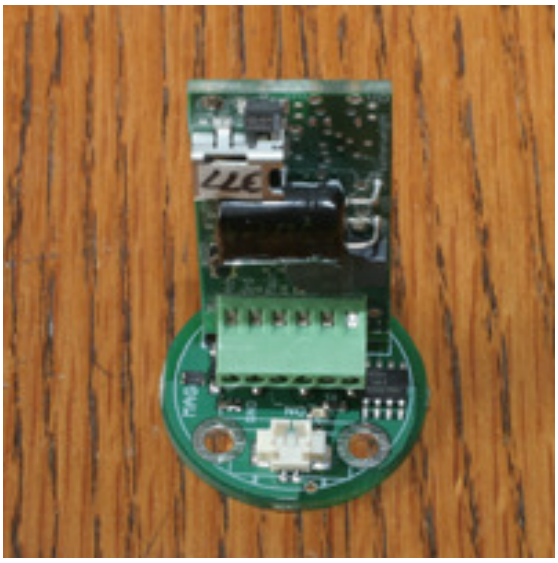
Initial preparations

For the most secure connection of the av-bay to the rocket, glue in a 2” long coupler tube into the rocket using high-strength epoxy, using about ½” overlap, so that approximately 1.5” of coupler is sticking out. A typical configuration attaches the coupler to the bottom of the main chute (upper) tube. Many other configurations are possible, but this is the one assumed for the purpose of this manual.

Preparing the active bulkhead plate



Begin by attaching your Raven to the active bulkhead, as shown in the picture. **The green terminal block on the Raven must be towards the white battery connector on the bulkhead.** Using a small screwdriver, be sure to tighten *all* of the screws on the terminal block.

Failure to install the Raven before the threaded rods will make it impossible to properly tighten two the screws.

Next, assemble the threaded rods onto active bulkhead as shown below**.** A nut driver makes it easy to tighten the nuts. Be careful not to over-tighten the nuts, since the nuts and the threaded rods are made of aluminum.

In the photos shown above, we begin by using nuts on both sides of the active bulkhead. If it works better in your installation, nuts can be used on both sides of the passive bulkhead, and only on the bottom (outside) of the active bulkhead.

Next, plug in the battery, as seen below. If the battery does not block access to the screw terminals, the Raven is installed backwards onto the bulkhead.

This is a good time to test the magnetic arm switch. Note the blue arming switch LED underneath the terminal block, showing that it is sensing the proximity of the included magnet. The magnet should be oriented as shown for best activation range.

The magnetic switch used to arm / disarm the av bay is sensitive to the polarity of the magnet. If the arming LED does not active, flip the magnet over (end-for-end) and try again. The orientation used to power on the av bay is the opposite of the orientation used to turn it off.

The large, rectangular part of the Raven covered in shiny black plastic is an aerogel ultracapacitor with a very large capacity, great for providing power to the Raven even through several consecutive deployment events. However, it can also provide the Raven with a small voltage long after the Raven's external power is removed. For the Raven version 1 (original Raven), this small voltage can prevent the Raven from powering up properly when an external power source is re-applied. After turning using the magnet to turn the Raven off, use the magnet or another conductive item to discharge the capacitor. For a Raven 2, this step is not necessary.

When turning the Raven off with the magnet, remember the polarity – if the av bay does not begin to power down (arming light will immediately dim, then go out after a moment), flip the magnet over and try again.

Assemble battery restraint

Assemble the two halves of the plywood battery restraint. Note that there are two orientations in which the battery restraint can fit together, but only one of which will allow the pieces to stay perpendicular when installed in the av-bay, as shown at right. Optionally, the battery restraint can be glued together and glued onto the passive bulkhead.

When assembling the battery restrain, pay attention to the orientation of each of the pieces. The notch on one side of the larger piece goes towards the Raven, with the notch providing room for the large black capacitor. When holding the restraint with the capacitor notch to the rear, the wider portion of the second piece is to the left, as shown in the picture above. If this piece is reversed, the restraint will not fit properly around the USB port on the Raven.

Preparing the passive bulkhead

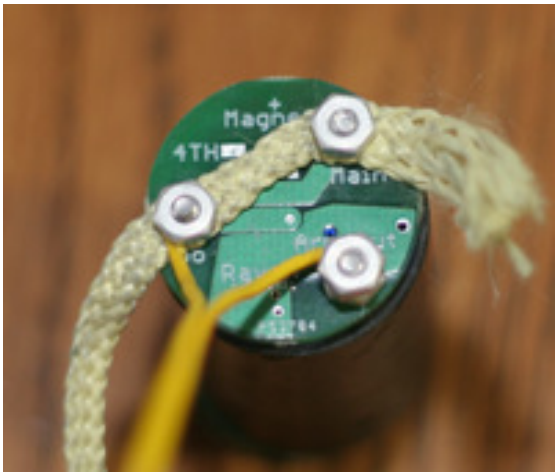
The passive bulkhead is the bare bulkhead without electronic components. When the av-bay installation is complete, the passive bulkhead and the active bulkhead should face the same direction. The Apo (apogee) terminal should be over the threaded rod to the rear of the Raven.

The passive bulkhead is then secured in place with the aluminum nuts provided. Be sure not to over-tighten the nuts, as the aluminum rod will strip easily.

Attaching the shock cord

A braided Kevlar shock cord can be attached directly to the threaded rods by separating the strands to put the threaded rod through the middle of the cord, and clamping it using the included nuts. During a test flight of this attachment method in a minimum-diameter rocket, drag separation caused premature separation when coasting at Mach 1. The chute was ripped off but this attachment method was strong enough keep the rocket sections together. Attach the main chute shock cord to the active bulkhead.

