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4" Fiberglass Frenzy XL ™

$495.00

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Please make sure you read all directions and understand how to assemble your model before you start construction. It is also a good idea to test fit each part before assembly.

Fiberglass parts still contain small amounts of mold release and other materials on the surface that will inhibit adhesives and/or paint. It is important to clean each part prior to assembly with a solution of 1 part rubbing alcohol, 3 parts water and a drop of dish washing soap. IMPORTANT: do not sand any parts until after you have cleaned them - you will embed the materials you are trying to clean making it difficult to clean.

Some G10 parts may have holding tabs left over from the CNC machine. These small tabs will need to be sanded off before assembly.

Use only a high quality epoxy like Aeropoxy or West System to bond parts together. You can use a colloidal silica filler like West System 404 or 406 to thicken epoxy when making fillets. When using a filler for fillets a consistency like peanut butter or syrup is best For extra strength you can add 1/16" or 1/32" milled glass fiber.

IMPORTANT: Before assembling any part with epoxy, rough up the surface to be epoxied using 60-80 sandpaper. The scratches in the fiberglass surface will give the epoxy something to grab onto. Epoxy will not soak into the fiberglass like wood or cardboard - epoxy will not grip very well to fiberglass without this rough surface. You can use Zap or CA glue to tack parts into place before you apply epoxy.



☐ Step 1 - Use the slotted main body tube to mark 3 evenly spaced marks around the shorter coupler tube.



☐ Step 2 - Use a door jamb to mark the full length of the coupler. This will help later when marking other tubes.



☐ Step 3 - Sand the outside end of the coupler and the inside of the nose cone where the coupler and nose cone parts will bond together. Also sand the inside of the opposite side of the coupler where the bulkplate will be bonded.





☐ Step 4 - Mount the eyebolt with a nut and washer and secure with epoxy so it will not come apart later.



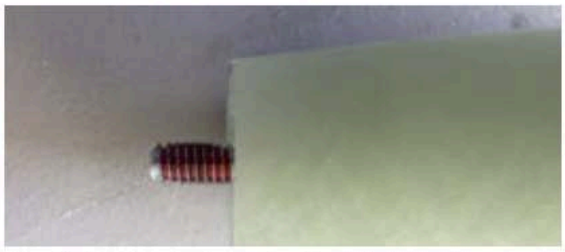
☐ Step 5 - Epoxy the bulkplate into the end of the coupler where you sanded the inside. Leave about 3/8" for a fillet. After the epoxy sets, apply a fillet around the inside edge.



☐ Step 6 - Drill a 1/8" vent hold in the bulkplate to let the air out while you epoxy the coupler into the nose cone base. Epoxy the coupler into the base of the nose cone and make sure you leave at least 4" of the coupler exposed. Also ensure you get epoxy on the whole area where the coupler and nose cone will contact to ensure a good bond. It is best to put epoxy inside the nose cone and not the outside of the coupler. Make sure you have a clean coupler so as to not interfere with the payload body tube later.

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☐ Step 7 - If you have the optional Metal Tip Nose Cone, use lock-tite on the nose cone tip to make sure it does not come loose during transportation.



☐ Step 8 - Put the shorter payload body tube on the nose cone coupler and transfer the 3 evenly spaced marks to the payload tube. Use a door jam like you did earlier to mark the entire length of the payload tube.



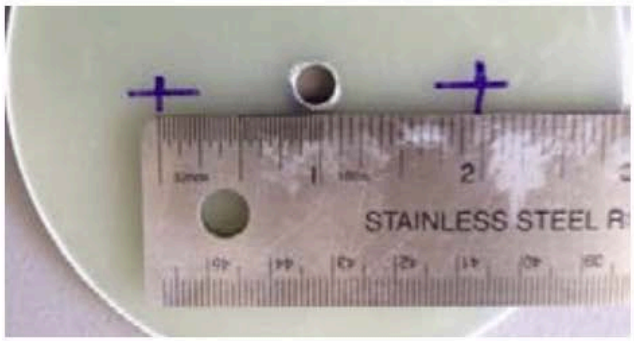
☐ Step 9 - Measure to the middle of the payload tube and drill a single 1/8" hole for a vent hole.



☐ Step 10 - Measure 2" from one end of the payload tube on each of the lines. This is where you will drill the shear pin holes. With the nose cone seated properly, drill a single 5/64" hole at one of your 2" marks. IMPORTANT: insert a 2-256 nylon screw into this hole before you rotate the tube for the other 2 holes. Last make an alignment mark on the nose cone and payload tube so you can remember the orientation since the spacing of the shear pins may not be even. Make sure you transfer this mark when you paint the rocket.



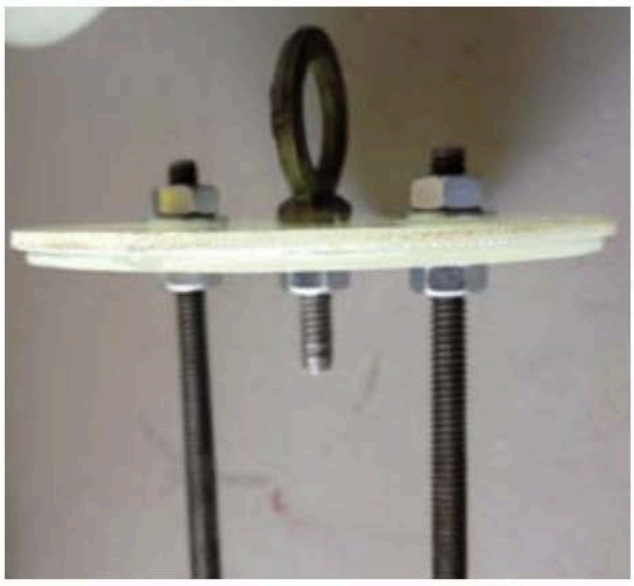
☐ Step 11 - Mark one of the bulkplates as shown.



☐ Step 12 - Stack the 2 large bulkplates and 2 smaller bulkplates and temporarily secure the plates with a single eyebolt to hold them together. Drill through all 4 bulkplates at the points you just marked with a 1/4" drill bit.



☐ Step 13 - Separate the bulkplates and then glue a large bulkplate to a smaller bulkplate while aligning the holes. You will make 2 sets like this. Make sure the bulkplates are centered so that they will go into the ends of the coupler and not interfere with the body tube. You can secure with an eyebolt, nut and washer while these dry. After the epoxy has set, trap the two 14" threaded rods using 2 nuts and two washers each as shown. Use thread lock to make sure these don't come undone later. Also, remove the nuts on the 2 eyebolts and replace using thread lock.



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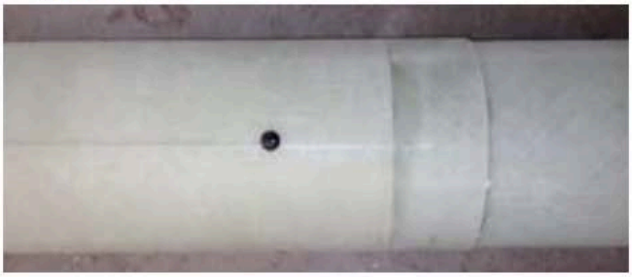
☐ Step 14 - DO NOT EPOXY OR USE THREAD LOCK FOR THIS STEP. Place the bulkplate set with the threaded rods on one end of the long coupler. Place the other bulkplate set on the other end of the coupler and secure using a nut and washer on each threaded rods. The larger bulkplates should seat against the coupler edge with the smaller bulkplates going inside the coupler. After you are satisfied with the fit, you can remove for the next steps.



☐ Step 15 - Mount the switch band in the center of the long coupler so 5" of coupler is exposed on each side. Place a thin layer of epoxy in the center of the coupler and slide the switch band over the epoxy while rotating so the epoxy slowly goes under the switch band. Make sure you clean up the edges of the switch band so it seats against the body tube later. After the epoxy sets, you can drill any desired altimeter vent holes and switch holes you need in the switch band.



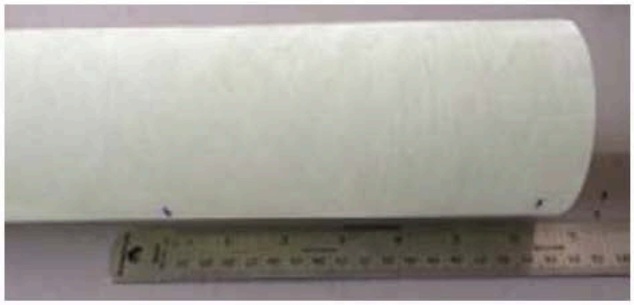
☐ Step 16 - Measure 2" from the aft end of the payload tube on each of the lines (the opposite end you did the shear pins earlier). This is where you will drill the rivet pin holes. IMPORTANT: when you seat the altimeter bay inside the payload tube, make sure your altimeter vent holes are not lined up with the rivet lines - turbulence from the rivets can disrupt the airflow over the altimeter vent holes. With the altimeter bay seated properly, drill a single 5/32" hole at one of your 2" marks. IMPORTANT: insert a rivet into this hole before you rotate the tube for the other 2 holes. Last make an alignment mark on the altimeter bay and payload tube so you can remember the orientation since the spacing of the rivets may not be even. Make sure you transfer this mark when you paint the rocket.



