



<http://altusmetrum.org>

## Avionics Installation Kit

This package contains materials that can be used to install a TeleMetrum or similar dual deployment altimeter in a model rocket. There are many ways to do this, depending on the exact electronics chosen, the geometry of the rocket, and of course personal preference. This document describes the parts included in this kit and how we think you might use them successfully, but does not include a detailed installation procedure.

A DVD documenting in detail the installation of a TeleMetrum altimeter in a typical high-power rocket electronics bay, using parts similar to these, is available from Apogee Components:

[http://www.apogeerockets.com/Build\\_e-Bay\\_DVD.asp](http://www.apogeerockets.com/Build_e-Bay_DVD.asp)

Contents:

| quan | photo   | description                             |
|------|---------|---|
| 1    | A       | #43 drill bit                           |
| 1    | A       | 4-40 3-flute plug tap                   |
| 5    | A       | 4-40 nylon nuts                         |
| 5    | A       | 4-40 x 3/16 inch nylon screw            |
| 5    | A       | 4-40 nylon standoff                     |
| 2    | B       | 1/2 inch CPVC pipe cap                  |
| 3    | B       | 2-56 nuts                               |
| 3    | B       | 2-56 x 3/4 inch fillister head screw    |
| 2    | C       | 2 circuit barrier strip                 |
| 3    | C       | 4-40 nuts                               |
| 3    | C       | 4-40 x 1 inch binding head screw        |
| 10   | C D E F | 22ga stranded wire in two colors        |
| 1    | D       | push switch with 12 inch soldered wires |
| 1    | E       | 4-pin 3M female crimp connector         |
| 1    | E       | 4-pin 3M male crimp connector           |
| 1    | F       | 12 x 12 x 1/8 inch closed cell foam     |
| 25   | F       | 4 inch black nylon zip ties             |

The nylon standoffs and screws are intended for mounting the altimeter board. Many commercial altimeters are compatible with 4-40 mounting hardware. Using nylon parts provides some protection to the electronics both by being non-conductive and thus preventing potential short circuits, but also because under extreme stress the nylon screws may shear consuming enough of the shock to allow the altimeter to survive.

The 4-40 tap and matching drill bit, which is the correct #43 drill size for use with a 4-40 tap, allow making threaded mounting holes in the "sled" the altimeter mounts to. Most home improvement store tap and die kits only go down to 6-32, and buying just one tap can be expensive. The "tap handle" from such a set may work with this tap, or you can use a pair of pliers to grip it while turning in the wood and fiberglass materials commonly used for altimeter sleds in hobby rocketry.

The process we use to install the altimeter board itself starts by deciding where to mount the board. Then the positions of the mounting holes are carefully marked. The drill bit provided with the 4-40 tap is used to drill holes, and then the tap is used to thread those holes. Then the nylon standoffs are screwed into the threaded holes, usually with a dab of 5 minute epoxy put on the threads, or a drop or two of super glue put on after they're threaded in. If the sled material is very thin, the nylon 4-40 nuts can be put on the back side to provide added strength. The 4-40 nylon screws are used to hold the altimeter board down to the standoffs. Photo A shows a typical standoff installation:

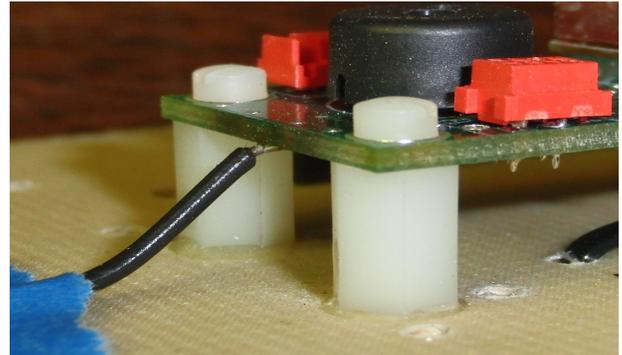


Photo A

The CPVC end caps are intended to be charge holders for loose black powder or smokeless powder used for ejection charges. An end cap this size can hold about 2 grams, which is sufficient for most airframes through 5.5 inches diameter.

The 2-56 metal screws and nuts are meant to hold the charge caps on the avionics bay bulkhead. Photo B shows a charge cup installed in this manner (note epoxy on nut to hold it tight):



Photo B

The pair of 2-circuit nylon screw terminal strips are meant to be mounted on the avionics bay bulkheads to connect e-matches or other igniters for the ejection charges.

