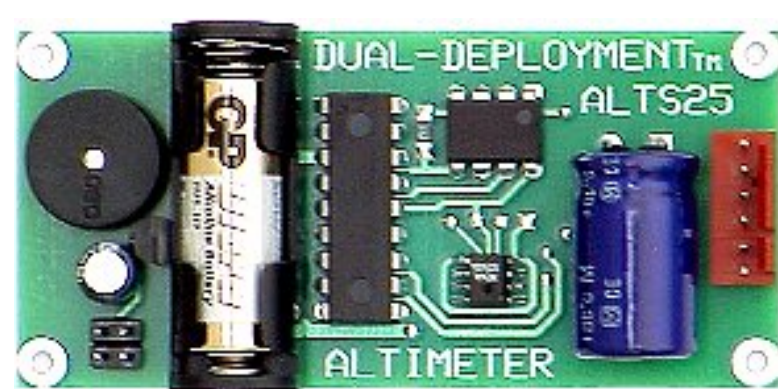


# Adept Rocketry - ALTS25 Instructions and Data Sheet

## ALTS25 Maximum Altitude Altimeter with Dual Deployment™



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The ALTS25 Altimeter with Dual Deployment™ is a maximum altitude altimeter. It measures and reports the maximum above-ground altitude value of a rocket's flight. The ALTS25 also has two altitude controlled deployment switches for firing 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 1,800, 1,200, 900, 600 or 300 feet above ground, or two seconds after apogee, or at 150 feet below apogee (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.

This device is used in rockets that will reach at least 300 feet altitude. Either or both deployment switches may be used, or the device may be used as a maximum altitude altimeter only. The ALTS25 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 ALTS25 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 ALTS25 precisely captures the highest altitude obtained during a flight to a maximum of 25,000 feet above sea level (by special order the ALTS25 can be calibrated to altitudes up to 60,000 feet). **The maximum value obtained above the local ground-zero altitude is precisely measured and reported in one-foot increments (one-foot resolution).**

The ALTS25 measures 1.4" wide by .6" thick by 3" long. It fits inside a tube with a minimum ID of 1.5" (38 mm). It will also fit on either side of a center divider inside a 54 mm ID bay 3" long. The device weighs only 1 ounce, including the battery. It uses a 12-volt alkaline lighter battery

with a battery life up to 6 hours, so you need not be concerned about how long your rocket sits on the launchpad after the unit is powered up. The ALTS25 is a totally stand-alone device including the battery holder, arming mechanism, and current source for firing deployment charges. Nothing more is required except for the wires (interconnect cable) that connect to the On-Off switch and to the deployment charges.

The altimeter uses a custom absolute pressure device to precisely measure altitude values up to 25,000 (or 60,000) feet in one-foot increments. It uses a 17-bit logarithmic analog-to-digital converter to precisely (one-foot resolution) measure the nonlinear pressure versus altitude relationship over this large altitude range. Once powered up, the ALTS25 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 switch fires at the very moment when the rocket reaches the maximum altitude. The second switch fires when the descending altitude reaches either 1,800, 1,200, 900, 600 or 300 feet above the ground, (or two seconds after apogee, or 150 feet below apogee) as preset by the user. The ALTS25 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 ALTS25 cannot be used for, and will not function for, maximum altitudes less than 300 feet.

## SPECIFICATIONS

- Altitude Capability: to 25,000 feet Above Ground Level (AGL), to limit of 25,000 feet Above Sea Level (ASL) for the standard version (60,000 feet by special order). **Note: the latest version of the ALTS25 can actually measure altitudes to 100,000 feet ASL, and apogee detection still functions to 100,000 feet ASL. However, above the normal specified ranges, 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.
- Lowest Maximum Altitude Readable: 300 feet above ground. Liftoff is detected when the altitude quickly increases by 300 feet.
- Mach Compatible; the ALTS25 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; uses a logarithmic 17-bit A-to-D converter.
- Calibration Accuracy Over Full Range: +/- 1%, typical.
- Uses 12-volt lighter battery and has large integral capacitor to fire flashbulb or low-current electric match charges. Battery Life: up to 6 hours.
- 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.

