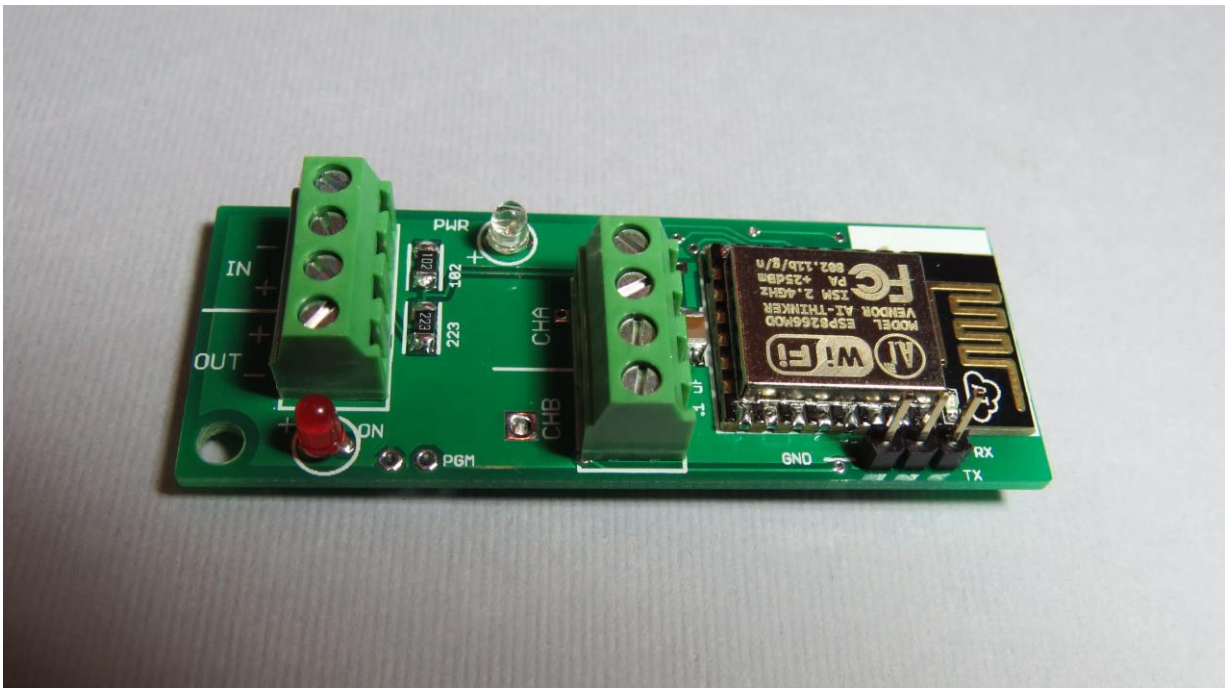


Eggtimer WiFi Switch Assembly and Users Manual

Rev A4a



© 2015 Eggtimer Rocketry
All Rights Reserved

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>

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 2.4 GHz band, and therefore must not be used in residential areas.

Contains FCC ID: 2ADUIESP-12

The Eggtimer WiFi Switch uses an ESP8266-12 WiFi module in the 2.4 GHz unlicensed band, per FCC part 15. It is intended to be used only in the United States or other countries in which this band (or a subset of it) is not subject to licensing. 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 not modifying the WiFi module in any way.

Because the WiFi Switch 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 WiFi Switch is unlikely to be significantly affected by outside radio sources, but there's no guarantee.

If your Eggtimer WiFi Switch 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 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 and unintentional emitters)

<http://www.ecfr.gov/cgi-bin/text-idx?SID=adb12f74b498e43ec453f7899d9df0fd&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>

~~~~~

## **Before You Start...**

- Go to our web site at [www.Eggtimerrocketry.com](http://www.Eggtimerrocketry.com) and download the latest Assembly/Users Guide..
- Read them thoroughly before starting... it will save you some grief later, we promise!

~~~~~

Thanks for buying an Eggtimer WiFi Switch! This is the answer to a problem that has bugged many of us electronic deployment users for a long time... How do you turn on (and off) the power to your electronics, monitor the battery voltage, and monitor deployment charge status without opening up the AV bay? There have been all kinds of switches, both mechanical and electronic, used in hobby rocketry, but they all have involved having to reach into a hole in the AV bay or put something like a magnet very close to it in order to turn on the switch. More than once we've had to take a rocket off the rail because we couldn't reach the power switch inside the AV bay...

The WiFi Switch allows you to turn on (and off) your electronics using any WiFi-enabled browser device, such as a smartphone, tablet, or laptop computer. In addition, it has two deployment-monitoring channels that can be connected to your altimeter's outputs to show you the continuity status of your deployment igniters, and you can monitor the battery voltage as well. You can do all of this from up to 100' away from your rocket. Each WiFi Switch has a unique WiFi SSID code, and it uses WPA2-PSK and AES encryption with a unique 8-digit passkey, so it's almost impossible for anyone except yourself to connect to your WiFi Switch and turn it on (or off!). To turn your electronics on or off you need to enter a 4-digit validation code that changes every 60 seconds or whenever you refresh the web page. This prevents the switch from being toggled if you put the phone in you pocket... you wouldn't want to "pocket dial" your altimeter!

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 this, 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 WiFi Switch...

Assembling your WiFi Switch kit isn't that hard, but we recommend that you don't choose it as your first kit project. You must be able to solder small components using fine solder and get nice shiny solder joints. If you have never soldered before, you need to learn anyway, because if you are going to do rocketry electronics you're going to be doing some soldering. If you want to get into advanced projects like telemetry, you're probably going to be doing a lot of soldering. We recommend that you get a few small kits from Ramsey or SparkFun, put them together, and hone your skills on them first. There's a lot of fun stuff out there, so go for it!

The WiFi Switch uses a number of Surface Mount Technology (SMT) parts, they are large by SMT standards, and are within the realm of being hand-solderable. In order to help make your assembly successful, we have included some 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 on using flux: Be VERY careful about your choice of any extra flux.

You really don't need to use any, but if you do choose to do so make sure that you use a liquid "no-clean" type of flux such as Kester 951. DO NOT use any kind of rosin or similar organic flux, it is almost certainly going to be incompatible with the flux in the no-clean solder and make a big mess. Extra flux may require excessive heat in order to boil off the flux, possibly damaging the sensitive components in the kit.

For soldering components on a board like the WiFi Switch, we recommend a small pencil soldering iron, about 15W. If you are only going to use it occasionally, Weller makes a decent cheap 12W iron, it's about \$15. There is also a similar iron that's sold by ECG. We like those, but the copper tips seem to oxidize and corrode rather quickly compared to some more expensive irons; fortunately, the tips are replaceable and cheap. Better would be a fancier soldering pencil with iron tips; those run about \$30, but they'll last forever. The best iron would be a temperature-controlled solder station; they typically start at about \$50 for a cheap one and can go to a few hundred dollars if you want to get really fancy. Weller makes a good one for about \$50, if you make the investment that will probably be the last soldering iron you will ever need to buy. These solder stations usually have a little well with a tip-cleaning sponge, so they end up taking less room on your workstation too. Get the smallest tip you can find, preferably with a conical tip that's about the same width as the smallest pad. .032" (.8 mm) conical tip is ideal. We do NOT recommend that you use an extremely-fine "needle nose" tip, we have found that they may not conduct enough heat to the pads to allow the solder to flow out well. A conical tip with a 1/32" width (.031") should be fine.

General Assembly Information

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

- ___ Low-wattage soldering iron, 15W or less, with a fine conical tip
- ___ Small needle-nose pliers
- ___ Small diagonal cutters
- ___ Tweezers to handle the SMT parts
- ___ A small damp sponge for cleaning the tip of your soldering iron
(mesh "sponge" works great too)
- ___ A sal ammoniac block or "tip cleaner" (not essential, but helpful)
- ___ A lighted magnifier, for inspecting solder joints (not essential, but very helpful)
- ___ A jeweler's loupe or small 10x magnifier, for inspecting the SMT solder joints
(again, not essential but VERY helpful)
- ___ A well-lighted place to work, preferably with a wood or metal surface,
also preferably not carpeted
- ___ Some PAPER masking tape (do NOT use Scotch® tape or electrical tape)

Each installation step has a check-off line, we strongly recommend that you check them off as you go, and that you perform the steps in sequence. We have listed the steps in order to make it easiest to assemble the WiFi Switch, deviating from them isn't going to make your life any easier.