☐ Step 17 - Sand the outside of the motor tube to rough up the surface for the epoxy to stick to.



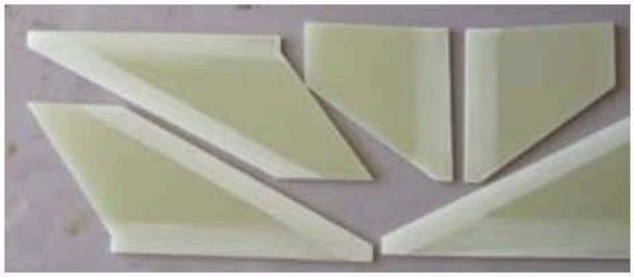
☐ Step 18 - Mark the motor tube 6 1/8" and 1/2" from one end of the motor tube. Epoxy two of the three centering rings on each of the marks. IMPORTANT: make sure the motor tube is clean of epoxy from the centering ring that is 6 1/8" from the end for the remaining 15 or so inches of the motor tube because the fin roots will need a clean surface to attach to. At this point it is a good idea to test fit the retainer because it is much easier to sand the motor tube now rather than later.



☐ Step 19 - Sand the slotted main body tube for at least 1/2" around the fin slots inside and outside to rough the surface for the fin fillets. Also sand where the centering rings will attach in front of the fin slots on the inside. You can wrap sand paper around a large dowel to help sand the inside of the body tube.



☐ Step 20 - Test fit each of the fins in the fin slots and file the slots to make sure you have a snug but smooth fit. Also sand the sides of the fin tangs so the entire tang plus at least 1/2" of the exposed fin above the body tube is roughed up so epoxy will stick to the fin. You can clean any residue from the machining process using acetone. It is a good idea to number your fin pairs and slots to remember which fin fits best in what slot.



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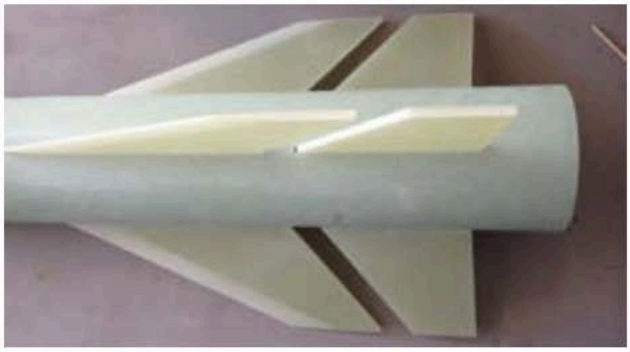
☐ Step 21 - Use a door jamb to mark half way between two fins on the slotted main body tube. This line will be used later to align the rail buttons.



☐ Step 22 - Test fit the motor tube assembly inside the slotted main body tube to ensure a smooth fit. The two centering rings should go in first. When you are satisfied with the fit, spread epoxy on the inside of the body tube above the fin slots and slide the motor tube in until the centering rings clear the forward fin slot. Make sure any fillet on the forward centering ring is clear of the slot also so the fin root can seat against the motor tube. The aft end of the motor tube should be recessed about 1/2" inside the aft end of the body tube. IMPORTANT: do not use epoxy on the 3rd centering ring yet. Insert the 3rd centering ring temporarily inside the aft end of the rocket to make sure the aft end of the motor tube remains centered while the epoxy sets.



☐ Step 23 - With the 3rd centering ring temporarily still in place, tack each of the fins in place using CA on the root edge of the fin. Start with the aft fins first because the forward fins overlap the aft fins. Make sure each fin seats properly to the motor tube before applying CA. Readjust your slot if needed. IMPORTANT: make sure you do not accidentally glue the 3rd centering ring in place. Clamp a scrap of wood to the fin pair to make sure they stay in alignment with each other. Remove the aft 3rd centering ring after the glue sets.



☐ Step 24 - It is a good idea to use masking tape to seal the outside of all the fin/body tube joints for this step in case there are any gaps where epoxy can leak through. Mix some epoxy and use thickener or milled glass to make a thick syrup like consistency. Pour the mixure down each fin line between the motor tube and body tube. Use a dowel and spread epoxy forming a fillet on all fin to motor tube joints and internal fin to body tube joints. Make sure you get a good fillet on the entire fin because this is main strength point of the fin joint. Failure to get a good solid strong joint at this point can lead to a fin separation in flight. You can use plastic syringes here if you want to help place the epoxy accurately. IMPORTANT: make sure you keep the last 1 1/2" of the motor tube clean where the 3rd centering ring and motor retainer will go



☐ Step 25 - Use the same epoxy consistency to form fillets on the outside fin/body tube joint.



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- ☐ Step 26 - Test fit the 3rd centering ring and epoxy in place. Make sure you leave enough exposed motor tube to attach the motor retainer. Follow the manufacturers directions and attach the motor retaiiner at this point. We recommend a motor retainer that attaches to the motor tube and not the centering ring for this design.
- ☐ Step 27 - Drill a 1/8" vent hole just forward of the forward centering ring.
- ☐ Step 28 - Drill a 7/64" hole on the rail button line for the forward and aft rail buttons. The aft hole should be 1 1/2" from the aft end of the slotted main body tube and the forward hole should be just behind the forward centering ring..
- ☐ Step 29 - Apply a small amount of epoxy in the holes and attach the rail buttons using the supplied #6 wood screws. Make sure the screw is loose enough for the rail button to spin freely - this ensures the button is not compressed to the point it will hang on the rail guide.
- ☐ Step 30 - Cut the shock cord in half and use half to tie the nose cone to the forward side of the altimeter bay, and the other half to tie the aft end of the altimeter bay to the motor anchor bolt. This design relies on the motor's forward closure retention eyebolt for the recovery attachment point.
- ☐ Step 31 - Pack the chutes and assemble the rocket. Insert the largest motor that you intend to fly (or simulate the weight with an appropriate substitute) and ensure that the CG is at least 1 body diameter in front of the estimated CP point specificationed on the first page. The estimated CP should be measured from the tip of the nose cone. If the CG is too far back, add weight inside the nose cone by pouring lead shot into the nose cone and adding some epoxy. Please note, it is unlikely you will need nose weight because of the long nose design.
- ☐ Step 32 - Your model is now ready to paint and fly.

Now go have some fun!

Flying Your Model

IMPORTANT: always use positive motor retention to secure the motor. Failure to use motor retention will cause the motor to be ejected instead of the parachute making for a dangerous ballistic reentry.

IMPORTANT: Proper CG is critical to the stability of this model. This model may require some ballast in the nose - the amount will depend on how you build and the size motor you use to fly. Do not fly without balancing this model properly as a dangerous unstable flight will result.

IMPORTANT: Always follow the NAR safety code and remember that rockets are not toys and can be dangerous if not prepared and used properly. If you are a beginner, it is a good idea to fly with a club or other group of experienced rocketeers until you have gained some experience.

IMPORTANT: In no event shall Madcow Rocketry be liable for any direct, indirect, punitive, incidental, special consequential damages whatsoever arising out of or connected with the use or misuse of it's products. The buyer assumes all risk and liability resulting from ANY use of any and all products sold by Madcow Rocketry. Your purchase and use of any Madcow Rocketry product constitutes your agreement to and acceptance of these terms. If you do not agree to these terms and conditions, you must return the unused product in resalable condition for a refund or credit.

IMPORTANT: Please contact us via phone or email if you have any questions about constructing or flying your model.

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Note: the primary deviation from these instructions was the nosecone and shoulder. Due to the fitting, the bulkhead sat flush with the outer diameter of the shoulder coupler. This required me to secure the bulkhead between the shoulder and nosecone. This joint was secured with epoxy and 1/4 - 20 bolts



U bolts attached and epoxied to Ebay bulkheads



Switchband epoxied onto Ebay



Bulkhead and ebay fit test



Upper bulkhead epoxied into nosecone with shoulder coupler



Shear pin holes drilled into payloadsection



Removable threaded screws to attach payload to ebay



Shear pin holes drilled and tapped into body section



Upper centering rings and shock cord epoxied onto motor tube



Rail buttons measured, drilled, installed, and lower one temporarily removed



Lower centering ring fit tested and removed



Notches cut in bottom fins



First set of fins



Second set of fins



Third set of fins



Internal fillets pt1



Ebay hardware epoxied in place



Lower Rail button epoxied and screwed in place



Broken lower centering ring (removed and refabricated)