- Switch #1 fires at maximum altitude; Switch #2 fires during descent at 1,800, 1,200, 900, 600 or 300 feet above ground, or two seconds after apogee, or at 150 feet below apogee as selected by the user, or 2 seconds after Switch #1, whichever occurs last.
- Measures 1.4" wide by .6" thick by 3" long and fits inside a tube with a minimum ID of 1.5" (38 mm), or on either side of a center plate inside a 54 mm ID tube. Also, it may be mounted flat against a bulkhead in larger diameter tubes.
- Weighs only 1 ounce with battery installed.
- Accessories Required: one 12-volt alkaline lighter battery, and one cable (Adept **CAB6L-xx** series) to connect an On-Off switch and deployment charges.

## TESTING AND USING THE ALTS25

NOTE 1: The precision amplifier and continuity sensing circuitry on the ALTS25 may be sensitive to noise and static when being held. *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; however, pink-colored or smoke-colored antistatic bags are ideal. Storage in a small cardboard box, or wrapped in a paper towel inside a plastic bag is acceptable. Do not use Velcro to secure the device.*

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

ALTS25 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.**

**Install a 12-volt alkaline lighter battery** (GP-23A, Eveready Energizer No. A23, Radio Shack 23-144, etc.) in the battery holder. The spring end of the battery holder connects to the negative end of the battery. Remove the battery when not in use to avoid prolonged stress on the battery holder and possible long-term disfigurement of the battery holder.

**Connect an Adept CAB6L-xx series interconnect cable to the 6-pin connector.**

The BLACK and BROWN wires enable power to the altimeter when they are connected together. They may be connected to an On-Off switch.

The RED and ORANGE wires connect to the first deployment charge, that fires at apogee.

The YELLOW and GREEN wires connect to the second deployment charge, the one that fires during descent as selected by the user.

To turn the unit on, connect the BLACK wire and the BROWN wire together. Typically these wires will connect to a normally-open On-Off switch or other device. Or the two wires simply may be twisted together. The unit sounds out a long pulsating beep when powered up, to indicate proper operation. Then the altitude of the most recent flight is beeped out twice. After another five seconds of silence the unit starts beeping once a second to indicate that it is now taking altitude readings and is waiting for liftoff.

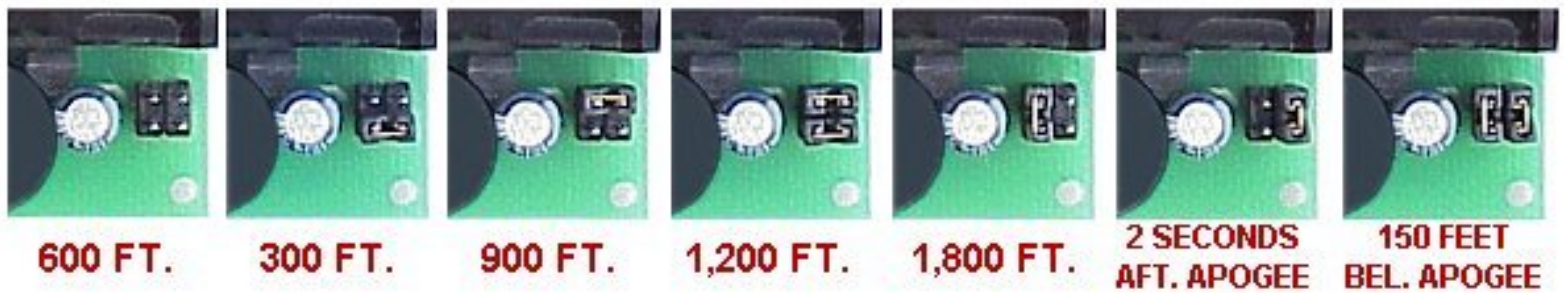
If flashbulbs (or low-current electric matches at a safe distance) are connected (don't connect anything quite yet), the beeping changes from a single beep to other beeping patterns to indicate continuity of the deployment charges. A single beep indicates proper operation with no deployment charges connected. 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 ALTS25 (with the cable connector at the top, and the battery holder near the bottom), a four-pin square connector is located below the right end of the battery holder. 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 1,200 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, the setting is 1,800 feet above ground. The second deployment charge will fire during descent at 1,800 feet.

