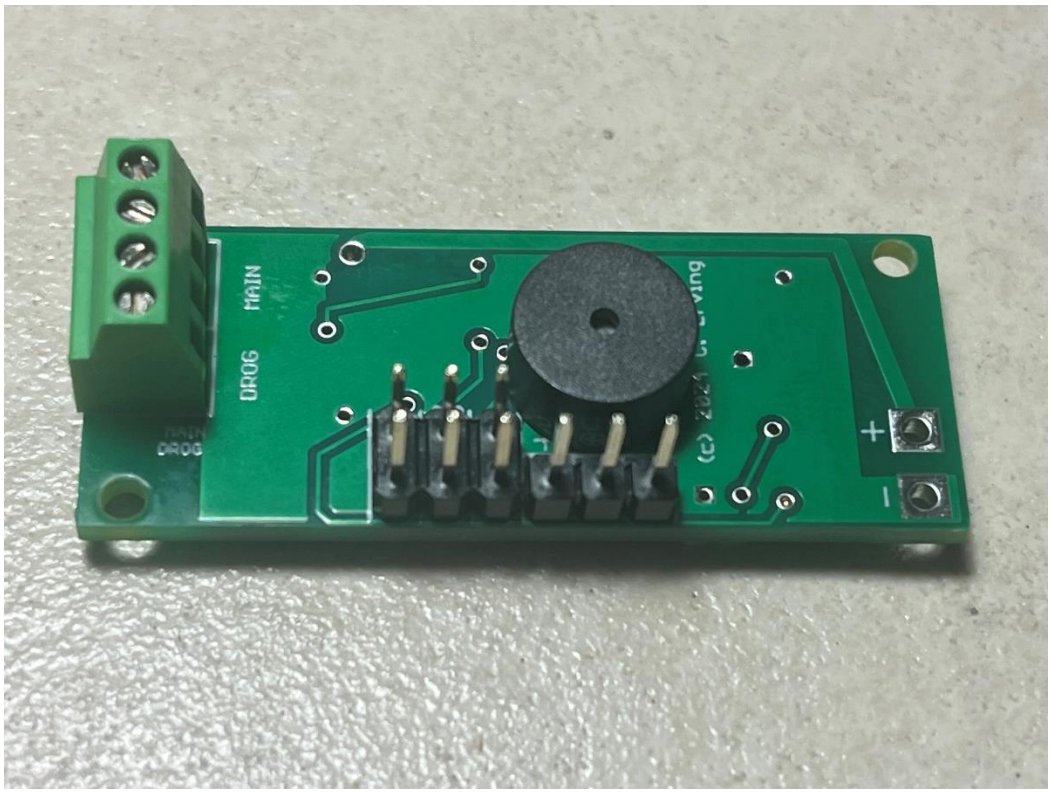
Eggtimer Quark
Easy Kit
Assembly Manual

Board Rev D3-D6



Disclaimers, Legal Stuff, Etc.

The Eggtimer Quark is meant to be used for hobby and experimental rocketry purposes. Although hobby rocketry has an admirable safety record, largely due to the efforts of the good people at the National Association of Rocketry (NAR) and the Tripoli Rocketry Association (TRA), rocketry can be dangerous if proper safety precautions are not observed. This is particularly true with some of the advanced techniques like pyrotechnic parachute deployment and airstarting motors. People can and have been seriously injured by not following recognized and accepted safety practices. We cannot be responsible for your actions.

We ***strongly*** recommend that if you are not a member of either the NAR or the TRA, you join one of them, join a local rocketry club, and pick the brains of experienced members before you try any kind of electronic deployment or airstart flight. The safety information included in these instructions is by no means comprehensive or complete, and is no substitute for the supervision and advice of experienced rocketeers.