We strongly recommend that you consult the assembly pictures on the Eggtimer Rocketry web site, www.EggtimerRocketry.com . Go to Photos/WiFi Switch Build.

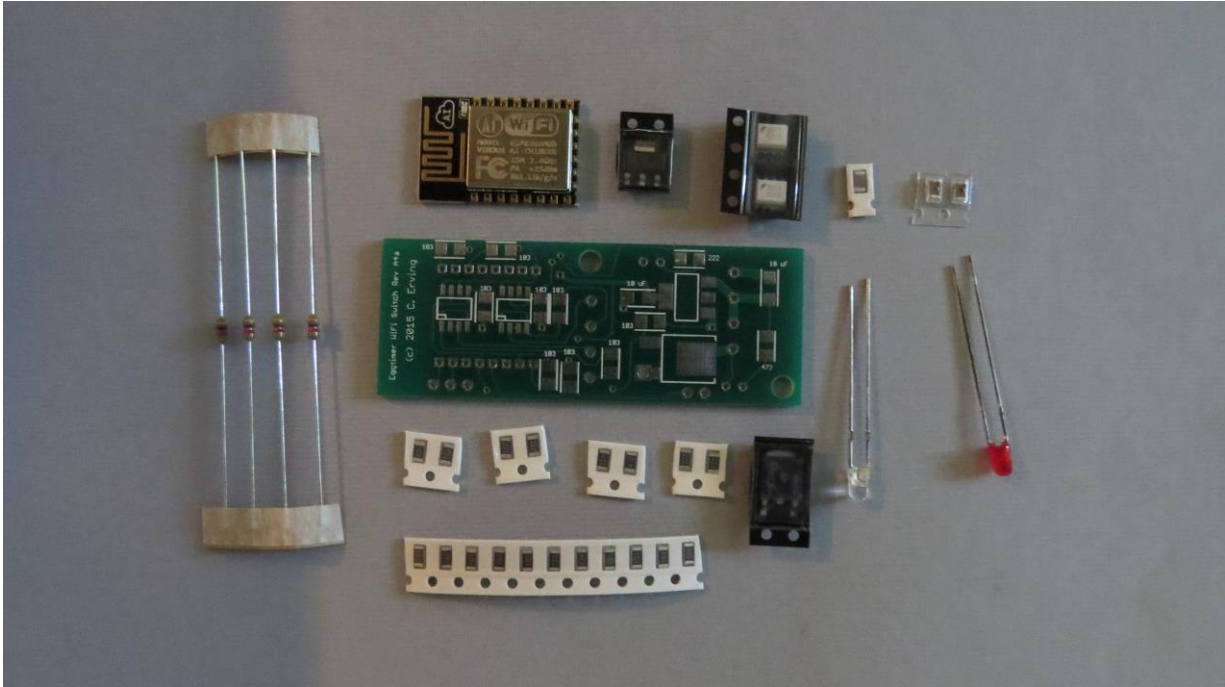
Each step is pictured, so you can see exactly what you need to be soldering. Looking at the pictures as you go will help prevent you from soldering the wrong thing, or putting something in the wrong way.

Assembling your WiFi Switch

Step 1: Sort the Components

Before you start soldering anything, you need to lay everything out and make sure that you are familiar with all of components, and that you have everything. If you are missing something, let us know immediately so we can send you whatever you need. You should have the following parts, check them off as you sort them...

<u>Qty</u>	<u>Description</u>
___ 1	Circuit board
___ 1	Pre-programmed ESP8266-12 WiFi Module
___ 1	LD1117-33 3.3V voltage regulator (SOT-223 package)
___ 2	MOCD217 Optoisolators (SOIC-8 package)
___ 1	NTD4965NT4G MOSFET (Larger package with 3 leads)
___ 1	3mm Red LED
___ 1	3mm Amber LED (may be clear)
___ 1	1K 1206 resistor (marked "102")
___ 1	2.2K 1206 resistor (marked "222")
___ 1	4.7K 1206 resistor (marked "472")
___ 9	10K 1206 resistors (marked "103")
___ 1	22K 1206 resistor (marked "223")
___ 1	.1 uF 1206 ceramic multilayer capacitor (brown) (not marked, but it's in a PAPER carrier)
___ 2	10 uF 1206 ceramic multilayer capacitors (brown) (not marked, but they're in a CLEAR PLASTIC carrier)
___ 4	1/8W resistors (value not important... we're just using them for the leads)
___ 1	3-pin header
___ 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 WiFi Switch 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 WiFi Switch, 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 WiFi Switch with static electricity, but consider yourself notified of the possibility...

Also note that some of the components are polarized, i.e. it matters which way you put them in. If you solder one of these components in backwards, the effect will range from something not lighting up (LEDs) to nothing at all working. It is **CRITICAL** that you test-fit the parts before you solder, and that you make **SURE** that you have them pointed the right direction before soldering. Like the old adage says, "Measure twice, cut once." If you solder a part onto the board incorrectly, it can be a minor pain to remove if it only has two pins, or it can be virtually impossible for something with a lot of pins. ***The WiFi Switch Limited Warranty does not cover incorrect assembly***, so if you mess up badly enough you may end up having to get another kit and starting over; neither of us want that.

It is very important that you assemble the WiFi Switch in the order listed. This makes it easier to access the surface-mount components; if you start soldering out of order it's going to be tough for you to get to the pads of the SMT parts. Some of the instructions will call for you to tack-tape parts to the board to maintain alignment while you solder. You should **ONLY** use paper masking tape for that purpose, **DO NOT** use "Scotch"® tape or electrical tape for this; plastic tapes can pick up static electricity and damage parts, and electrical tape tends to leave a sticky residue.

If you have any questions about the assembly, please send us an email, to support@eggtimerrocketry.com , BEFORE you start building. We generally answer all questions the same day, and we do our best to ensure your success.

Eggtimer WiFi Switch Assembly Checklist

Before you solder anything, make *absolutely* sure that you have the correct part and that it is inserted in the board correctly. The board has all of the component values, outlines, and polarities silk-screened on the top, so there shouldn't be any doubt about what goes where and how. Nevertheless, if you have any questions about the assembly procedure, do not hesitate to drop us a line at support@eggtimerrocketry.com before you solder the parts to the board. You may have to wait a day for the answer, but it could save you a lot of grief later on!

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

About soldering the resistors and capacitors

A lot of people get put off by the idea of having to solder small SMT parts like resistors and capacitors, but it's really not that hard to do once you get the hang of it. In fact, many of our users prefer SMT parts to through-hole parts, because you don't have to clip the leads and they just plain look cooler. Here's how to mount them... once you do one or two you'll find that it's actually pretty easy.

Lightly tin only ONE of the two pads on the board. With tweezers, lay the part down on the board, and heat up the lead over the tinned pad until the solder flows. Wait a few more seconds, then remove the heat, holding the part there until the solder cools for a few seconds. Let it cool for another 10 seconds, then carefully solder the other pad, being careful not to use too much heat. Once the solder starts to flow, remove the heat and let the joint cool. If you keep the heat on too long, you may heat up the part enough so that both joints melt and the part is likely to lift off the board when you remove your iron. It might also "tombstone", that is, lay on end due to the previously-soldered joint melting. If this happens, just heat up the joint, remove the part with your tweezers, and try again.

After you've soldered the part in place, inspect the joint carefully with a 10x jeweler's loupe. You should see good solder coverage on the pad with the solder wicking up to side/end of the part, and there should not be any solder splatter or bridges. (Splatter means your iron is too hot... turn it down about 50F and try again). If you don't like what you see, heat up the joints and remove the part, and/or clean it up with some solder wick, and start over.

OK, so let's get started...

