

Adept Rocketry - ALT05 Instructions and Data Sheet

ALT05 Maximum Altitude Altimeter



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DESCRIPTION

The ALT05 is a Maximum Altitude Altimeter that precisely measures and reports the maximum above-ground altitude value obtained during a rocket's flight. The device is used in rockets that will reach at least 150 feet altitude. The ALT05 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 ALT05 units (or other altimeter devices) may be placed in each stage of interest to report maximum altitudes obtained by each stage. The ALT05 is very small and light weight. It was designed specially for use in small contest rockets, or for use in small diameter rockets or darts that will reach high altitudes.

The ALT05 precisely captures the highest altitude obtained during a flight to a maximum of 15,000 feet above sea level for the standard version (50,000 feet above sea level for the ALT05-50K extended version). **The maximum value obtained above the local ground-zero altitude is precisely measured and reported in one-foot increments.**

The ALT05 measures .55" wide by .67" thick by 2.7" long. Its weight with battery installed is only 0.46 ounce (13 grams). It fits inside a tube with a minimum ID of .68 inch (17.3 mm), a loose fit in an Estes BT-20 body tube). This device runs on a 12-volt alkaline lighter battery. The battery life for this product is in excess of 8 hours, so you need not be concerned about how long your rocket sits on the launch pad after the Altimeter is powered up. The ALT05 is a totally stand-alone device including the battery holder and arming mechanism. Nothing more is required.

The ALT05 uses a custom absolute pressure device to precisely measure and report altitude values up to 15,000 (or 50,000) feet in one-foot increments. It uses a 16-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 ALT05 constantly measures the ground-level altitude and waits for a quick 150-foot change upward. It then captures the maximum altitude obtained (above ground zero), then begins to report the maximum altitude value (the ALT05 cannot measure maximum altitudes less than 150 feet). The value is "beeped" out as a series of counts that can be heard easily, 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.

TESTING AND USING THE ALT05

NOTE 1: The precision amplifier circuitry and continuity sensing circuitry on the ALT05 may be sensitive to noise and static when being held. A 10-second silent time following power up gives 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; 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 ALT05 must be installed in an area that is totally sealed from motors and charges.*

To turn the unit on, 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 turn off the device and to avoid prolonged stress on the battery holder and possible long-term disfigurement of the battery holder. When the battery is first installed, there will be a long pulsating beep to indicate that power is on. Then after an additional 10 seconds, the unit will beep every two seconds to indicate that it is ready to start looking for a 150-foot increase in altitude. The 10-second pause after powerup gives the user time to slip the unit inside the rocket tube before it starts looking for liftoff.

A 150-foot increase in altitude tells the unit it has liftoff. This is a very small change in pressure, and wind blowing directly on the Altimeter can cause a false start. The problem is avoided when the unit is inside the rocket. The ALT05 constantly measures the ground-level altitude and waits for a quick 150-foot change upward. It then precisely captures the maximum altitude obtained above ground zero. The ALT05 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.

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 Beeeeeep 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 beeping system is copyrighted and patented, and is a registered trade mark of Adept Instruments, Inc.**

To simulate rocket liftoff and to see (hear) the unit do its thing, it is necessary to pull a vacuum on the top of the pressure sensor (the black gizmo with four pins). A quarter-inch diameter piece of plastic or rubber tubing can be used. You need only hold the vacuum for a few seconds, then release slowly. However, the best method is to put the device inside a small bottle, and pull a vacuum on the bottle (or you may use an Adept VCK1, VCK2, or VACBOT Vacuum Chamber). 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 ALT05 will BOOP to indicate that 150 feet has been reached (liftoff). Then when the Altimeter starts its descent (vacuum is being released), it starts beeping out the maximum altitude attained above ground. Check out the Adept vacuum bottle device [VACBOT](#). It is small, and it is a complete Vacuum Chamber Assembly that will accept small altimeters such as the ALT05.

SPECIFICATIONS

Altitude Capability: to 15,000 feet Above Ground Level (AGL), to limit of 15,000 feet Above Sea Level (ASL) for the standard version (50,000 feet for the ALT05-50K extended version).

- Lowest Maximum Altitude Readable: 150 feet. Liftoff is detected when the altitude quickly increases by 150 feet. Mach compatible - detects apogee at true apogee.
- Resolution of Measurement: one foot; system uses a logarithmic 16-bit A-to-D converter.
- Accuracy Over Full Range: +/- 5% of reading with all atmospheric, barometric, temperature, and other conditions considered. Calibration accuracy is +/- 1%, typical.
- Piezo Beeper reports altitude and operational status.
- Battery Life: 8 hours minimum.
- Measures .55" wide by .67" thick by 2.7" long.
- Weight: 6 grams. Weight with battery installed is 0.46 ounce (13 grams).
- Fits inside a tube with a minimum ID of .68 inch (17.3 mm), a loose fit in an Estes BT-20 body tube. Avoid mounting it vertically with the battery holder spring toward the bottom.
- Accessory required: one 12-volt alkaline lighter battery.

NOTES ON MOUNTING AND INSTALLING

This device is intended to be installed lengthwise in a small rocket tube. It fits inside a .68 inch (17.3mm) minimum ID tube; it is a loose fit in an 18 mm or BT-20 tube. When it is to be used in a larger diameter body tube, it may be mounted in any orientation. It may be mounted inside a BT-20 tube that is connected to bulkheads or other structural elements. Also, it may be wrapped with or rolled up in foam or paper towels before being slipped into a larger diameter tube. This has the advantage of additional protection against crash damage, or contamination. The Altimeter will still be able to "breathe" through the porous materials.

Do not use Velcro as a mounting device. When installing lengthwise, always mount the Altimeter with the spring end of the battery holder facing upward toward the nose end of the rocket. This will avoid compression of the spring and battery disconnection during a very high acceleration liftoff.

An Altimeter must be mounted 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. 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. Vents 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 on the ground, the effects of transitioning through wind shears during flight, 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. Keep hole sizes within -50% or +100% of the general guideline. Obviously, a vent or vents in a BT-20 (18 mm) body tube will be quite small.

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 judgement 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.

ALT05, Price: \$89 (GP-23A battery included)

ALT05-50K, Price: \$99 (GP-23A battery included)

Additional **GP-23A** Alkaline Lighter Battery; Price: \$2.25.

VACBOT Vacuum Chamber, Complete with Bottle and Syringe

Price: \$9.95. Use for simulating flights, and for testing small Altimeters that do NOT have deployment outputs.

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 pack.

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