Limited Warranty

Eggtimer Rocketry warrants that all of the parts on the packing list of this Eggtimer Rocketry kit have been included, and that they are all in working condition. If you are missing something, contact us immediately at support@EggtimerRocketry.com and we will send you whatever it is that you are missing. If you are missing something really egregious (like the PC board or the processor, for example), we may ask you to return the entire kit unbuilt, we will send you a prepaid shipping label for this purpose. We'd especially like to see the packing list so we can figure out what went wrong so it doesn't happen again…

If your Eggtimer Quark does not work properly after assembly, take a deep breath, get out the magnifying glass and a good light, and see if you have inadvertently created a solder bridge somewhere. Chances are pretty good that you have, or that you have installed a part incorrectly. We are a very small company and we just don't have the resources to repair your board, but we will be more than happy to give you advice and we might be able to help you find your error if you send us some high resolution pictures, to support@EggtimerRocketry.com . We cannot take responsibility for your assembly techniques; if you do not have experience building kits of this nature, we recommend that you enlist some help. (Another reason for joining a rocketry club, there is usually at least one electronically-inclined member who can be bribed with a beverage or two to give you a hand. Engineering types love a challenge, especially if it's easy for them but hard for you.)

Eggtimer Rocketry warrants that when properly assembled this Eggtimer Rocketry product will perform substantially according to the published documentation. This means that we spent a lot of time trying to ensure that it's going to work the way that we say it does, and we try to fix things that don't quite work right in a reasonable time. Nevertheless, we can not and do not warrant that this product is perfect and will meet every rocketry purpose, for the simple reason that we can't test every possible rocket/motor/environmental combination. It is the buyer's responsibility to determine the suitability of the Eggtimer Quark for their particular purpose. If you have a problem with this, please contact us and we will be happy to send you a prepaid return label for your unbuilt kit and we will refund the purchase price on receipt of your kit.

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 Quark 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 Quark. The Quark is named after a tiny elementary atomic particle, which aptly describes the unit. It is designed to be extremely easy to use, and is also very small so you can put it in virtually any rocket that you could possibly want. You can fire the Drogue chute at either nose-over (just past apogee) or you can add 1 second for backup use, and the Main chute can be fired at 300’, 500’, 800’, or 1000’. It beeps out your apogee after every flight, and you can easily test the deployment channels. Finally, you can actually stream live altitude and status data out the serial port for simple telemetry use.

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 Quark, 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 Quark Easy Kit…

The Eggtimer Quark Easy Kit has been designed to be as simple as possible, making it a good project for somebody new to electronic assembly. All of the itty bitty surface mount parts have been professionally pre-mounted for you using an automated pick and place machine and reflow oven, so all that’s left for you to do is to mount things like the buzzer and terminals that are soldered through holes in the PC board. Experienced assemblers can do this in just a few minutes… even if you’re new to electronic assembly, it shouldn’t take you very long.

To make it was easy as possible, we include some special solder. We recommend that you use a 12W-15W soldering iron with a small conical tip, or a temperature-controlled workstation. If you have a workstation, we recommend that you set it to 680F/360C, and use a 0.8mm/0.32” conical tip. You should not need to use any additional flux with the board, but if you choose to use some we strongly recommend that you use a no-clean flux; we’ve had great results with MJ Chemicals #8351.
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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, or a temperature-controlled station

___ Small needle-nose pliers

___ Small diagonal cutters

___ A mesh "sponge" for cleaning the tip of your soldering iron

___ A tinning block to clean and tin your iron as you go along

___ A lighted magnifier

___ 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 Quark, deviating from them isn't going to make your life any easier.