Mounting the Bottom-Mount Parts

There are parts mounted on both sides of the WiFi Switch board, this is done to save space. It does make the assembly task a little bit more complicated, but in general most of the smaller parts are mounted on the “bottom” side of the board (i.e. the side that you don’t see when it’s mounted in your AV bay), so the “top” side of the board is pretty easy. We’re going to mount the stuff on the bottom first, then when we’re done we’ll turn it over and mount the stuff on the top side. All of the parts on the bottom side of the board are surface-mount, so we recommend that you tape the board to your work table first to make it a little bit easier.

— Orient the board

Tape the board down to your work surface with masking tape, on the extreme left and right sides so you don’t cover any of the pads. The left side should be the side with the Eggtimer WiFi Switch logo, the right side should be where the mounting holes are.

— Mount the Optoisolators

Locate the two spots for the optoisolators, they’re the 8-pin pads on the left side of the board. The optoisolators will be mounted so that the notch/pin is facing the left side of the board. Note that some optoisolators don’t have a notch/pin, but if the writing is right-side up then it’s positioned properly. We’ll do the left one first, then you can do the right one the same way.

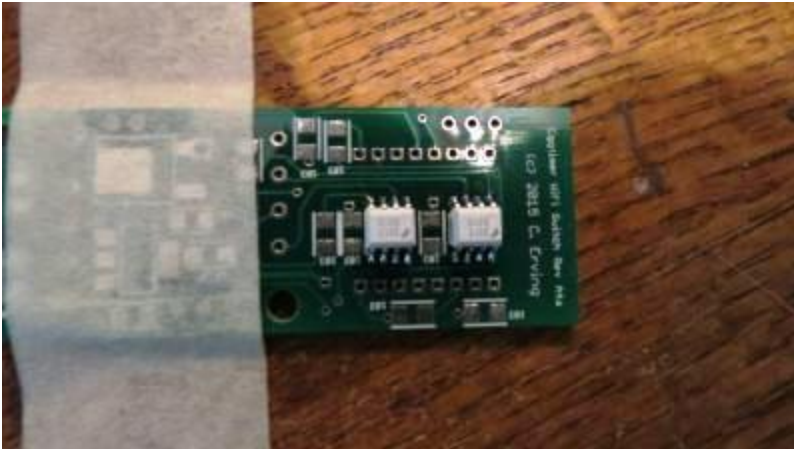
Tin the lower-right pad with just a little bit of solder. With tweezers, hold the optoisolator in place, and heat the lead over the tinned pad until the solder melts. Keep the heat on for another 3-4 seconds, then remove the iron and let the pad cool.

Check the alignment of the optoisolator on the pads, all of the leads should be centered on the pads. If not, heat up the lead and carefully move the optoisolator in place.

Once you’re satisfied with the alignment, carefully solder the remaining leads to the pads, waiting 15 seconds between each lead so that the device has a chance to cool down a bit.



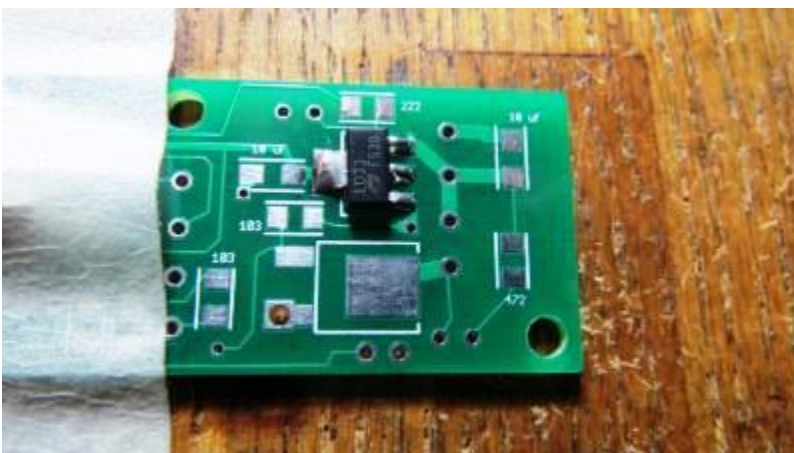
When you're done, solder the right optoisolator in place using the same procedure. Inspect the joints carefully... the optoisolators have short stubby leads, and it's relatively easy to have the solder on the pads miss the leads if you don't use enough solder.



___ Mount the 3.3V Voltage Regulator

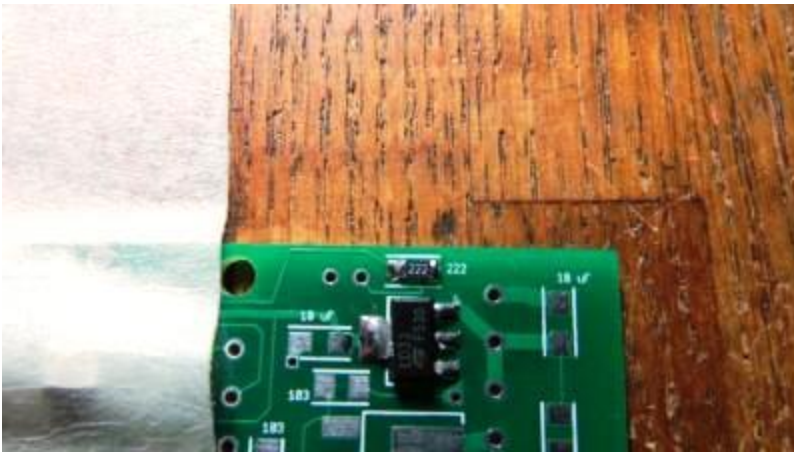
Locate the large pad and the three small pads for the voltage regulator. Heat up the large pad with your soldering iron and melt a small amount of solder on the large pad, just enough to cover it. Place the voltage regulator IC in place, and hold it down, then heat up the large pad on the voltage regulator until the solder starts to flow. Hold your soldering iron on the pad for another 5 seconds, then remove it and wait at least 10 seconds.

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



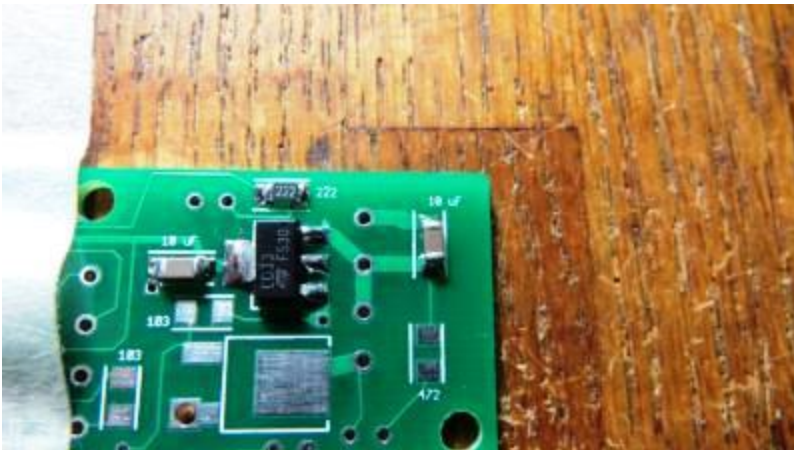
___ Mount the 2.2K resistor

Locate the 2.2K resistor (marked "222") next to the regulator. Solder it in place.



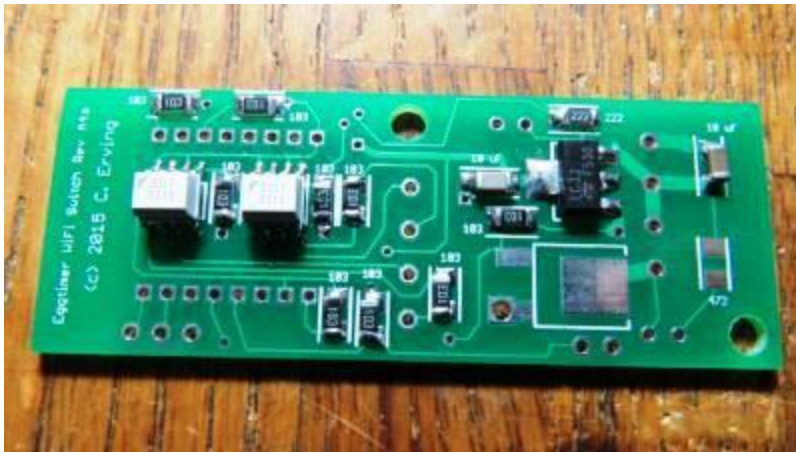
— Mount the 10 uF capacitors

Locate the two 10 uF capacitors, one on either side of the voltage regulator. Note that the two different valued capacitors look almost identical and are unfortunately not marked... the 10 uF capacitors are the ones that have one MORE (i.e. there are TWO 10 uF capacitors but only ONE .1 uF capacitor), and they come in a clear plastic carrier (the other ones are in a paper tape carrier). Solder them in place.