New lower centering ring epoxied in



Motor retainer epoxied in



Taped off, primed, painted, stenciled



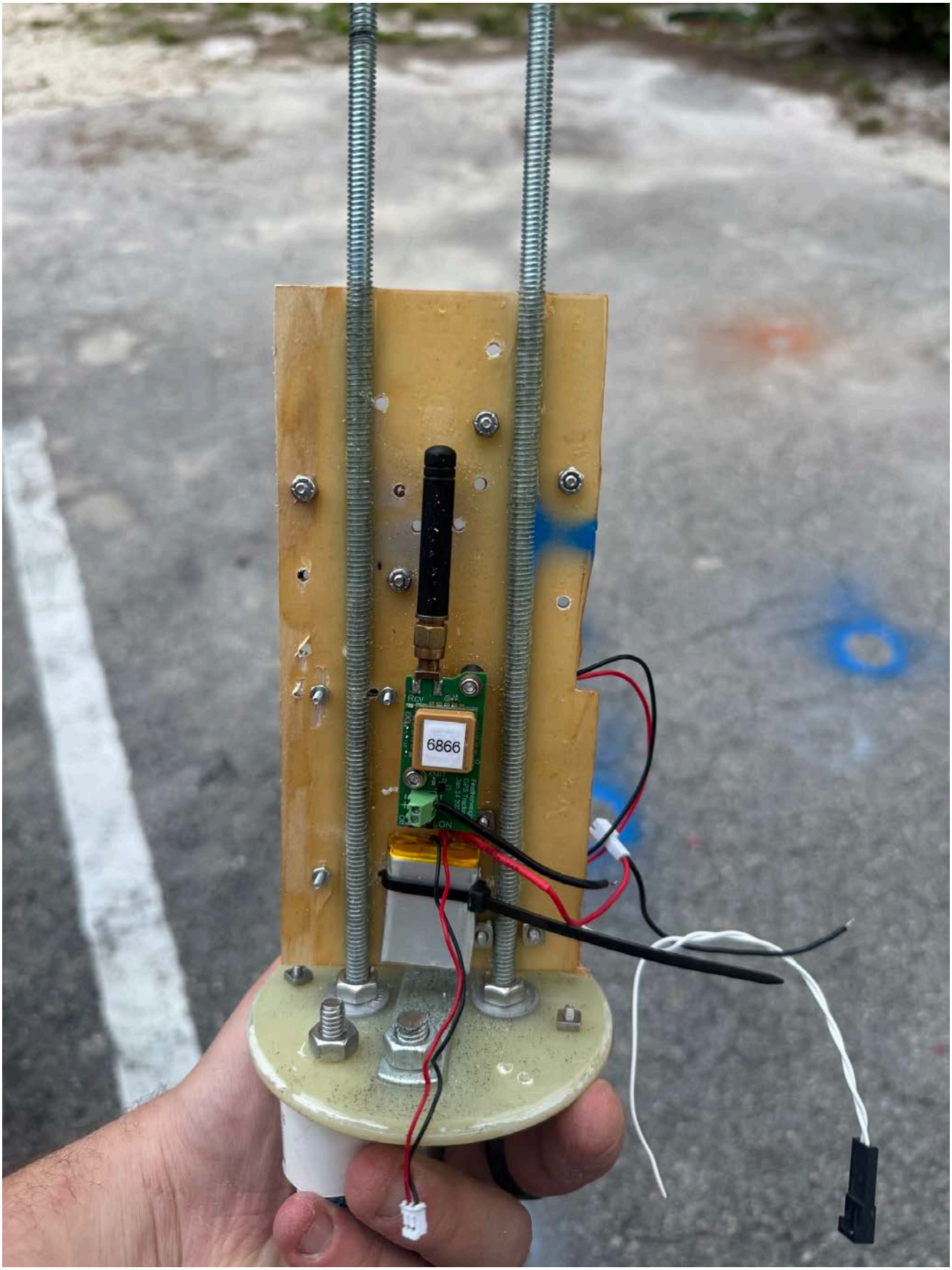
Ejection tested



Charge weights originally determined by the calculator https://www.insanerocketry.com/blackpowder.html and then refined through ejection testing with L3CC to be 3.2 primary 3.5 g backup for the main parachute and 3.7 primary and 4.2 g backup for the drogue parachute
Injected internal fillets to be safe



Put together Ebay electronics 2 adept 22s powered by 9v batteries and one featherweight gps powered by a 1s lipo actuated with keyed radial switches

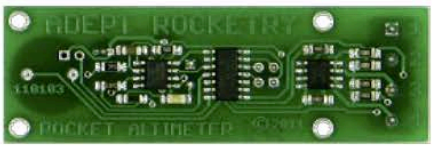


Adept Rocketry

ADEPT22 Instructions and Data Sheet

ADEPT22 Maximum Altitude Altimeter with Dual Deployment™





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ADEPT22 Maximum Altitude Altimeter with Dual Deployment™
Price: $39.00

The ADEPT22 Altimeter with Dual Deployment™ is a maximum altitude altimeter that precisely measures, saves, and reports the maximum above-ground altitude value obtained during a rocket's flight. The ADEPT22 also has two altitude controlled deployment current outputs that are typically used to fire deployment charges, based on altitude. The first charge fires when the rocket reaches its maximum altitude (apogee), and the second charge fires when the rocket descends to 1800, 1200, 900, 600, or 300 feet above ground, or 6 seconds after apogee, or at 150 feet below apogee (7 choices, user selectable). One common usage is to deploy a main parachute at apogee by using only the first output. However, the most typical usage is to deploy a drogue chute or streamer first, then to deploy a main parachute when the rocket descends to a user selected altitude above ground (**Dual Deployment™**), in order to avoid significant drifting due to wind. Dual Deployment™ was invented by Adept Rocketry in 1990 when the term was copyrighted and trade marked. The term Dual Deployment™ remains the sole property of Adept Rocketry.

This device is used in rockets that will reach at least 300 feet altitude. Either or both deployment outputs may be used, or the device may be used as a maximum altitude altimeter only. The ADEPT22 may be used in any rocket configuration including multistage rockets, in which case maximum altitude information about a particular stage can be obtained by placing the device in the particular stage of interest. Or individual ADEPT22 units (or other altimeter devices) may be placed in each stage of interest to report maximum altitudes obtained by each stage, and/or to handle deployment for each stage.

The ADEPT22 precisely captures and saves the highest altitude obtained during a flight to a maximum of 15,000 feet above sea level. **The maximum value obtained above the local ground-zero altitude is precisely measured, saved, and reported in one-foot increments (one-foot resolution).**

The ADEPT22 measures 0.9” wide by 0.6” thick by 2.8” long. It fits inside a tube with a minimum ID of 1.0” (25.4 mm). The device weighs only 0.4 ounce (12 grams). It is designed to be used with a standard 9-volt battery. The ADEPT22 is a stand-alone device that includes the arming mechanism, and the current drivers for firing deployment charges. A four-pin terminal block is included for connecting to the user supplied external

battery, wiring, and On-Off switch.

The altimeter uses a custom absolute pressure device to precisely measure altitude values up to 15,000 feet in one-foot increments. It uses an 18-bit logarithmic analog-to-digital converter to precisely (one-foot resolution) measure the nonlinear pressure versus altitude relationship over this altitude range. Once powered up, the ADEPT22 reports that neither, or one or both deployment charges has continuity. It also constantly measures the ground-level altitude and waits for a quick 300-foot change upward. It then captures the maximum altitude obtained above ground zero. The first deployment output fires at the very moment when the rocket reaches the maximum altitude. The second output fires when the descending altitude reaches either 1800, 1200, 900, 600, or 300 feet above the ground, (or 6 seconds after apogee, or 150 feet below apogee) as preset by the user. The ADEPT22 uses the copyrighted and patented and trade marked technique of beeping out (blinking on some models) a value to report the maximum altitude value. The beeps can be heard even when the unit is still inside the rocket. The rocketeer knows the maximum altitude as soon as he/she picks it up, or just gets close to it. Note: the ADEPT22 cannot be used for, and will not function for, maximum altitudes less than 300 feet.

SPECIFICATIONS

- Altitude Capability: to 15,000 feet Above Ground Level (AGL), to limit of 15,000 feet Above Sea Level (ASL). **Note: the ADEPT22 can actually measure altitudes to 100,000 feet ASL, and apogee detection still functions to 100,000 feet ASL. However, above the normal specified range, accuracy is not guaranteed.**
- Nonvolatile Memory: remembers and reports the altitude of the most recent flight, no matter how long the device has been powered down or lost.
- Lowest Maximum Altitude Readable: 300 feet above ground. Liftoff is detected when the altitude quickly increases by 300 feet.
- Mach Compatible; the ADEPT22 uses Adept's proprietary Real Time Dynamic Lockout™ system that tracks speed in real time to ignore pressure glitches that occur when transitioning through the sound barrier, both in and out. This system is possible due to the extreme precision of one-foot resolution measurements.
- Resolution of Measurement: one foot; system uses a logarithmic 18-bit A-to-D converter.
- Calibration Accuracy Over Specified Range: +/- 1%, typical.
- Custom altitude sensor that is immune to light, including direct sunlight.
- Uses external alkaline 9-volt battery to fire low-current electric match charges. Advanced on-board Voltage Regulator that is totally immune to reverse voltage (battery in backwards).
- Battery Life: up to 48 hours. Battery Current Consumption of the ADEPT22 is only 2.7 mA, so the device can run for a week on a 9-volt alkaline battery. However, if the unit is being used to fire deployment charges, then the 48 hour specification should be observed; the battery will remain reasonably fresh for up to 48 hours of operation time. Do not substitute an external battery with a voltage less than 7 volts. A 2-cell Li-Po battery should be sufficient, but complete pre-testing will be necessary.
- Piezo beeper reports altitude and operational status including the continuity of the deployment devices. One repeating beep if neither device has continuity, two beeps repeating if only device #1 has continuity, three beeps if only device #2 has continuity, and four beeps if both devices have continuity. The Beeper uses a push-pull driver for increased volume level, loud enough to serve as a location beacon.
- Output #1 fires at maximum altitude; Output #2 fires during descent at 1800, 1200, 900, 600, or 300 feet above ground, or 6 seconds after apogee, or at 150 feet below apogee as selected by the user. The second charge can never fire any sooner than 2 seconds after the first charge fires.

