the polarity of the optoisolator
- Bad solder joint on the optoisolator pads
- Bad solder joint on the 4.7K resistors
- Bad solder joint on the 1K resistors
- Resistor installed in the wrong place (check the color bands)

Ematch doesn't pop when performing deployment test
- Inadequate vacuum… hold the vacuum closer
- Bad solder joint on the transistor
- Transistor backwards
- Bad solder joint of 1K resistor
- Bad connection between your Apogee and the ematch (check your wiring/connectors)