— Mount the 10K resistors

Locate the nine 10K resistors (marked “103”) on the board. Solder them in place.



___ Mount the MOSFET

Locate the spot for the MOSFET, it's just to the right and below the voltage regulator. Very carefully remove the MOSFET from its package.

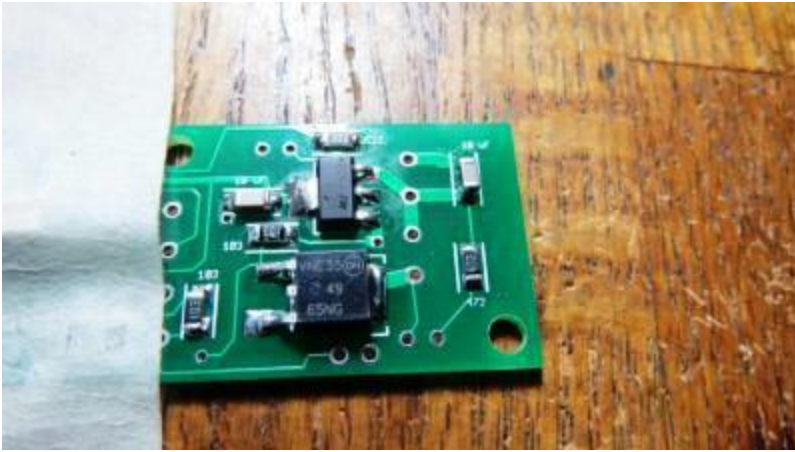
Lightly tin the large pad nearest to the right side of the board. With tweezers, hold the MOSFET in place, centering it over the pad. If you have it right, the two leads on the other side should just sit on the opposing pads. Heat up the lead over the tinned pad until the solder starts to flow onto the lead, wait a few more seconds, then remove the iron and let it cool for at least 5 seconds before you let it go. Note that this is a big pad, so it may take several seconds to get enough heat into the pad to melt the solder.

Inspect the alignment of the MOSFET, making sure that the other two leads are sitting on their pads. Once you are satisfied, solder the remaining leads to the pads.



___ Mount the 4.7K resistor

Locate the 4.7K resistor (marked "472") to the right of the MOSFET. Solder it in place.



This completes the bottom-mount part of the assembly. Check all of the solder joints carefully with a magnifying glass or 10x jeweler's loupe to make sure that you have good solder coverage and you haven't created any solder bridges. When you're satisfied with your work, untape the board from your work surface.

The Top-Mounted Components

The rest of the parts are mounted on the “top” of the board, that is, the side that you’re going to see when you hook things up. You may find that a “third hands” board holder will come in handy... you’re going to be turning the board over and soldering the parts to the “top” side, but some of the parts are through-hole parts so the solder joints will be on the “bottom” side, so it isn’t really practical to tape the board down, especially when you mount the WiFi module because it goes all the way to the left edge of the board.

— Mount the ESP8266-12 WiFi Module

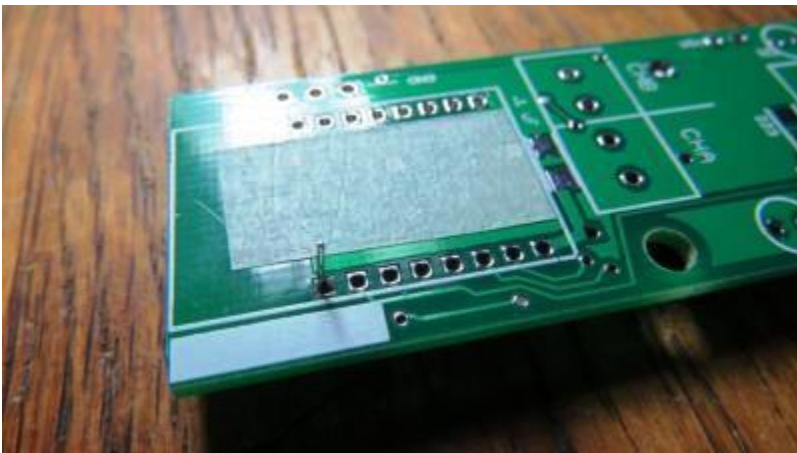
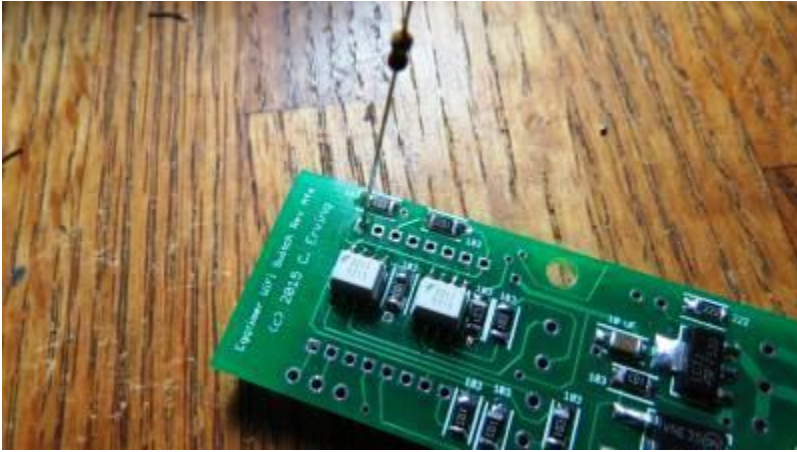
Carefully remove the ESP8266-12 WiFi module from the baggie in which it was shipped. (Be sure to keep the baggie, it has the passkey that you’ll need to connect to your WiFi device.) Note that one end has a “squiggly” line and sticks out, this is the antenna side, be sure to line it up with the left side of the PC board.

Locate the space where the WiFi module will be mounted, there’s a large rectangular marking with eight pads on either side. Cut a piece of paper masking tape so that it fits between the row of pads where the WiFi module goes, from the edge just past the pads to the opposite edge of the module. This will provide insulation from the vias on the PC board that are underneath the WiFi module.

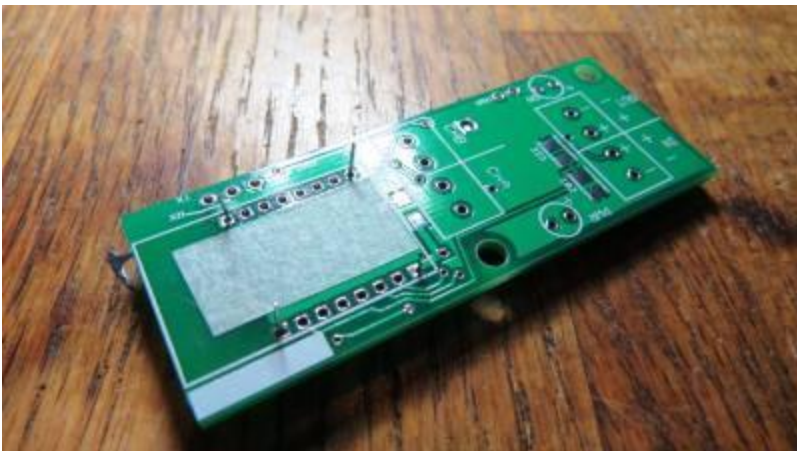


Turn the PC board over so that the BOTTOM side (the one with the optoisolators, etc.) is “up”. Prop the board up so that there’s about 1/8” or so underneath the board. Take one of the 1/8W resistors and put it into one of the corner holes where the WiFi modules pads are.. Yes, it will stick up a lot. Solder the lead to the pad, then clip the lead off at the pad. Insert the resistor’s leads into the next three corners, soldering them to the pads.