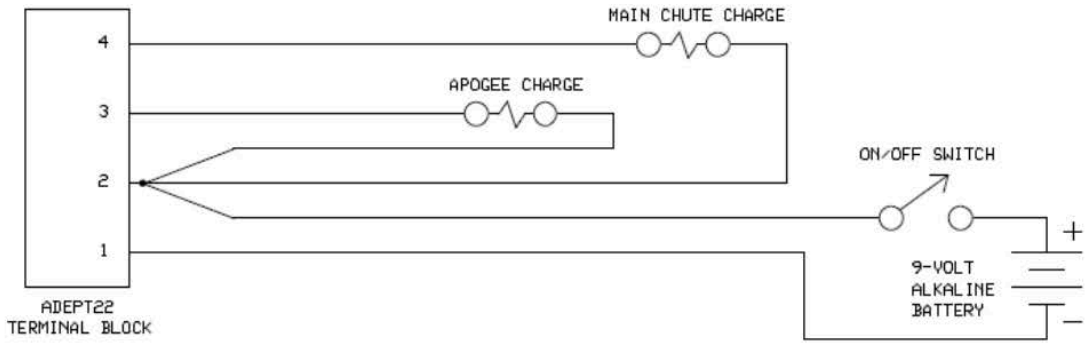
- Measures 0.9” wide by 0.6” thick by 2.8” long and fits inside a tube with a minimum ID of 1.0” (25.4 mm), It may be mounted to a plate, or flat against a bulkhead in larger diameter tubes.
- Weighs only 0.4 ounce (12 grams).
- Accessories Required: one 9-volt alkaline battery, external wiring, and an On-Off switch if one is used. Zero, one, or two Programming Jumpers required to choose the main chute setting - two are included.

TESTING AND USING THE ADEPT22

NOTE 1: The precision amplifier circuitry and continuity sensing circuitry on the ADEPT22 may be sensitive to noise and static electricity when being held. Following power up the ADEPT22 reports the previous flight's maximum altitude from permanent memory. The altitude is reported twice, then there is a 10-second silent period to allow time to get your hands off the unit before it starts taking readings. *Always handle the device by the edges when testing or installing to avoid touching any of the circuitry. Avoid carpeted floors and other sources of static electricity when handling and testing the device.* ***Never store the device in a clear plastic bag****; clear plastic bags are prone to static buildup and discharge. However, pink-colored or smoke-colored antistatic bags are ideal, because they are chemically treated to prevent static buildup. Storage in a small cardboard box, or wrapped in a paper towel inside a clear plastic bag is acceptable. Do not use Velcro to secure the device, as Velcro is a substantial source for unwanted static discharge.* The ADEPT22 is a super precision instrument. Use care to keep the device clean and dry.

NOTE 2: This device must be installed only in a “clean area.” *Electronic Instrumentation is not compatible with the fumes and residue created by rocket motors and deployment charges.* The ADEPT22 must be installed in an area that is totally sealed from motors and charges. **After passing wires through holes in bulkheads and such, seal them with epoxy or removable putty.**

CONNECTING THE EXTERNAL BATTERY AND DEPLOYMENT CHARGES



The ADEPT22 is designed to be powered with an external 9-volt alkaline battery. The same battery also furnishes the current that fires the deployment charges. The negative lead from the battery (usually BLACK) connects to pin 1 of the terminal block on the ADEPT22.

The positive lead from the battery (usually RED) connects to pin 2 of the terminal block. **One side of each deployment charge also connects to pin 2 of the terminal block.** Pin two will have three wires connected. It is best to connect the three wire ends

together before connecting them to pin 2 of the terminal block. The On-OFF switch (recommended) is connected either in-line in the positive lead from the battery, or in-line in the negative lead if desired.

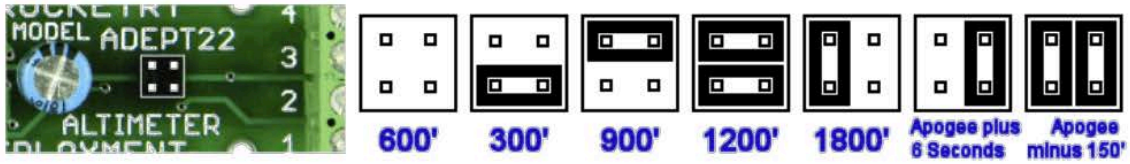
The other side of the apogee charge connects to pin 3 of the terminal block, and the other side of the main chute charge connects to pin 4.

When the unit is switched on, the unit sounds out a long pulsating beep to indicate proper operation. Then the altitude of the most recent flight is beeped out twice. After another ten seconds of silence the unit starts beeping once a second to indicate that it is now taking altitude readings and is waiting for liftoff.

If low-current deployment charges are connected, the beeping changes from a single beep to other beeping patterns to indicate continuity of the deployment charges. A single beep indicates proper operation with no deployment charges connected. A double beep indicates continuity of only the first output or first deployment charge, the one that fires at apogee (maximum altitude). A triple beep indicates continuity of only the second output or second deployment charge, the one that fires during descent as selected by the user. Four beeps repeating indicates that both deployment charges have continuity.

SETTING THE SECOND OUTPUT VALUE

When viewing the front of the ADEPT22 (with the green terminal block to the right), a four-pin square connector is located just below the legend **ADEPT22**. When no jumpers are installed on the connector, the default altitude setting is 600 feet above ground. The second deployment charge will fire during descent at 600 feet. When a single shorting jumper is installed horizontally on the lower two pins only, the setting is 300 feet. When a single jumper is installed horizontally on the upper two pins only, the setting is 900 feet. When two jumpers are installed horizontally, on both the lower two pins, and on the upper two pins, the setting is 1200 feet.



Jumpers also may be installed vertically on the four-pin square connector. When a single jumper is installed vertically on the left two pins only (toward the blue capacitor), the setting is 1800 feet above ground. The second deployment charge will fire during descent at 1800 feet.

When a single jumper is installed vertically on the right two pins only (toward the terminal block, the second deployment charge will fire **6 seconds after apogee** (6 seconds after the first charge fires).

When two jumpers are installed vertically, on both the left two pins, and on the right two pins, the second deployment charge will fire after apogee during descent at **150 feet below apogee**.

With the 6 Seconds After Apogee setting, and the 150 Feet Below Apogee setting it is possible to use the second output as a backup for the first charge. With these settings it is possible to create an apogee deployment sequence that is implemented with two sequential steps. One of the many possibilities for these settings is to click a camera after the rocket's descent has stabilized.

To simulate rocket liftoff it is necessary to pull a vacuum on the altimeter while it is inside a sealed chamber. You need only hold the vacuum for a few seconds, then slowly release. However, the best method is to put the whole device (including wires and flashbulbs or small light bulbs, for testing the outputs) inside a small wide-mouth juice bottle, and pull a vacuum on the bottle (or you may use an Adept VCK2 Vacuum Chamber - see **VCK2 Vacuum Chamber** and **VCK2 Instructions**). It is easy to simulate rocket flights to altitudes of several thousand feet. Slowly pull the vacuum, then slowly release the vacuum. As the vacuum (altitude) increases, the ADEPT22 will BOOP to indicate that 300 feet has been reached (liftoff). Then when the altitude starts its descent (vacuum is being released), a BEEP will indicate that the maximum altitude was reached, and this is when the first output (apogee) fires. When the simulated altitude falls to the user selected altitude above the original ground level, there will be a long BEEP, and this is when the second output fires. The unit then begins reporting the maximum altitude.

After a flight, the altimeter will be beeping out the maximum altitude in this manner: (1,321 feet) Beep .....Beep Beep Beep.....Beep Beep.....Beep. A zero is indicated with a long Beep: (1,302 feet) Beep.....Beep Beep Beep.....Beeeeep.....Beep Beep. After each sequence there is a long pause before it repeats. This system works for three, four, or five digits depending on the value. This readout system is an Adept Rocketry invention. Even though this readout system is copyrighted and patented (patent expired), and a registered trade mark of Adept Instruments, Inc, it has become the industry standard.

Warning: never install this device in a rocket without first testing its controlling outputs. Always test before each flight. Also, backup deployment systems and/or instrument redundancy (use of two similar systems in the same rocket) are highly recommended.

MAXIMUM ALTITUDE VALUE FROM THE PREVIOUS FLIGHT

Whenever the ADEPT22 is turned on, the long beep indicates proper operation. Then the previous flight's maximum value is beeped out twice, followed by a 10 second delay before the device starts looking for liftoff. This sequence is repeated every time the unit is turned on. To hear the previous flight's altitude again, turn off the ADEPT22 (before the end of the 10 second pause if possible) and wait for it to shut down. Turn it on again to hear the previous flight's maximum altitude.