Attaching the deployment charges:



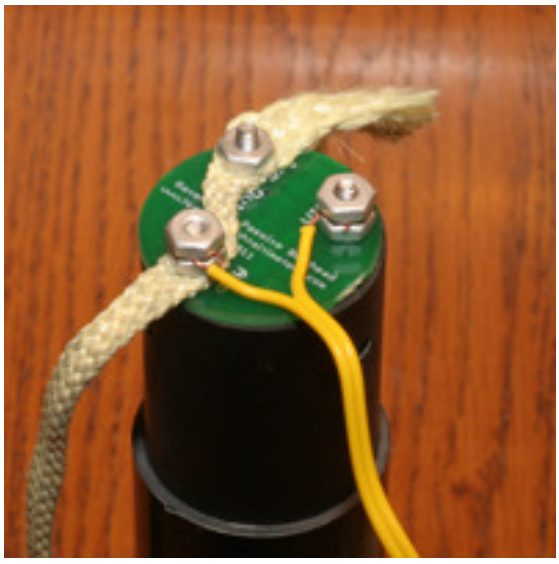
The threaded rods are also the deployment charge terminals, so be sure not to put insulating washers between the bulkhead and the nuts. The altimeter bulkhead, in particular, needs good electrical contact with the nuts of the threaded rod. Clamp the wires of the deployment charges between two nuts as shown at right. **Caution: Whenever handling deployment charges, use eye protection.** Be sure that the charges are attached to the correct terminals for your application. One end of the charge attaches to terminal labeled "Arm Out", and the other attaches to the terminal according to your application.

Install the av-bay into the rocket

Drop the bulkhead with the rods through the tube with the coupler, so that the rods poke through the coupler. If the battery restraint has not been glued onto the passive bulkhead, install it now. Install the passive bulkhead over the threaded rods.

Important: Align the two bulkheads so that they are facing the same direction. If the labels are not facing the same direction, the charges will be connected to the wrong terminals. Attach the shock cord and deployment charges as you did for the other end of the av-bay. Completed av-bay shown below.

Be sure to keep the magnet clear of the av-bay until it's time to arm at the pad. If you put the magnet in a pocket, be sure to maintain an awareness of where the magnet is, and keep the rocket from close proximity.



At the pad, turn on and arm the av-bay by bringing a magnet next to the rocket, near the side with the magnet and the blue LED. Wait 2-3 seconds for the altimeter to boot up and start beeping out the battery

voltage and the continuity status. **If you don't hear the Raven beep out the continuity status you're expecting, don't launch**! To disarm the av-bay, bring the magnet back near the magnet sensor, and the beeping from the altimeter will stop, indicating that the av-bay has been powered off. When you do hear the continuity status, walk away and get ready for a great flight!

When disarming the av-bay, remember that the magnetic switch is sensitive to the orientation of the magnet!

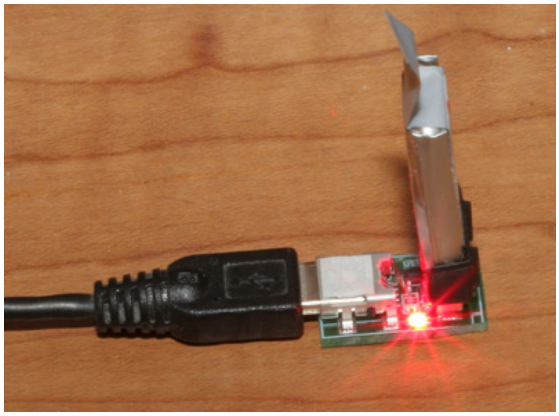
Thick-Walled Couplers

Some couplers may have too thick of a wall to allow the nuts on the inside of a bulkhead to fit. In this case, a rotary tool can be used to reduce the wall thickness in the nut locations, allowing the bulkhead to fit snugly against the coupler.

The photo to the right shows a coupler from a Wildman Blackhawk 29 where the coupler has been modified to allow the nuts to fit. When modifying the coupler, be sure to use one of the bulkheads to determine the appropriate locations – the nuts are *not* equally spaced around the bulkhead!

Battery Management

Due to space constraints on the active bulkhead, unlike the 38mm version, the 29mm av-bay does not include a USB port for charging the battery. To charge the LiPo battery used in the av-bay, you will need to provide your own charger, or obtain a Featherweight USB Battery Charger.



To use the Featherweight USB Battery Charger, plug the battery in to the board, the connect the USB cable to the board, and finally to either a USB port on your computer, or a USB wall wart. The LED on the board will be red while the battery is charging, and will turn orange when charging is complete.

The charger takes care of charging the battery, and won't overcharge the cell unless there is a failure in the system. **Because of the (remote) possibility of failure, you should take precautions when charging, such as not charging unattended or with**

flammable material nearby. Never charged a cell that is damaged or that has its cover puffed up.

When the charger's LED turns from red to orange, the cell is fully charged. If the cell has been very discharged, it could take 1-2 hours to fully charge it. Usually the cell would start out with a higher state of charge and it would take less time than that

Always recharge the battery and/or measure its voltage before flight. If it's less than 4 V, a recharge is recommended. When the charger cuts off the charge and turns the LED from red to orange, the cell's open-circuit voltage should be around 4.1-4.15 V.

While the LiPo battery included with the av-bay has a long life, there are limitations. The magnetic switch used to turn the av-bay on and off consumes power, even when the unit is powered down. Because of this, the av-bay should not be assembled with the battery installed for extended periods of time – a few days is fine, but more than a week will noticeably discharge the battery and is not recommended.