When you are done, you will have a wire sticking out of each corner on the TOP of the board, the side that the WiFi module is going. Slide the WiFi module over the four wires, one in each corner, then tape the board down temporarily so it won’t move. With a pair of diagonal cutters, cut the wires flush with the top of the WiFi module’s four corner pads. Note if you look at them in a magnifying glass, there will still be a little sticking up; that’s fine, if not preferable.



Hold your soldering iron to the **SIDE** of one of the corner pads for about 5 seconds, then apply solder to the **TOP** of the pad right next to the wire. You only need a little bit, you'll see it flow out and drop down the hole when you got it right. Be careful not to get any solder on the metal shield covering the top of the WiFi module. Repeat for the other three pads, then remove the tape from the board.



Now, turn the board over so the WiFi module is on the bottom, and using the remaining resistors/leads stick wires through the remaining 12 WiFi module pads, soldering them and clipping them as you go. When you are done, all 16 pads (8 on each side) should be soldered on the bottom of the board, and all 16 pads on the WiFi module should be soldered.



Note: Your WiFi module may have six extra pads opposite the antenna, do not solder these or do anything at all with them.

— Mount the .1uF capacitor

Locate the spot for the .1 uF capacitor, just below the WiFi module. This is the capacitor that comes in the PAPER tape carrier. Solder in place, making sure that you do not get solder on any pads on the WiFi module (especially the aforementioned 6 pads at the end, if they are present).



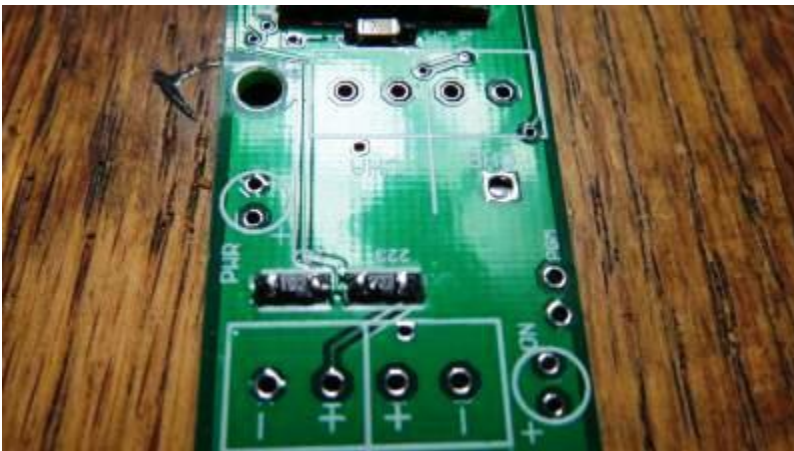
— Mount the 1K resistor

Locate the 1K resistor (marked “102”) near the left side of the board. Solder in place.



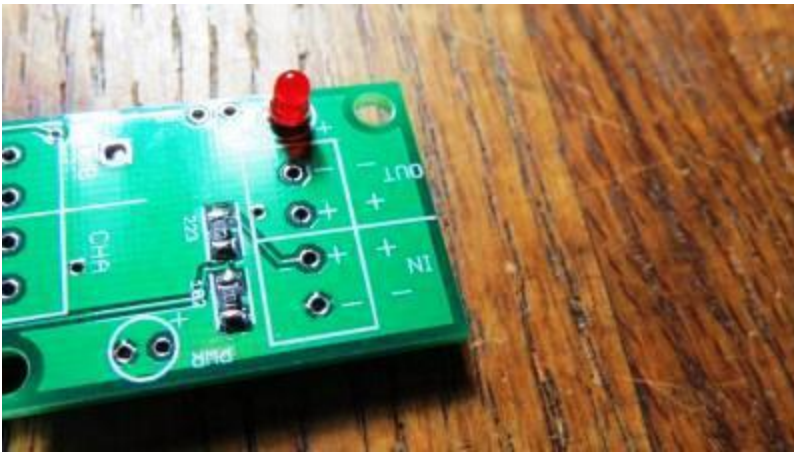
— Mount the 22K resistor

Locate the 22K resistor (marked “223”) near the left side of the board. Solder in place.



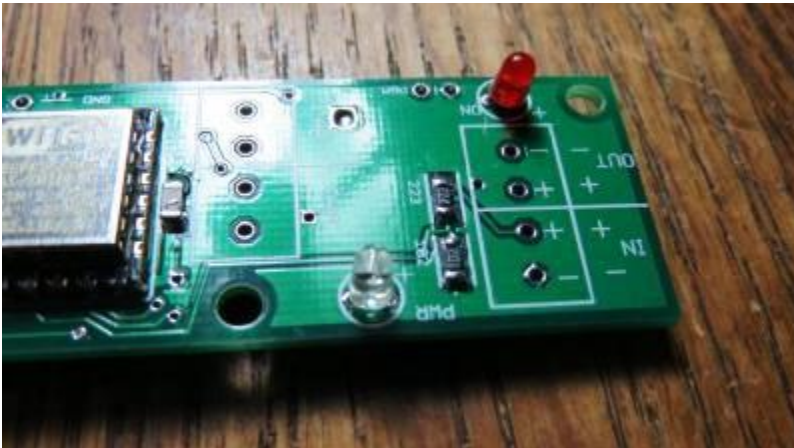
— Mount the Red LED

Locate the spot for the Red LED, it’s the one on the bottom left hand side of the board marked “ON”. Note that it is polarized; you need to match up the LONG lead on the LED with the “+” pad on the board. Insert in in place, and use a small piece of paper tape to hold it to the board. Turn the board over, solder the leads to the pads, and clip the excess leads.



— Mount the Amber LED

Locate the spot for the Amber LED, it's the one marked "PWR" on the upper-center side of the board. Note that it is polarized; you need to match up the LONG lead on the LED with the "+" pad on the board. Insert in in place, and use a small piece of paper tape to hold it to the board. Turn the board over, solder the leads to the pads, and clip the excess leads.



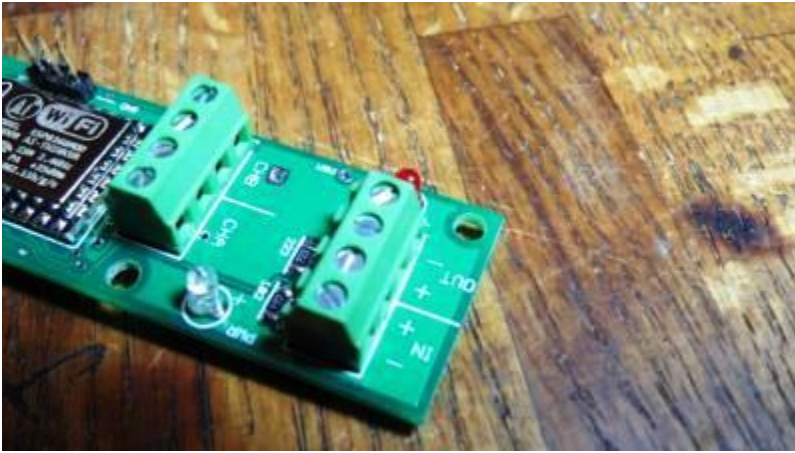
— Mount the Header

Insert the 3-pin header so that the short side goes through the board. Hold it in place with some masking tape, turn the board over, and carefully solder the pins in using just enough solder to bond the pins to the pads.



— Solder the Screw Terminal Blocks (Optional)

If you're going to use them, insert the screw terminal blocks on the board, making sure that the open side is facing outwards (to the left), away from the WiFi module. The open side of the blocks (where the wires go) should face the markings on the board. Turn the board over and solder the pins to the pads.



Get out your lighted magnifier and carefully inspect all of the solder joints. Make sure that there are no solder bridges, particularly on the WiFi module. If something doesn't look 100% right, resolder it, removing it first if you have to.