NOTES ON MOUNTING AND INSTALLING

The ADEPT22 may be installed lengthwise in a small-diameter rocket tube. It will fit lengthwise in a 1.0 inch (25.4 mm) ID tube. In larger tubes it may be mounted flat against a plate or bulkhead in any orientation. The mounting holes are .090 inch diameter for #2 hardware. Use #2 screws, standoffs, and hexnuts when mounting the altimeter to a plate or bulkhead. **Do not enlarge the mounting holes, and do not use Velcro.**

An Altimeter must be installed in a "sealed" chamber with a vent or vents to the outside. A sealed bulkhead below the altimeter chamber is necessary to avoid the strong vacuum caused by the aft end of a rocket during flight. Any leakage around the motor mount or in other areas at the aft end of the rocket will allow the strong vacuum to be partially felt inside the rocket body. In this case an altimeter could incorrectly indicate and record an altitude that is far higher than reality.

A sealed bulkhead above the altimeter chamber is necessary to avoid any pressure fluctuations that may be created at the nose end of the rocket. If the front of the payload section slip fits to another section such as a nosecone, then the fit must be as free as possible from turbulence.

A breathing hole or vent (also known as a static port) to the outside of the rocket must be in an area where there are no obstacles above it that can cause turbulent air flow

over the vent hole. Do not allow screws, ornamental objects, or anything that protrudes out from the rocket body to be in line with and forward of a vent hole. The vent must be neat and burr free and on an outside surface that is smooth and vertical where airflow is smooth without turbulence.

Some rocketeers use multiple static ports (vent holes) instead of just one. Very strong wind blowing directly on a single static port could affect the altimeter. Multiple ports evenly spaced around the rocket tube may help cancel the effects of strong wind, the pressure effects of a non-stable liftoff, or the pressure effects that occur due to flipping and spinning after deployment. If you wish to use multiple ports, then use three or four. **Never use two.** Ports must be the same size and evenly spaced in line around the tube.

The general guideline for choosing port size is to use one 1/4 inch diameter vent hole (or equivalent area, if multiple holes are used) per 100 cubic inches of volume in the altimeter chamber. For instance, An eight-inch long four-inch diameter tube has a volume of about 100 cubic inches. Use one 1/4 inch port, or three or four 1/8 inch ports evenly spaced around the tube. An altimeter chamber two inches in diameter and eight inches long (25 cubic inches) needs one 1/8 inch vent hole or three or four 1/16 inch vent holes. Try to keep hole sizes within -50% or +100% of the general guideline. Do not make the holes too small, and **especially do not make them too large**. In general, the vent holes need never be smaller than 1/32 inch. Also, the vent hole diameter need never be less than the thickness of the body tube.

Adept Rocketry completed the research on static port sizes in 1990. The information provided here has remained the industry standard ever since those early years.

When possible, vent holes should be a minimum of 4 body diameters below the junction of the nosecone with the rocket body. This is necessary with high performance (high speed) rockets. The tremendous pressure on the nosecone leeches down the rocket body as much as three or four body diameters before it dissipates. However, with lower speed rockets, the "minimum of 4 diameters" rule may be reduced to one or two.

LIMITED WARRANTY AND DISCLAIMER

Adept Rocketry and Adept Instruments, Inc. warrant to the original purchaser that this product is free of defective parts and workmanship and that it will remain in good working order for a period of 90 days from the date of original purchase. This product will be repaired or replaced within 90 days of purchase if it fails to operate as specified, if returned by the original purchaser and if it has not been damaged or modified, or serviced by anyone other than the manufacturer. Adept Rocketry and Adept Instruments, Inc., their owners, employees, vendors and contractors shall not be liable for any special, incidental, or consequential damages or for loss, damage or expense directly or indirectly arising from customer's or anyone's use of or inability to use this device either separately or in combination with other equipment, or for personal injury or loss or destruction of other property, for experiment failure, or for any other cause. This device is sold as an experimental accessory only, and due to the nature of experimental carriers such as rockets, the possibility of failure can never be totally removed. It is up to the user, the experimenter, to use good judgment and safe design practices and to properly pretest the device for its intended performance in the intended vehicle, or reasonable facsimile of same, under controlled conditions to gain reasonable belief that the device and vehicle will perform in a safe manner, and to assure that all reasonable precautions are exercised to prevent injury or damage to anyone or anything. **WARNING**: Do not use this device unless you completely understand, agree with, and accept all of the above statements and conditions.

ADEPT22 Maximum Altitude Altimeter with Dual Deployment™
Price: $39.00

36 in diameter nylon drogue parachute

120 in main parachute nylon from rocketman

Cesaroni 5198M1101-P

Manufacturer

Cesaroni Technology

Designation

5198M1101-P

Common Name

M1101

Motor Type

reload

Delays

P (no ejection)

Diameter

75 mm

Length

621 mm

Total Weight

4,938 g

Prop. Weight

2,993 g

Avg. Thrust

1,111.2 N

Initial Thrust*

1,256.5 N

Max. Thrust

1,475.0 N

Total Impulse

5,197.6 Ns

Burn Time

4.7 s

I_{SP}

177 s

Mass Fraction*

0.61

Motor Case

Pro75-4G

Propellant

White

Cert. Org.

CAR

Cert. Date

June 17, 2014

Availability

regular

HazMat Shipping

HazMat

* These values are calculated; not reported in the certification document.

Compared with all 120 **M** motors:

5,123 Ns 10,482 Ns

Total Impulse

542.0 N 6,365 N

Average Thrust

794.0 N 7,238 N

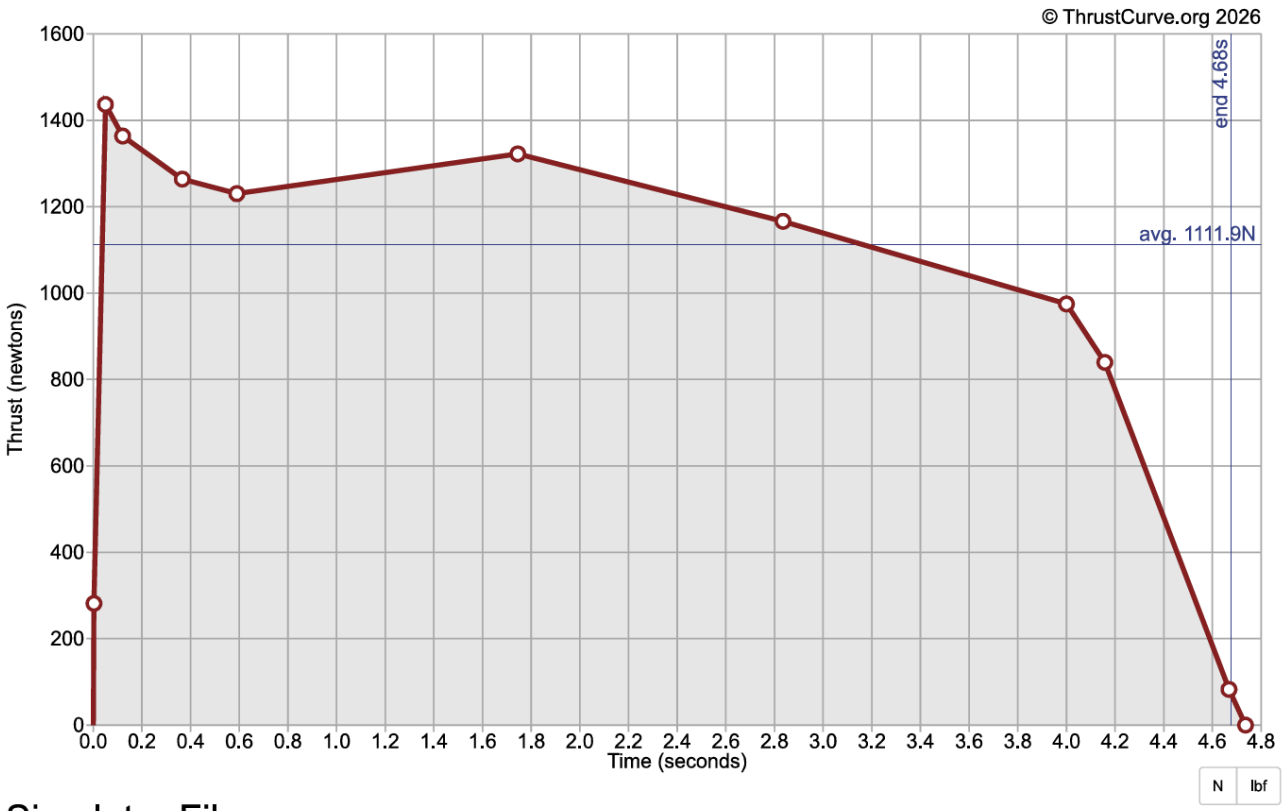
Maximum Thrust

1.4 s 13.8 s

Burn Time

Report incorrect info.