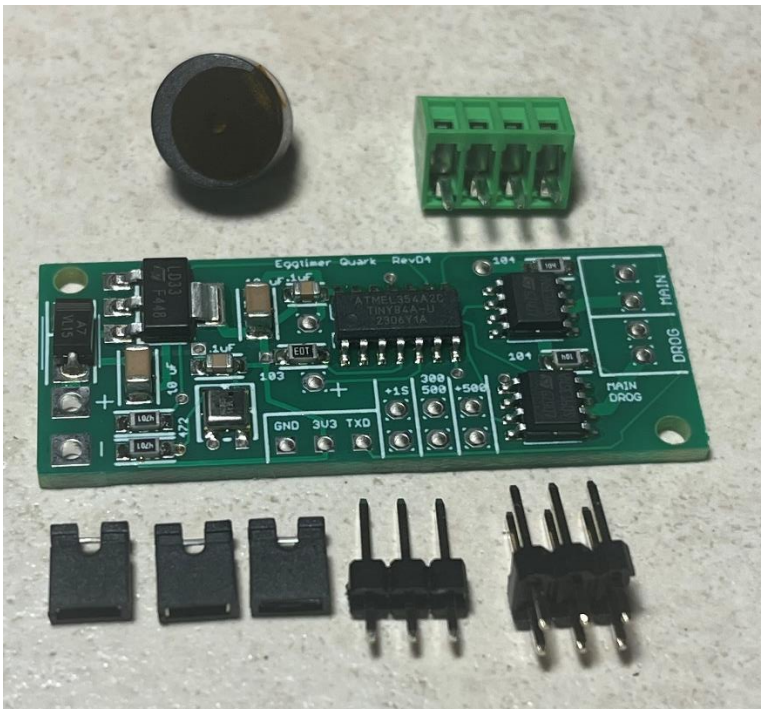
Each step is pictured, so you can see exactly what you need to be soldering. Looking at the pictures as you go will help prevent you from soldering the wrong thing, or putting something in the wrong way.

Assembling your Quark

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 SMT parts
__	1	Buzzer
__	1	3-pin header strip
__	3	.1” shorting jumpers
__	1	4-pin x 2.54mm Screw Terminal Block
__	1	Coil of .020” 63/37 No-Clean solder wire



Note that the board is static sensitive, so you should avoid sources of static electricity while you are handling it. We recommend that you assemble the Quark on a non-plastic surface unless you are fortunate enough to have a high-temperature anti-static mat (don't buy one just to build the Quark, however!) A piece of ceramic floor tile works great, too. 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 Quark 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 (buzzer) 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 Eggtimer Quark 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.

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 Quark 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.