Congratulations, you're done! Time to make sure it works now...

Preliminary Testing

Loosen the screws on the terminal block screws (if you're using them) and connect your battery "pigtail" to the leads marked IN. If you're not using the terminal blocks, solder your battery pigtails to the pads marked IN. Make sure that the "+" lead (generally RED) goes to the "+" terminal on the terminal block, and the "-" lead (generally BLACK) goes to the "-" terminal. If you are not 100% sure of the colors and polarity of your battery pigtail, check them with a digital voltmeter and your battery BEFORE you connect it. **YOU WILL DAMAGE THE WIFI MODULE IF YOU HOOK A LIPO BATTERY UP BACKWARDS, SO TAKE YOUR TIME AND BE 100% SURE!** Tighten the screws (if you used the terminal block).

Connect your battery to the pigtail. The red LED marked PWR should blink three times, go out for a second or two, then remain on... if it does, congratulations! You're done. Read on for a detailed explanation of how to hook it up to your electronics and how to use it. If you're a bit impatient and want the 10-second tutorial, jump to the Quick Reference Guide at the end of this manual... if you get stuck, though, you just might end up reading the long version anyway!

If it does not, immediately disconnect the battery and go to the troubleshooting section. Chances are pretty good that you have a solder bridge or an incomplete joint, so the first thing you need to do is to examine the board thoroughly with a magnifying glass. About 99% of all the problems that we see are due to soldering issues.

Mounting the WiFi Switch in Your AV Bay

The WiFi Switch has two #4 holes for mounting in a AV bay sled. It's about 2.5" x .9" x 3/8", so you'll need to make sure that you have enough room on your sled for it. It doesn't matter which way you mount it, as long as it's mounted so the WiFi module is facing outwards. There's a drilling template on the Eggtimer Rocketry web site, we recommend that you download it, print it, and cut it out with scissors so you can drill the mounting holes accurately.

Our favorite mounting method is to use two #4 hex-head cap screws, about 3/4" long, and a short (about 1/8") piece of 1/4" i.d. rubber tubing to act as a spacer between the bottom of the PC board and the sled. We hold it on with nylon-insert nuts... they don't work loose. If you mount it like this, you can pretty much use whatever monster motor you may have on-hand (like the infamous O5800, for example) without fear of anything coming loose, and the rubber tubing makes a nice cushioned mount.

For rockets with somewhat lesser acceleration, we've used double-stick foam tape ("servo tape"), it works just fine, but note that the tape isn't going to cover 100% of the bottom of the board because it's not flat. Make sure that whatever surface you're attaching it to is nice and clean; any dirt will get between the adhesive and the board, and keep it from sticking.

We generally recommend that you try to mount the WiFi Switch as close to the battery and your altimeter as possible, and keep the wiring as short as possible. Small zip ties work really well for tidying up the wires. Also, we **strongly** recommend that you zip tie the wires connected to the WiFi Switch to your sled, to provide strain relief for them. In general, if a wire can't move, it won't come loose. Enough said...

Note that large bits of metal in your AV bay will reduce the range of your WiFi switch, as will metallic paint or carbon fiber body tubes. In most cases, the range will be good enough for you to be able to operate the WiFi Switch from a reasonable distance, but you need to be aware of this in case you're thinking that you can arm your 75mm minimum-diameter carbon fiber machbuster sitting on the away pad from the LCO's table... it ain't gonna happen.

About Batteries for Your WiFi Switch...

The Eggtimer WiFi Switch is designed for a battery from 4V-16V, this fits in nicely with the requirements of most hobby rocketry electronics. Since the WiFi Switch is designed to be used with a variety of different batteries, we don't provide a battery connector; you'll need to get whatever connector matches the battery that you're using. You CAN use a 1S/3.7V LiPo battery with the WiFi Switch, note that the range may be slightly reduced compared to a larger battery, but it should be more than adequate for most uses.

The WiFi Switch uses about 85 mA of current, so we recommend that you use a battery with at least 300 mAH of capacity. That will give you about 3 hours of power, which should be enough for almost all flights. Bigger is better. You CAN use a smaller LiPo battery, just remember that the run-time will be less, so if you put a 200 mAH battery in your AV bay and it sits on the pad for two hours, you may have an unpleasant surprise if your battery runs down

before your flight. Fortunately, it's easy to monitor the battery voltage of your WiFi Switch, so this shouldn't happen.

Regarding the battery voltage monitor, we recommend that if you're using a LiPo battery you don't fly if the battery voltage registers under 3.5V per cell. 3.7V is the nominal rated output voltage, but the reality is that a fully-charged LiPo cell will read 4.2V or near. That's a lot of leeway, so if it's already drained down that far before you fly it may end up going dead (below 3.0V) if you have to spend a lot of time looking for your rocket. As always, the best policy is to charge your batteries completely before each flight, and/or use a fresh battery.

Note: We strongly recommend that you do NOT use a 9V alkaline battery with your WiFi Switch, unless you connect it shortly before launch and do not reuse it. Most 9V alkaline batteries are only good for 100 mA, so you may get less than 60 minutes of use out of one. We realize that they ARE easy to get and they ARE convenient because you don't have to mess with charging them, but having an expensive rocket lawn-dart into the ground because of a weak battery is not something we like to see.

Loosen the screws on the INPUT side of the screw terminal block, and connect your battery connector to it. Usually, the "+" side of the battery will be RED and the "-" side will be BLACK; if you are not 100% sure, use a DVM to confirm the polarity BEFORE you connect a battery. Tighten the screws firmly. If you are using stranded wire, you may want to tin just the very end of the wire to prevent it from fraying; a loose strand of wire can short out the battery, which can cause a fire if you're using LiPo batteries, so check your connections carefully to make sure that there are no shorts.

Connecting To Your Electronics

You will be hooking up your electronics to the OUT terminals of the WiFi Switch. The WiFi Switch basically replaces the battery input on your altimeter, which is why you want to be using the same battery that you'd be using for your altimeter. Connect the "+" side of the OUT terminal to the "+" battery input on your altimeter, and the "-" side of the OUT terminal to the "-" battery input on your altimeter.

Since the Altimeter is going to be switched on and off by the WiFi Switch, you will need to shunt any separate switch input that your altimeter may have. Generally, all you need to do is to connect a short piece of wire between the two switch terminals. When you turn on (and off) your WiFi Switch, it will then power on (or off) your electronics.

The continuity connections are a little bit trickier. There are two sets of continuity terminals, marked CHA (-1 and -2) and CHB (-1 and -2). To get these to work properly, you need to connect the channel between the switched side of your igniter and either GND ("-") or +V depending on whether your altimeter switches GND or +V. Confused? Read on...

Deployment channels work as a switch, basically connecting the igniter to the battery. Some altimeters act as a switch on the GND side of the battery, and some altimeters act as a switch on the + side of the battery. In order to tell if you have continuity, you need to connect the CHA (or CHB) leads between the side of the igniter that's on the OPEN part of the switch and

the SWITCHED battery terminal, effectively completing the igniter circuit with the high-resistance continuity-check circuit of the WiFi Switch. The WiFi Switch uses optoisolators to isolate the higher-voltage from its circuitry, and there's a 10K resistor in series so it typically draws under 1 mA of current... you don't need to worry about it firing your igniter, but it's plenty enough current to tell the optoisolators to turn on.

To make life easier, we've tried the WiFi Switch with a number of popular altimeters, and we've posted connection diagrams on the Eggtimer Rocketry web site. If your altimeter isn't listed, drop an email to us at support@eggtimerrocketry.com , chances are good that we can tell you how to hook it up.

Using Your WiFi Switch

The WiFi Switch acts like a WiFi access point and a server, you simply connect your WiFi-enabled device to it and browse to its home page, and voila! you get a web page that lets you turn your switch on and off.

Like any secured WiFi network, you need two things to connect... the SSID and the passkey. The SSID of your WiFi Switch will be "WIFI_SW_nnnnnn" where nnnn is the last 6 hexadecimal digits of your device's MAC address (a unique address given to every Ethernet device).