When a single jumper is installed vertically on the right two pins only, the second deployment charge will fire **two seconds after apogee** (two seconds after the first charge fires). With this setting it is possible to use the second output as a backup for the first charge. With this setting it is possible to create an apogee deployment sequence that is implemented with two timed steps.

When two jumpers are installed vertically, on both the left two pins, and on the two right pins, the second deployment charge will fire after apogee during descent at **150 feet below apogee**. One of the many possibilities for this setting 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 top of the pressure sensor (the small black component with eight pins). A 1/8 inch diameter piece of plastic or rubber tubing can be used. 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 for testing the output switches) 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 ALTS25 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) flashbulb 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 flashbulb 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. The system works for three, four, or five digits depending on the value. **This beeping technique and system is copyrighted and patented, and is a registered trade mark of Adept Instruments, Inc.**

**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.

## NOTES ON MOUNTING AND INSTALLING

The ALTS25 may be installed lengthwise in a small-diameter rocket tube. It will fit lengthwise in a 38 mm ID tube. Also, it may be mounted lengthwise on either side of a center plate inside a 54 mm tube. In larger tubes it may be mounted flat against a bulkhead. 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 vacuum caused by the aft end of a rocket during flight. 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.

The 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 directly 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.**

Vent holes should be a minimum of four 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 four diameters before it dissipates.

## 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.

## ALTS25 Maximum Altitude Altimeter with Dual Deployment™

**Price: \$159.00** - Includes CAB6L-24 Interconnect Cable and GP-23A Battery.

## ADDITIONAL ACCESSORIES

Additional [CAB6L-24 Interconnect Cable](#)

**Price: \$7.50** - 24 inches long. Connects ALTS25 to On-Off Switch and to Deployment Charges.

[CAB6L-12 Interconnect Cable](#)

**Price: \$5.99** - 12 inches long.

[CAB6L-36 Interconnect Cable](#)

**Price: \$8.79** - 36 inches long.

Additional [GP-23A Alkaline Lighter Battery](#); Price: \$2.25.

[GP-23A50 Alkaline Lighter Batteries](#) (box of 50 at 50% Discount); Price: \$56.25.

Shorting Jumpers are used to connect two connector pins together in order to turn on the power for some of the Adept devices. Shorting Jumpers are also used on some devices to program certain values or functions. They are used on the ALTS25 to program the value for the Second Output Function, the output that fires the Deployment Charge for the Main Parachute.

### [Shorting Jumpers](#)

Price: \$1.39 per pack of 10

[VCK2 Vacuum Chamber](#), Complete with Bottle

Price: \$16.79. Use for simulating flights, and for testing Altimeters with or without deployment.

### *Electronic*

*Instrumentation is not compatible with the fumes and residue created by rocket motors and deployment charges.*

Seal

holes and gaps in bulkheads and such with epoxy or removable putty.

[Tac'N Stik Removable and Reusable Putty](#)

Price: \$1.99 per 2 ounce pack.

The perfect mate for the ALTS25 when used in a dual redundancy backup system is the DDCS25. The ALTS25 would function as the primary device to measure altitude and to control Dual Deployment™. The DDCS25 would function as the redundant backup device to also control Dual Deployment™.





## **[DDCS25](#) Dual Deployment Controller™**

**Price: \$119.00** - Includes CAB6L-24 Interconnect Cable and GP-23A Battery.

**[www.adeptrocketry.com](http://www.adeptrocketry.com)**, 3-24-08