There are no reported failures of this motor in the **MESS** database.
If you have had a failure, please report it on **motorcato.org.**



Simulator Files

Format	Source	Updated	Contributor
RASP	user	June 26, 2018	Greg Gardner
RockSim	cert	June 20, 2014	Andre Choquette

Do you have a data file? Please contribute it. See how to contribute for more info.

Motor Notes

Do you have other info on this motor? Please add a note.

Pro75® High-Power Reloadable Rocket Motor Systems

FOR USE ONLY BY CERTIFIED HIGH-POWER ROCKETRY USERS 18 YEARS OF AGE OR OLDER

FLAMMABLE MATERIAL – KEEP AWAY FROM OPEN FLAME, CIGARETTES OR OTHER HEAT SOURCES AT ALL TIMES

USE WITHIN 1 YEAR OF MANUFACTURING DATE **TEMPERATURE RANGE: -5 to 30°C**

Read this BEFORE you start assembly:

- If you have any questions or require assistance, please contact your dealer. If you are unable to resolve your questions or problems then please contact the manufacturer directly. Assistance is available Mon – Fri. 9am – 4:30pm at (905) 887-2370. Ask for ProXX motor products technical support.
- Read all instructions carefully and be sure you fully understand each step before proceeding with motor assembly.
- **Make sure to also read the Pro75 Product Notes for reload specific instructions. Your reload may require bonding of grains into the case liner. For moonburner reloads there are also separate moonburner instructions for gluing the grains.**
- Inspect the components of your reload kit carefully before you start assembly. DO NOT use any parts that appear damaged or faulty in any way.
- Do not tamper with or modify the hardware or reload kit components in any way. Not only will this void all product warranty, it could cause catastrophic failure of your motor system and result in damage to your rocket vehicle, launch equipment and create a hazard to persons or property.
- Reload kit components are designed for ONE USE ONLY, and may not be reused. Reuse of any of these components could result in motor failure and will void product warranty.
- Follow the safety code and all rules and regulations of your sport rocketry association. Also ensure that you are in compliance with all local, state/provincial, and Federal laws in all activities involving high power rockets and rocket motors.
- Parts checklist:



Pro75® hardware components (if used):

- ✓ Appropriate size of motor case
- ✓ Forward closure
- ✓ Nozzle holder
- ✓ Threaded retaining rings (2)

Reload kit components:

- ✓ Case liner (phenolic tube)
- ✓ Nozzle
- ✓ Forward insulator disk
- ✓ P75-ORK (o-ring kit)
- ✓ P75-TSI-KIT (smoke tracking grain/insulator & igniter kit)
- ✓ Propellant grains (check reload kit package for number and type required for your motor)

Assembly instructions

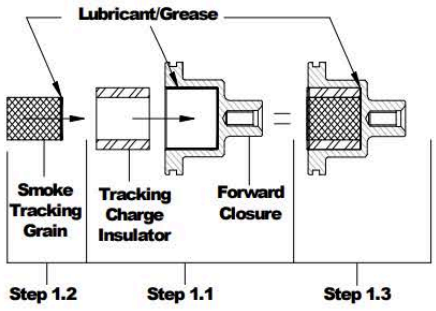
- Be sure to follow the correct instructions for the brand of motor hardware you are using!
- Step 1 is the same for both brands of hardware.
- All o-rings are pre-lubricated at the factory where required.
- Three o-rings are supplied in the P75-ORK o-ring kits. The two larger o-rings are used with both Pro75® and RMS™ hardware. The smaller o-ring is only used with Pro75® hardware.
- Do not apply lubricant to the grain spacer o-rings, they are for spacing only.
- Phenolic and phenolic/paper components such as the nozzle and case liner tube are brittle and can be cracked, broken or otherwise damaged by excessive force or impact. Please be careful during handling and assembly. If you suspect a part has been damaged in any way, STOP and do not proceed with assembly and especially firing until inspected and replaced if necessary.

1. Forward Closure Assembly

1.1. Apply a light coating of o-ring lubricant or grease to the inside of the cavity in the forward closure. Insert the smoke tracking charge insulator into this cavity and ensure it is seated fully.

1.2. Apply a liberal layer of grease or o-ring lubricant to one end of the smoke tracking grain. Be sure the entire face is coated.

1.3. Insert the smoke tracking grain into the smoke tracking charge insulator, coated end first. Push the grain in with sufficient force to fully seat it and spread the lubricant as shown. The excess lubricant will help prevent gas leakage forward as well as protecting the forward closure from heat and combustion products from the smoke tracking charge.



You may now proceed to the remainder of the instructions for your brand of motor hardware.

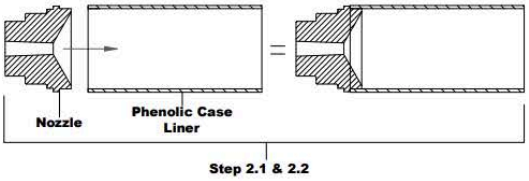
Step 2 is for Pro75® hardware users.

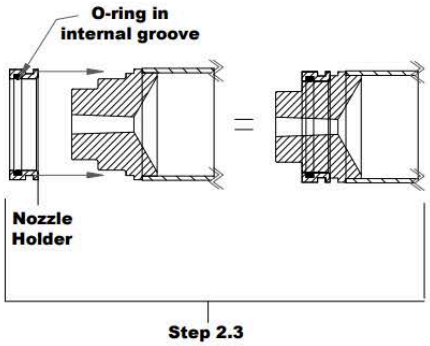
Step 3 is for RMS™ hardware users.

2. Motor Assembly: Pro75® Hardware.

Before proceeding, inspect the external o-ring grooves on the forward closure and nozzle holder, as well as the internal groove on the nozzle holder. Clean thoroughly if necessary to remove ALL combustion residue and debris. Also ensure that the inside of the motor case has been thoroughly cleaned.

2.1. Check both ends of the phenolic case liner to ensure that the inside ends have been chamfered or deburred. If not, use a hobby knife or coarse sandpaper to remove the sharp inner edge to allow components to be inserted easily.



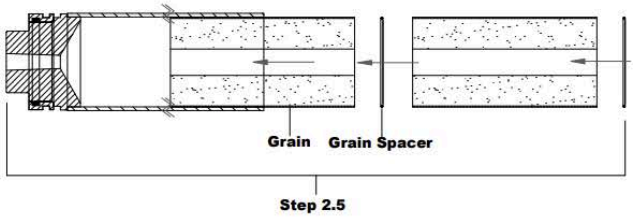


2.2. Fit the nozzle to one end of the paper/phenolic case liner tube. It may be a snug fit. Push it carefully but with sufficient force to seat the shoulder on the nozzle all the way into the insulator tube.

2.3. Locate the smaller o-ring in the P75-ORK o-ring kit. Fit the o-ring to the internal groove of the nozzle holder. Push the nozzle holder over the nozzle until fully seated. Apply additional lubricant to the nozzle exit section if necessary to facilitate assembly.

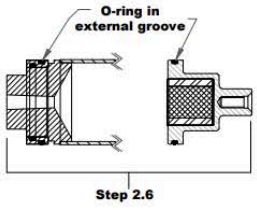
2.4. For steps 2.5 – 2.6 work with the nozzle/case liner assembly and motor case horizontally on your work surface.

2.5. Insert one propellant grain into the forward end of the case liner and push it a short way into the tube. Fit one grain spacer o-ring to the top face of the grain, ensuring it sits flat on the end of the grain. Insert the second grain, push it in a short ways, then add another grain spacer, and so on until you have loaded all propellant grains into the case liner.

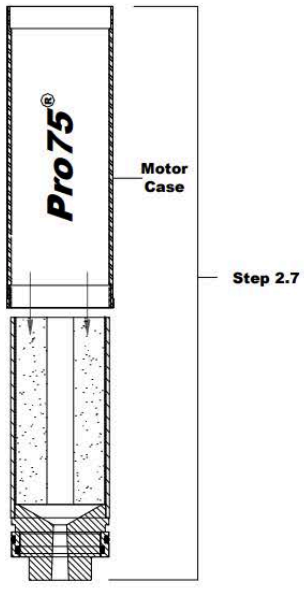


2.5.1. There should be sufficient space after the last grain is inserted to fit the last spacer in place so that it is flush or extends only slightly from the end of the tube. If it extends out by more than 1/3 of its own thickness, remove it and do not use. Only this spacer may be omitted and only if necessary to fit.

2.6. Carefully install the two larger o-rings into the external grooves of the nozzle holder and forward closure. Handle these components with care from this point on so as not to damage or contaminate the o-rings.



2.7. Place the case liner/nozzle assembly on your work surface with the nozzle end down, and slide the motor case down rear end first (end with thrust ring) over the top of the liner towards the nozzle. **Note:** a light coat of grease on the liner exterior will aid assembly, disassembly and cleanup!