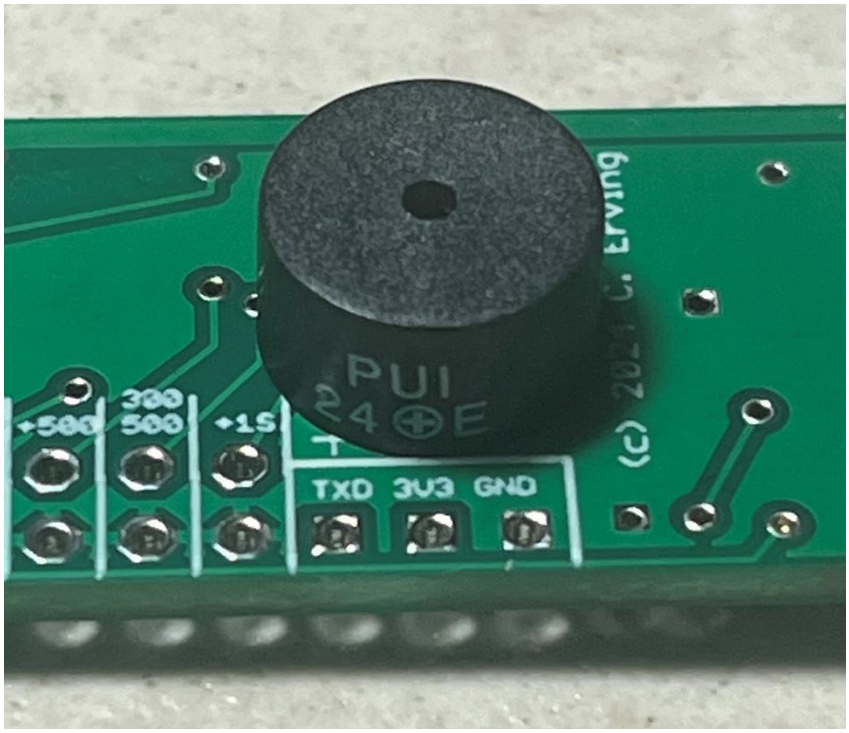
OK, so let's get started…

An Assembly Note

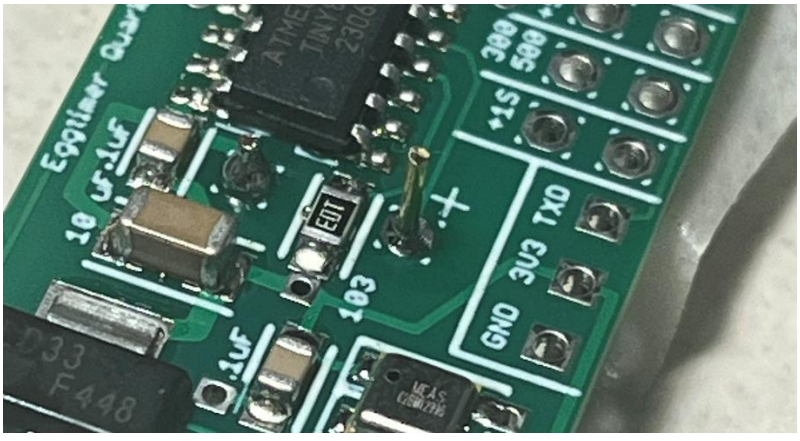
If you have built other Eggtimer Quarks before or if you've looked at the full kit assembly instructions for the Eggtimer Quark, you'll notice that we mount the parts on the "other" side of the board, i.e. the "flat" side, compared to those instructions. We do this to make it a little easier to assemble… with "component side" mount, the buzzer is raised a little bit off the board. There are markings on both sides of the board, so the through-hole parts CAN be mounted on either side if you wish… just make sure that the buzzer's "+" side matches the markings on the board. One reason to mount the parts on the component side is so you can mount the Quark to a sled with double-side foam tape… we've done that a few times. But if you're going to be mounting it with screws, there are really no differences.

Mount the Buzzer

___ Locate the spot for the buzzer, there are two holes, one is marked with a "+". Tape the buzzer in place, then turn the board over and solder the two pins. One of the pins will stick out slightly, you may want to trim it with some small diagonal cutters.



Top side of the board… notice the "+" on the buzzer and the board



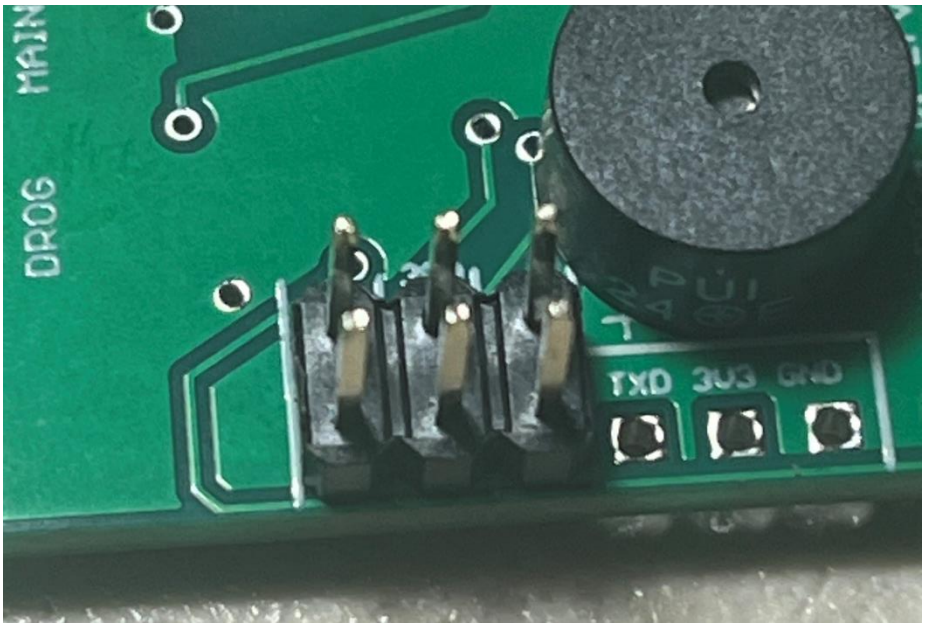
Bottom side of the board… notice the two leads, the longer lead is on the pad marked "+"

Be sure to trim them after soldering!