The 4-40 metal screws and nuts are provided to hold the nylon screw terminal strips down to the bulkheads. Photo C shows a typical installation:

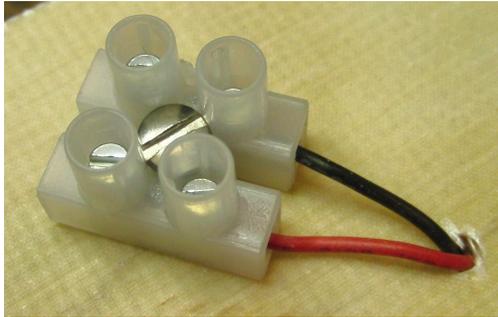


Photo C

The push button switch with pre-soldered wire leads is intended to be the power switch for your altimeter. The switch is wired as a redundant single-pole switch, that is “on” when pushed in and “off” when pushed out. This switch can be glued to your avionics bay sled, taking care to not get adhesives inside the switch or around the plunger where they will interfere with the mechanism. Position the switch behind the static vent hole such that you can turn the power on and off using a small screwdriver or other stick through the hole. See photo D:

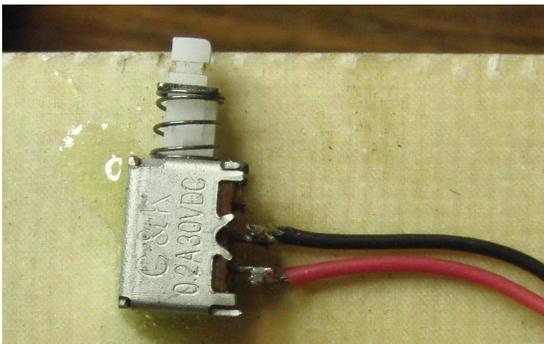


Photo D

The loose pieces of 22 gauge stranded wire and the 3M crimp connectors are provided for wiring between the altimeter and the screw terminal strips mounted on the bulkheads. To disassemble an electronics bay, one bulkhead needs to be removable. Using the crimp connectors makes it easy to disconnect and reconnect one bulkhead without needing a screwdriver.

Since the 3M connectors support 4 conductors, one connector can be shared between two altimeters when installing redundant electronics (such as for a Level 3 certification flight) with two ejection charges on each bulkhead. These connectors support 20-24 gauge wire only (the wire we provide in the kit is 22, which is right in the middle of the correct range), and can be easily crimped using pliers or the jaws of a small vice. Photo E shows a mated connector pair in use in a single-altimeter installation:

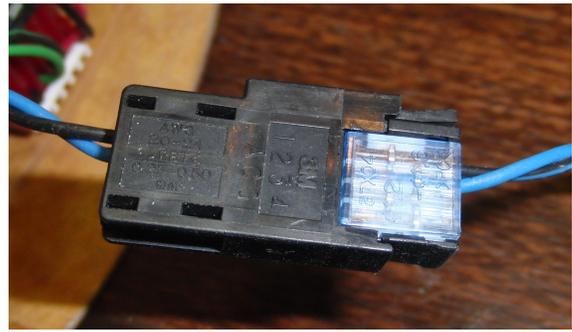


Photo E

The nylon zip ties can be used to neaten up your wiring, to hold batteries down to your sled, and so forth. We like these small gauge ties because they fit through a 1/8 inch hole easily. Since they are short, you may need to connect 2 or 3 end to end to make up a long enough strap, as shown in photo F.

The closed cell foam may be cut with scissors into strips for wrapping batteries before strapping them down. This is particularly recommended when using the Lithium Polymer batteries provided in the TeleMetrum Starter Kit. Photo F shows a battery installed as described in this document:

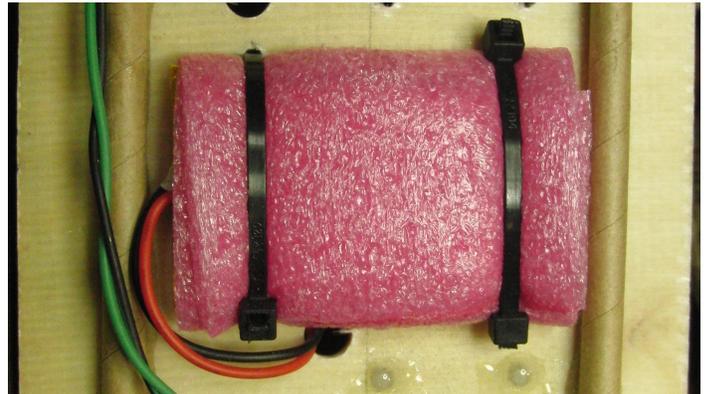


Photo F

One last note about connecting wires to screw terminal strips. It may be a good idea to strip the wire far enough to allow the strands to be twisted together, then folded back on themselves once before putting them into the screw terminal. This provides more wire volume to compress under the screw, and may help prevent screw stress from breaking the conductors.

Good luck, and have fun!