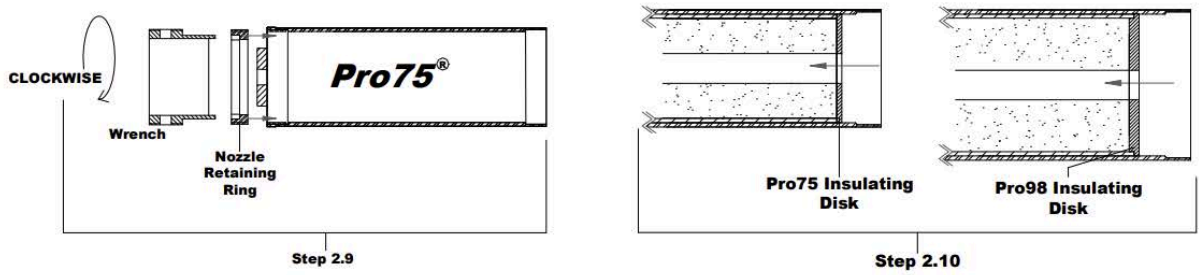


2.8. Lay the motor case assembly down horizontally, and push on the nozzle ring until the assembly is far enough inside the case that the threads are partly exposed and the screw ring can be threaded into the rear of the case. Don't push on the nozzle itself as you will push it out of the nozzle holder.

2.9. Screw in the nozzle retaining ring using the supplied wrench, pushing the nozzle/nozzle ring/case liner assembly forward as you proceed. Screw it in *only until the retaining ring is*

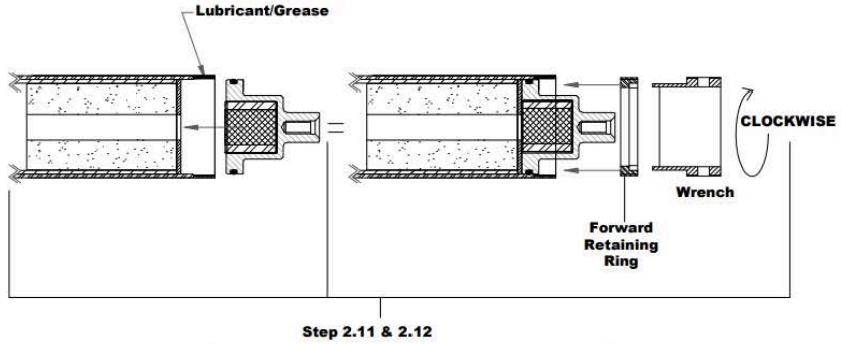
exactly even with the end of the motor case - do not thread it in as far as it will go. Then, back the retaining ring out one half of a turn.

2.10. Fit the forward insulating disk to the top of the case liner, checking that the top grain spacer (if used) is still properly in place.



2.11. Verify that the inside of the motor case is clean ahead of the liner assembly before proceeding. Wipe with a clean rag, tissue or wet-wipe if required. Apply a light coat of silicone o-ring lubricant onto this area after cleaning.

2.12. Insert the assembled forward closure into the top of the motor case, pushing it down carefully with your fingers until you can thread in the retaining ring. Thread in the forward retaining ring using the wrench, until you feel it take up a load against the top of the case liner. At this point the ring should be approximately flush with the end of the motor case, or slightly submerged. If it extends out the case at this point by more than about one half a turn, check the nozzle end to make sure the ring is not screwed in too far forward. If so, unscrew the nozzle retaining ring another half turn and screw the forward closure retainer in further.



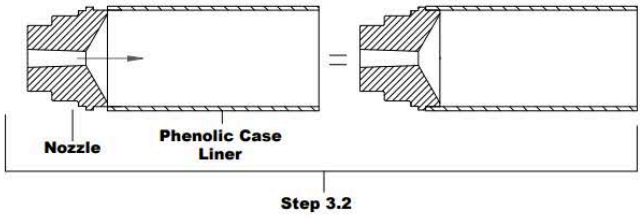
NOTE: it is best to have the forward closure retaining ring flush or slightly submerged and the nozzle retaining ring protruding by a half turn or so, than vice versa. There is more tolerance for o-ring location at the nozzle end. There will always be some minor variation in the length of internal components due to manufacturing tolerances.

2.13. Skip ahead to Section 4, Preflight preparation.

3. Motor Assembly, RMS™ Hardware.

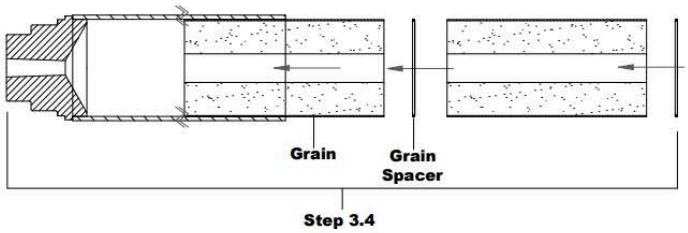
3.1. Check both ends of the phenolic case liner to ensure that the inside ends have been chamfered or deburred. If not, use a hobby knife or coarse sandpaper to remove the sharp inner edge to allow components to be inserted easily.

3.2. Fit the nozzle to one end of the paper/phenolic case liner tube. It may be a snug fit. Push it carefully but with sufficient force to seat the shoulder on the nozzle all the way into the insulator tube.



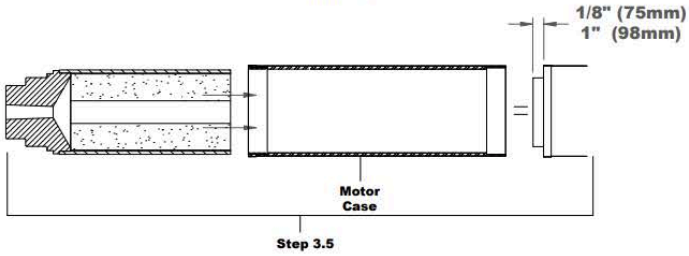
3.3. For steps 3.4 – 3.8 work with the nozzle/case liner assembly and motor case horizontally on your work surface.

3.4. Insert one propellant grain into the forward end of the case liner and push it a short way into the tube. Fit one grain spacer o-ring to the top face of the grain, ensuring it sits flat on the end of the grain. Insert the second grain, push it in a short ways, then add another grain spacer, and so on until you have loaded all propellant grains into the case liner.



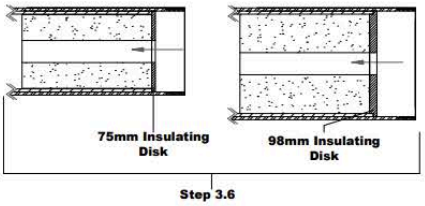
3.4.1. There should be sufficient space after the last grain is inserted to fit the last spacer in place so that it is flush or extends only slightly from the end of the tube. If it extends out by more than 1/3 of its own thickness, remove it and do not use. Only this spacer may be omitted and only if necessary to fit.

3.5. Slide the completed liner/nozzle/grain assembly into the motor case until the nozzle protrudes about 1/8" from the end of the case. **Note:** a light coat of grease on the liner exterior will aid assembly, disassembly and cleanup!



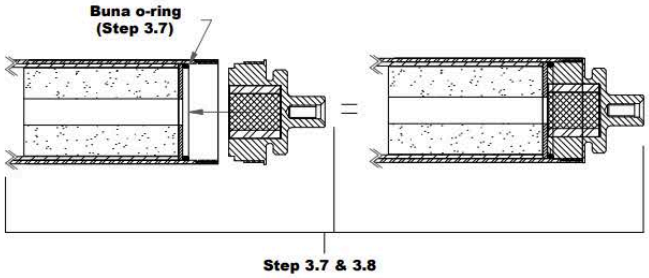
3.6. Fit the forward insulating disk to the top of the case liner, checking that the top grain spacer (if used) is still properly in place.

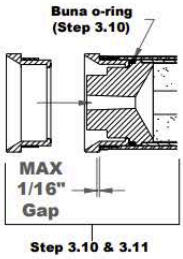
3.7. Place one of the larger pre-lubricated o-rings from the P75-ORK kit into the forward end of the case until it is seated against the forward insulator.



3.8. Thread the completed forward closure into the forward end of the motor case by hand until it is seated against the case. NOTE: There will be considerable resistance to threading in the closure in the last 1/8" to 3/16" of travel, due to compression of the o-ring.

3.9. Hold the motor vertically on your work surface with the forward closure downwards, and push down on the nozzle to ensure the liner/nozzle assembly is seated fully forward.





3.10. Place the other identical o-ring into the groove in the nozzle.

3.11. Thread the aft closure into the motor case until it is seated. It is normal for a small gap (up to about 1/16") to remain between the closure and the end of the case, due to manufacturing tolerances on internal components. Note: There will be considerable resistance to threading in the closure in the last 1/8" to 3/16" of travel, due to compression of the o-ring.

3.12. Proceed to Section 4, Preflight preparation.

4. Preflight Preparation.

4.1. Prepare the rocket's recovery system, before motor installation if possible.

4.2. Install the motor in your rocket, ensuring that it is securely mounted with a positive means of retention to prevent it from being ejected during any phase of the rocket's flight.

4.3. IMPORTANT: **DO NOT INSTALL THE IGNITER IN THE MOTOR UNTIL YOU HAVE THE ROCKET ON THE LAUNCH PAD, OR IN A SAFE AREA DESIGNATED BY THE RANGE SAFETY OFFICER**. Follow all rules and regulations of your rocketry association, and/or the National Fire Protection Association (NFPA) Code 1127 where applicable.