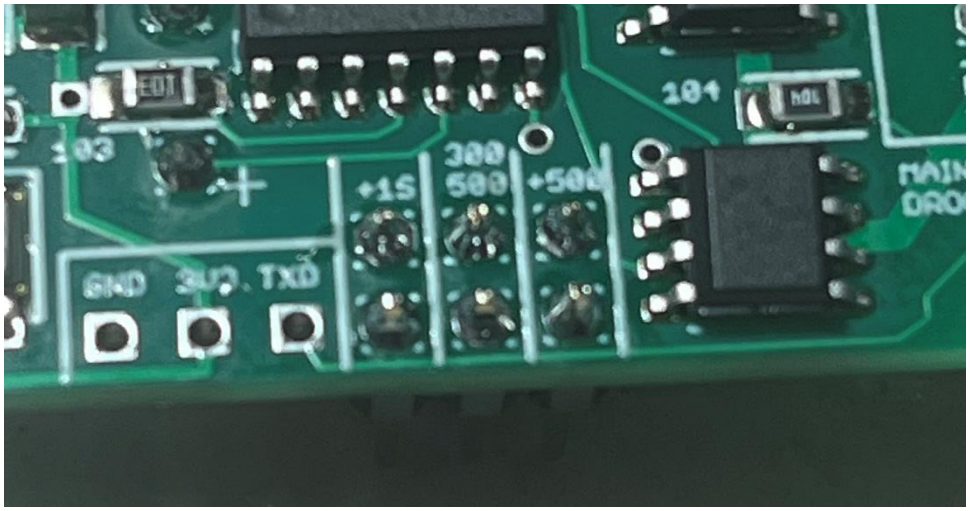
Mount the Headers

___ Locate the spot for the 2x3 header and the 3-pin header near the bottom-center of the PC board.

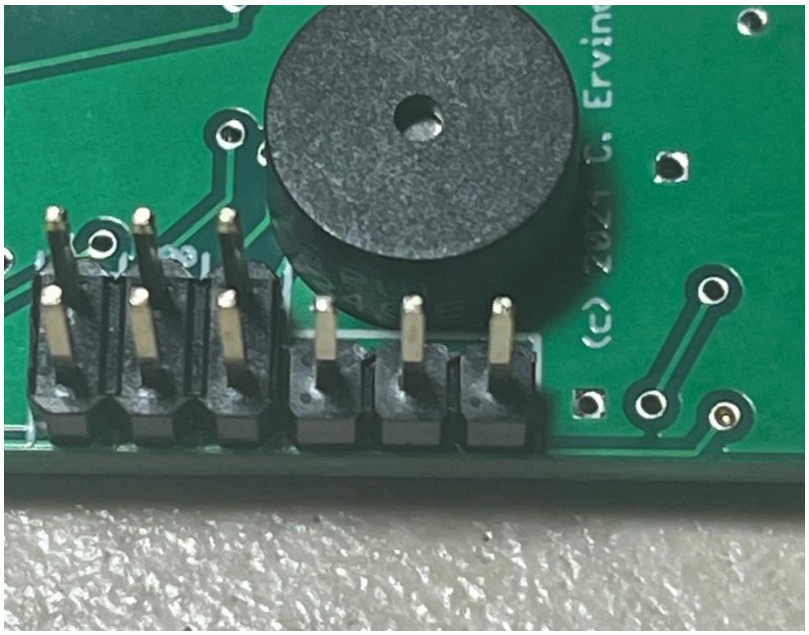
___ Put the headers in place, so that the short end goes through the PC board. With some masking tape, hold them in place. Turn over the board, and solder the pins to the pads on the PC board. Turn the board over again, and remove the tape.