The passkey is an eight-digit number generated by a random number algorithm the first time that your WiFi Switch is powered on, and is saved in EEPROM memory at that time. It's going to be unique for every WiFi Switch. There should be a label on the little baggie that the WiFi module came in with the passkey, but it's easy to get it if you lose it...

To get the passkey, connect a USB-Serial cable (the same cable that's used with all EggTimer Rocketry products) to the 3-pin header as follows:

BLACK wire – GND
WHITE wire – TX
GREEN wire – not used

Using an ASCII terminal program such as TeraTerm or HyperTerminal, connect to the serial port at 115,200 baud, 8 bits, no parity, 1 stop bit. Now connect the battery on your WiFi Switch. You should see the following information:

(a few lines of garbage... part of the boot process)

```
WiFi Switch v1.02
SSID: WIFI_SW_F87A6E
PASSKEY: 3718 6501
```

Note that there is a space between the first four digits of the passkey and the second four digits, that's just to make it easier to read; when you actually enter the passkey don't type the space.

Disconnect the battery, and remove the serial cable. You won't need the cable again unless you forget the passkey, or you need to flash the software.

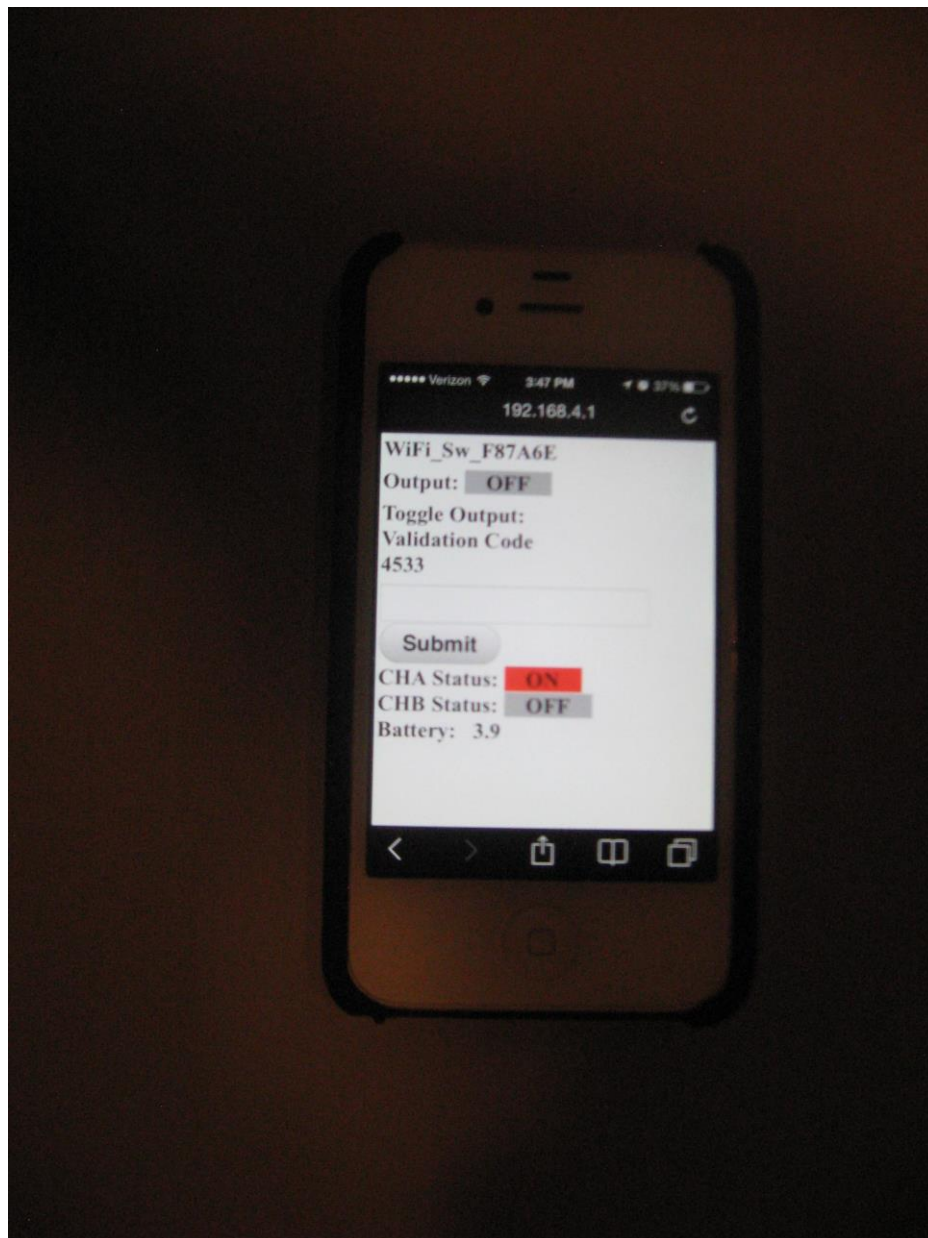
Now, fire up your device's WiFi manager. Connect the battery to your WiFi Switch... you'll see the PWR LED blink 3 times then stay on, and in about 10-15 seconds you should see your WiFi Switch's SSID on your WiFi manager. Connect to the SSID using the passkey that you obtained earlier (but don't put the space between the digits!), and you should see that the status of your WiFi connection changes to Connected. You're now connected to your WiFi Switch, and ready to start using it.

The WiFi Switch Web Page

After you've successfully connected to your WiFi Switch using the SSID and passkey, start the browser for your device and type the following URL into the address box:

<http://192.168.4.1>

You should immediately see the WiFi Switch page. We recommend that you add this page to your Favorites and/or bookmarks to make it easier to find. Note that if you have more than one WiFi Switch the home page is going to be the same for all of them, so you only need to bookmark it once.



The WiFi Switch page shows you several things:

- The ON/OFF status of the switch's output
- The Validation Code that you need to use to turn it off/off
- The status of the two continuity channels (CHA/CHB)
- The battery voltage

There is also a text box to enter the validation code to toggle the output, the validation code that you need to use is displayed immediately below the box.

Note that if you just sit and admire the screen for long enough (60 seconds, to be exact) it will refresh on its own, and you'll get a new validation code. This also refreshes the state of the continuity channels, so if for some reason one of the channels changed status you'll know. You can also force a refresh by clicking on your browser's refresh icon, or by simply clicking the Submit button below the validation code text box.

Note that we've put an "ON" status LED directly on the WiFi Switch PC board, you probably won't care much about it when it's locked up in your AV bay but it's very handy when you're testing because it shows you the actual state of your switch... you can test it before installing in your rocket.

When you first power on the WiFi Switch, the output is turned OFF. To turn it on, click in the validation code text box and enter the 4-digit validation code, then click on the Submit button. The "ON" LED should come on, and the WiFi Switch's web page should show that the Output status is now ON (red highlighted box). If you make a mistake or for some other reason it doesn't "take", simply enter the next validation code and click on Submit. The ON/OFF status is the actual status of the output, so you can be confident that whatever status is being reported is what's really happening.

The two continuity channels, CHA and CHB, are driven by the altimeter's power, so you'll see them turn ON (or not...) immediately after you power on the altimeter. If one of the channels is OFF and you're expecting it to be ON (i.e., you have an ematch connected to one of the outputs) that tells you that either you have a bad ematch or a bad connection... you should turn everything OFF and check your wiring before you fly. Of course, your altimeter will probably beep out some kind of status information to tell you that, but it's nice to have a visual indication.

To turn off the WiFi Switch, click in the validation code text box, enter the 4-digit validation code, then click the Submit button. The "ON" LED will go out, and the status will change to "OFF" (grey highlighted box). The battery voltage will continue to be displayed, however the continuity status will turn "OFF" along with the power since there's no power to drive them from the altimeter anymore.

Pretty easy, huh?

Flying with your WiFi Switch

Flying with the WiFi Switch is a little bit different than using a mechanical switch. With a mechanical switch, you have everything disconnected until you're on the pad, then you turn it on. With the WiFi Switch (or any other electronic switch, for that matter) you have to connect the battery to the switch when you're buttoning up your AV bay at your work table, then you activate it when you're on the pad. You don't want the switch coming on accidentally, which is why we have several "safeties" in place to prevent this from happening (WPA2-PSK encryption, unique SSID/passcode for each unit, validation code). There's no way that your WiFi Switch can be turned on or off accidentally by yourself or anyone else.