4.4. Install the supplied igniter, ensuring that it travels forward until it is in contact with the forward closure. Securely retain the igniter to the motor nozzle with tape, or (if supplied) the plastic cap, routing the wires through one of the vent holes. Ensure that whatever means you use provides a vent for igniter gases to prevent premature igniter ejection.

4.5. Launch the rocket in accordance with all Federal, State/Provincial, and municipal laws as well as the Safety Code of your rocketry association, as well as NFPA Code 1127 where applicable.

5. Post Flight Cleanup.

Do not try to dismount or disassemble your motor until it has thoroughly cooled down after firing. Some components such as the nozzle may be extremely hot for some time after firing.

Perform motor cleanup as soon as possible after firing, however, as combustion residues are corrosive to motor components, and become very difficult to remove after several hours.

5.1. Unthread and remove the forward and rear closures. Remove the nozzle holder from the nozzle.

5.2. Remove the phenolic tracking smoke charge insulator from the forward closure.

5.3. Remove all o-rings.

5.4. Discard all reload kit components with regular household waste, after they have completely cooled down.

5.5. Use wet wipes, or paper towels or rags dampened with water or vinegar to thoroughly clean all residue, grease etc. off all hardware components. Pay close attention to internal and external o-ring grooves. A cotton swab or small stick of balsa is an excellent tool for cleaning these grooves.

5.6. Apply a light coat of grease or o-ring lubricant to all threaded sections and reassemble threaded components for storage.

MEANS OF DISPOSAL: The propellant grains, smoke tracking charge, and the igniter are extremely flammable and burn with an intense, hot flame. The remainder of the components are inert and may be disposed of with household trash. To destroy the flammable components, dig a shallow hole in the ground in a remote area, away from any buildings, trees, people, or any other combustibles. Place the propellant grains and smoke tracking module in the hole. Install the igniter into the core of one of the propellant grains and secure with tape. Ignite electrically from a minimum distance of 15 meters. Douse any smoldering paper residue and discard. Ensure that you are not in violation of any local or state regulations for this procedure. If in doubt, contact your local fire department. Please direct any questions regarding safe disposal to our technical support number on page one of this document.

First Aid: If ingested, induce vomiting. Burns from flames are to be treated as regular burns with normal first aid procedures. In either case, seek medical attention**.**

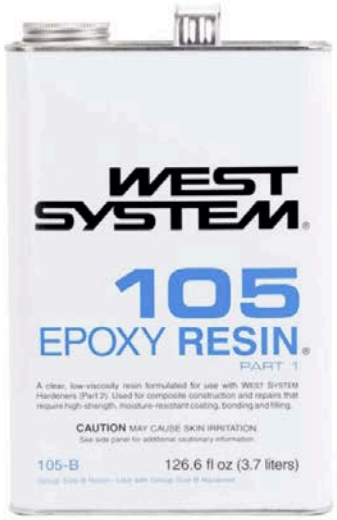
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⇒ Check out our web site at http://www.Pro-X.ca for tech tips, FAQ's, user feedback and photos, or e-mail us at ProX@cesaroni.net

⇒ For technical and warranty inquiries, please contact your Pro75® dealer.

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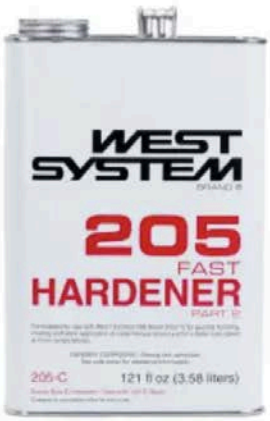
RESIN



105 Epoxy Resin® is a clear, low-viscosity liquid epoxy resin. Formulated for use with one of four WEST SYSTEM® hardeners. It can be cured in a wide temperature range to form a high-strength solid with excellent moisture resistance.

VIEW 105 EPOXY RESIN

HARDENERS



Select from a range of hardeners to tailor your epoxy mixture's handling characteristics and cured physical properties to suit your working conditions and specific coating or bonding application.

VIEW HARDENERS

Insert filled out flight card

NAR HIGH POWER LEVEL 3 CERTIFICATION APPLICATION

APPLICANT AND MOTOR INFORMATION (completed by applicant)

Name: _____ (First / Last)

Birth Date: ____/____/____

Address: _____ (Street / Apartment)

Phone: (____) _____ ☐ Evening? ☐ Day?

_____ (City / State / ZIP)

NAR No. _____

Email Address: _____

Membership Expires : ____/____

I, _____, certify that I am a Level 2 certified member in good standing of the National Association of Rocketry.

Signature: _____

Date: ____/____/____

Motor designation: _____

Motor Manufacturer: _____

CONSTRUCTION PACKAGE AFFIDAVIT (Completed by certification team).

I, the undersigned, am a senior member of the NAR, distinct from the applicant, and a member of the NAR Level 3 Certification Committee. I have reviewed the airframe construction data presented to me and I confirm that the applicant has followed and complied with accepted construction practice in this Level 3 project. My assessment is based on:

☐ Inspection during construction
☐ Documented Level 2 test flight
☐ Review and approval of construction package documentation
☐ Other: _____

Name (printed): _____ Signature: _____

NAR No: _____ Membership expires: ____/____/____ Certification Level: _____

RECOVERY PACKAGE AFFIDAVIT (Completed by certification team).

I, the undersigned, am a senior member of the NAR, distinct from the applicant, and a member of the NAR Level 3 Certification Committee. I have reviewed the recovery system design data presented to me and I confirm that the applicant has followed accepted guidelines in the design and implementation of a recovery system for this Level 3 project.
My assessment is based on:

☐ Recovery certification package review and a test flight demonstrating recovery systems
☐ Recovery certification package review and documentation of the recovery system ground testing

Name (printed): _____ Signature: _____

NAR No: _____ Membership expires: ____/____/____ Certification Level: _____

LEVEL 3 PRE-FLIGHT INSPECTION CHECKLIST (completed by certification team)

☐ Are all pyrotechnics and electronic deployment devices "safed" when presented for inspection? (The rocket must have this capability to pass the safety inspection).

☐ Does the rocket airframe conform to the Construction Package?

☐ Does the rocket recovery system conform to the Recovery System Package?

☐ Has the Certification Package stability analysis been reviewed? Is the CG forward of the aftmost allowable location?

☐ Have the Certification Package performance predictions been evaluated to determine that the motor and launch pad are adequate for a safe, stable flight?

The answer to all of the above questions must be "YES" to proceed.

LEVEL 3 PRE-FLIGHT INSPECTION CHECKLIST CONTINUED (completed by certification team)

__ Does the motor have a minimum total impulse of 5120.01 Newton-seconds and a "M", "N", or "O" designation?

__ Is the motor NAR or Tripoli certified?

__ Is the rocket's predicted altitude no greater than 90% of the FAA waiver restriction?

__ Has the pre-launch checklist been accomplished to verify the flight readiness of the model?

__ Has radio frequency usage, if applicable, been coordinated with the other fliers?

__ Is a launch device sufficient to launch a rocket in this impulse class available?

__ Is a launch system sufficient to safely ignite a rocket motor of this impulse class available?

The answer to all of the above questions must be "YES" to proceed.

The signatures below certify that the model has been inspected and is believed to be safe for flight. The signatures below certify that the certification package has been reviewed, found complete, and accurately describes the model about to be flown. The individuals below are the only ones who may certify this flight attempt. One of the following individuals must be a member of the Level 3 Certification committee.

Name (printed): _____ Signature: _____ NAR No: _____

Birth Date: ____/____/____ Membership expires: ____/____/____ Certification Level: _____ L3CC:_____

Name (printed): _____ Signature: _____ NAR No: _____

Birth Date: ___/___/___ Membership expires: ___/___/___ Certification Level: _____ L3CC:____

LEVEL 3 POST-FLIGHT CHECKLIST (completed by certification team)

__ Did the rocket make a stable flight? The certification attempt is a failure if the answer is "NO".

__ Did the recovery system operate adequately to safely recover the model? The certification attempt is a failure if the answer is "NO".

__ Did the rocket remain intact during recovery deployment, with no separation of parts without recovery devices? The certification attempt is a failure if the answer is "NO".

__ Have all pyrotechnic devices and electronic controls been "safed" for Post-Flight inspection?

__ Is there any damage that would prevent an immediate reflight of the model? The certification attempt is a failure if the answer is "YES".

__ Did the model exceed the FAA waiver authorized altitude? The certification attempt is a failure if the answer is "YES".

LEVEL 3 FLIGHT CERTIFICATION AFFIDAVIT (Completed by certification team).

We, the undersigned, being members of The National Association of Rocketry, distinct from the applicant, have witnessed a demonstration by (Name)_____, (NAR #)_____, of skills relative to the building and safe operation of high power rockets. We attest that the applicant is 18 years of age or older and a member in good standing of the NAR. We believe this member is qualified to build and operate high power models with a total installed impulse up to 40,960 Newton-seconds.

__ Post-flight inspection of rocket completed (See inspection list above).

Name (printed): _____ Signature: _____ NAR No: _____

Name (printed): _____ Signature: _____ NAR No: _____