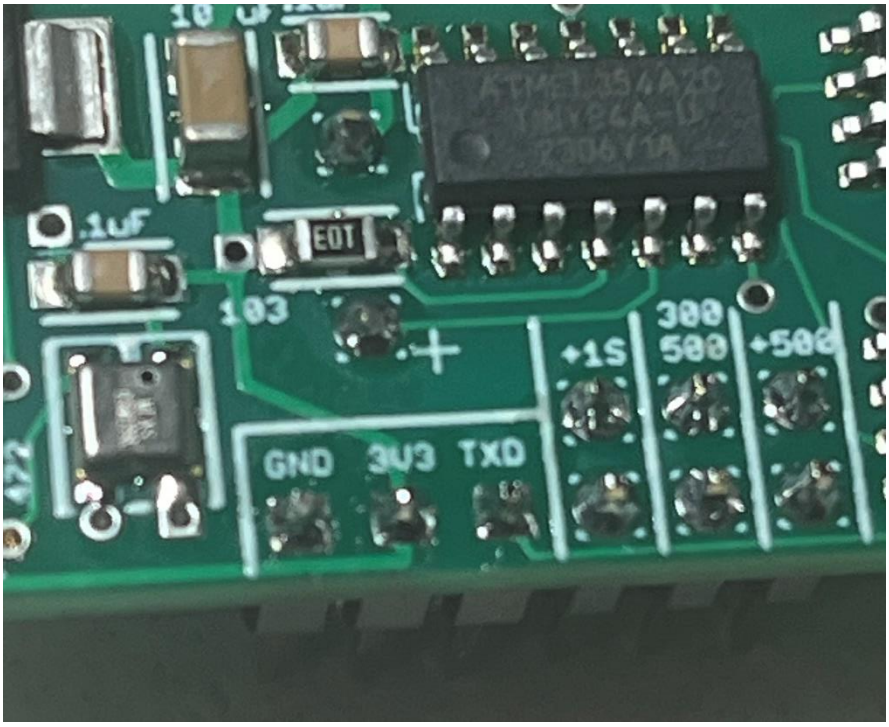
Top side of the board, showing 2x3 header



Bottom side of the board showing 2x3 header solder pads



Top side of the board showing 3-pin header



Bottom side of the board showing 3-pin header

Mount the Terminal Block (optional)

Optionally, you can install the 4-pin terminal block for your deployment wiring. Given the relatively low cost of a Quark, we generally recommend that you hardwire it to your sled by soldering your deployment wiring to the board, and don't remove it. However, some people like the convenience of removable screw terminal blocks for their wiring, so we've designed the board to take them too.

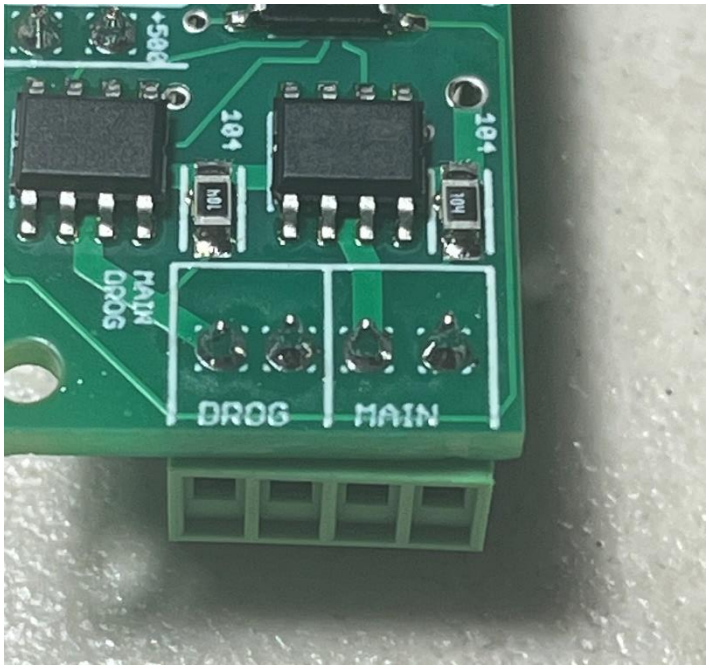
Hardwired	Terminal Blocks
• Lower Profile possible	• Slightly taller profile
• Requires soldering the wires	• Wires are simply screwed into the blocks
• Can't come loose in flight	• Wires can potentially vibrate loose in flight
• Not easy to move	• Easier to move between rockets
• Servo tape mounting OK	• Requires screw mounting due to torque

___ Locate the spot for the terminal block on the far right side of the PC board.

___ Inspect the terminal block, you'll notice that one end has larger holes and the other end appears to be closed off.

___ Install the terminal block in the mounting holes, so that the larger holes are on the RIGHT side of the board (the edge). The "closed off" side should be on the left (the inside) part of the board. Check this carefully… if you install the terminal block backwards it will be almost impossible to get to the wiring!