After you power up your WiFi Switch at your worktable, you'll want to connect to it with your phone/tablet to confirm that any deployment channels that you are using have continuity. (For safety's sake, you should do this with ONLY and ematch in your charge well, i.e. with NO pyrotechnic charge!) Note that nothing REQUIRES that you use the continuity check (i.e., the WiFi Switch will allow you to power up your altimeter with or without them in place), but it's nice to be able to visually see that you have good continuity on your igniters without having to listen for your altimeter beeping out continuity (or lack thereof, in the case of EggTimer altimeters). This is especially true of those large projects in which it may be difficult to get to the AV bay to hear the altimeter's beeping.

Once you've checked everything out, close up the AV bay and finish prepping your rocket. You can disconnect from the page if you want, and you can even shut off the WiFi connection. The page will be there waiting for you when you're at the pad.

Take the rocket to your RSO/LCO, get it cleared and take it out to the pad, hang it on the rod/rail, and re-connect to your WiFi Switch. Note that the validation code is undoubtedly going to be different than what it was when you disconnected, since it changes every 60 seconds. Make sure that your battery voltage is good, then enter the validation code in the text box and click Submit to turn on the switch. You should see the power status change to "ON" (red box), and any connected continuity channels should also turn to ON. Your altimeter will begin its startup sequence, once you're satisfied that it's ready to go then you can hook up your motor's igniter and be ready to fly. If everything does NOT come on the way that it should, turn the WiFi Switch OFF, take your rocket off the rail, and go back to your workstation and figure out what came loose. Better to find out about a problem on the ground than up in the air when it's too late...

After you've recovered your rocket, you may or may not want to turn the WiFi Switch off immediately, it's going to depend on whether or not you need to hear the altitude beep-out or do something else with it. No problem, you can connect to it to check the battery voltage, and turn it off (or leave it on) as appropriate.

Troubleshooting

If your Eggtimer WiFi Switch doesn't work after assembly and testing, take a deep breath, get out a beverage to clear your mind, and start troubleshooting...

Check Your Solder Joints

The very first thing you should do is to check out all of the solder joints under a lighted magnifier, or with a 10x jeweler's loupe or magnifier. The most common reason for things not working are solder bridges, i.e. putting too much solder on the pads and shorting two adjacent pads together. You can also get into problems by bridging pads with "vias" on the board, the smaller holes that don't have any components soldered to them. Most of the holes and the pads are very small, so it doesn't take much solder to get a nice "tented" solder joint. If you get a solder bridge, heat it up and use a solder wick or a vacuum bulb to remove the excess; afterwards, we recommend resoldering the joints. Note: NEVER use "canned air" or compressed air to "blow away" excess solder. The resulting solder splatter will almost always cause more damage than the original solder bridge.

Another thing to look out for is "cold" solder joints, they look dull and blobby compared to a nice shiny "tented" solder joint. Cold solder joints won't conduct well; at the low power that the WiFi Switch 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 small components aren't polarized, with some notable exceptions. The outline of the parts is silk-screened on the board, so you should be able to see readily if you have a component soldered in backwards. Some of the components are not symmetrical (i.e. the voltage regulators) so they would be difficult to install backwards, too.

In particular, you need to check the LEDs, the side with the long lead should be inserted into the holes marked "+". Unfortunately, once you've soldered them in and clipped the leads it will be difficult to tell, so make sure you get it right the first time.

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 WiFi Switch 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.

If It Still Doesn't Work...

There is, of course, always an outside chance that you have a bad component. We pre-program and test every WiFi module, and the other parts are factory-direct so the likelihood that one of them is bad is very small. Nevertheless, it is always possible that something may be wrong; there may be a bridge on the PC board itself, etc. If you have gone through all of the troubleshooting steps and the board still doesn't work, let us know at support@eggtimerrocketry.com . A high-resolution picture (5 megapixel or better) of both sides of your circuit board and a description of the problem would be very helpful...

Troubleshooting Tips (in approximate order of likelihood)

No power-on blinks from the PWR LED

- Battery cable connected incorrectly
(Match “+” and “-“ on the INPUT side with your battery connector)
- Bad solder joint on voltage regulator
- Bad solder joint on 10 uF capacitors
- Bad solder joint on the ESP8266-12 module
- LED mounted backwards (long lead needs to be on the “+” side)
- Weak battery

No data when I connect the USB-Serial cable

- Serial cable connected incorrectly
- Terminal program not configured correctly
(should be 115,200 baud, 8 bits, no parity, 1 stop bit)
- Bad solder joint on ESP8266-12 module
- Bad solder joint on header

Don't see an “WIFI_SW ...” SSID

- Bad solder joint on ESP8266-12 module
- Weak battery

Can't connect to “WIFI_SWITCH...” SSID

- Bad passkey (hook up the serial cable and check it)
- Wrong type/encryption selected
(set them all to “auto” and let your WiFi manager pick it up)

Can't bring up WiFi Switch web page

- Bad WiFi connection (check your WiFi manager)
- Incorrect URL (use **http://192.168.4.1**)
- Weak battery (use a freshly charged one)

Switch won't turn on when I enter the code and click Submit

- Bad solder joint on the “ON” LED or LED reversed
- Bad solder joint on 4.7K resistor next to the ON LED
- Bad solder joint on the ESP8266-12 module
- Bad solder joint on the MOSFET
- Bad solder joint on the 10K resistor next to the MOSFET
- Weak battery

Eggtimer WiFi Switch Quick Reference Guide

To Connect: Connect with your device's WiFi to "WiFi_Sw_#####", where "#####" is the unique 6-digit hex code for your WiFi Switch, and the 8-digit passkey is the one on the package (or displayed through the serial port at power-up)

To Turn ON/OFF: Enter the displayed validation code then click Submit

To Find Passkey: Connect USB-Serial cable:

BLACK: GND
WHITE: TX
GREEN: not used

Set your terminal program to 115,200/8/N/1
Turn it on... the SSID and Passkey will be displayed
(don't enter the space between the digits on the passkey, though!)

To Connect to your Altimeter:

Connect your battery to the IN terminals:

"+" to "BATT +"

"-" to "BATT-"

Connect your Altimeter battery input to the OUT terminals:

"OUT+" to altimeter battery "+"

"OUT-" to altimeter battery "-"

Optional – Connect the deployment status (CHA/CHB) leads
See the guide for connections...

Specifications:

Input: 4V-16V, approx.. 85 mA (we recommend at least as 300 mAH 2S LiPo battery)

Output: Voltage: Same as input, 13A max. continuous

WiFi Module: Espressif/AI-Thinker ESP8266-12
FCC ID: 2ADUIESP-12

Range: Typically 30'; up to 100' under ideal conditions

Security: WPA2-PSK, AES encryption
Passkey: 100,000,000 possible combinations
4-digit changing validation code required to toggle power

Eggtimer WiFi Switch Limited Warranty

Eggtimer Rocketry warrants that all of the parts listed in the parts list necessary to build the Eggtimer WiFi Switch are included in the kit, and that they are all new and working. We don't use surplus parts... we like stuff that we know will work. If you open up the package and find that something is missing, send us an email to support@eggtimerrocketry.com letting us know, and we'll get it taken care of right away.

Eggtimer Rocketry warrants that when constructed per the documented assembly procedure the Eggtimer WiFi Switch will perform substantially per the instructions. We try very hard to make sure that our stuff works the way we say it does, but because software isn't perfect we can't always anticipate things that may occur. If we find that there is a problem that prevents the WiFi Switch from operating as documented, we'll do our best to fix it in a timely manner.

Since there is a wide variation of possible configurations using the Eggtimer WiFi Switch and there is no way that we could possibly test them all, we do not warrant the suitability of the Eggtimer WiFi Switch for any particular purpose. Hobby Rocketry is just that...a hobby. It's up to you to decide how to use our products, and whether or not they are suitable for your projects.