___ With some masking tape, hold the terminal block in place. Turn over the board, and solder the four pins to the pads on the PC board. Turn it over again, and remove the tape.



Bottom side of the board showing terminal block solder pads

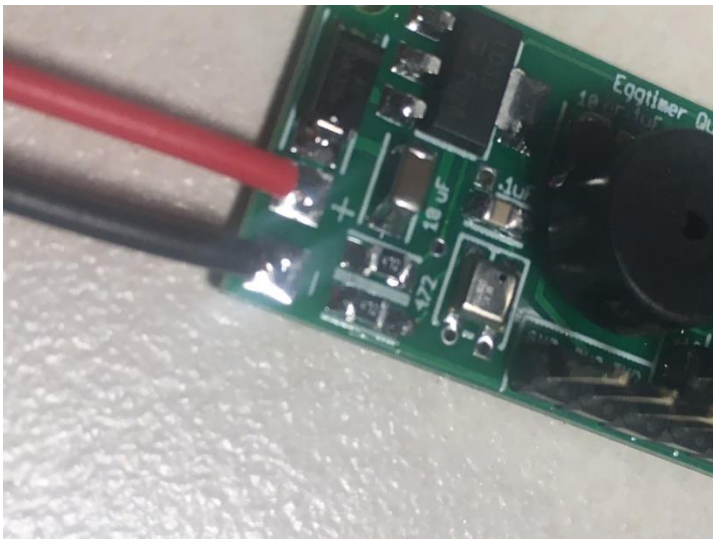
Congratulations, you are now done!   Time for some testing….

Preliminary Testing

Take the "pigtail" for the battery you are using, and compare it to your battery. Identify which lead is "+" and which lead is "-"… normally, the "+" lead is RED and the "-" lead is BLACK. IF YOU HAVE ANY DOUBT AT ALL, USE A DVM TO TEST IT WITH THE BATTERY BEFORE YOU MOUNT IT TO THE BOARD. The Quark is polarity-protected so it shouldn't be damaged if you connect the battery backwards, but it's better not to do it anyway.

We use JST connectors for almost all of our LiPo batteries. They're polarized so theoretically you can't connect the battery backwards. We say "theoretically" because some of the cheap ones aren't molded very precisely and it IS possible to insert them backwards, particularly since these connectors require a little bit of force to insert (and remove!) anyway. To help prevent against this, we take a black Sharpie marker and color the black side of both the pigtail and the battery connectors so that we have an easy reference: Match up the black stripes and you're good.

Strip about 1/8" from each lead of the pigtail, and tin the leads. Solder the "+" lead to the TOP side of the pad marked "+". Similarly, solder the "-" lead to the BOTTOM side of the pad marked "-".



Connect your battery to the pigtail. You should immediately hear a 1-second beep, and after a few seconds you should hear the "last apogee" beeps. Since it's just been programmed, it will beep 6-5-5-3-4. After another 15 seconds, you should hear four beeps, followed by a pause, then five beeps followed by a pause, with this sequence repeating for as long as you have the battery connected. This is telling you that neither of the deployment channels has continuity, which isn't surprising considering that there's nothing connected to them yet.

If you get this far, congratulations! At this point, you need to get out the Eggtimer Quark User's Guide, and perform the baro and deployment tests. Once everything passes, you're ready to mount it in your rocket at start enjoying the advantages of electronic deployments.

Troubleshooting

If your Quark 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. 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 module 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 Quark 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.

Finally, when you solder the pads, don't just melt the solder on top of the leads… it can get stuck there and actually miss the pads. We've had it happen. Head up the pads, not the leads, wait a few seconds for heat to transfer from the soldering iron to the parts, then gently apply the solder until it flows around the leads.

Check Your Buzzer Polarity

Since all of the SMT components come pre-mounted, the only active component that you're soldering in is the buzzer. Note that the buzzer IS polarized, so if you mount it backwards then it is not going to work. Make sure that the "+" mark on the buzzer matches the marking on the PC board.

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 Quark 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.

If you're using a 2S Lipo battery, make sure that it's fully charged. We've seen some funky problems due to using a battery with a low charge.

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…