www.WingedShadow.com

See How™

Display Unit for the *How High*™ Altimeter and
the *How Fast*™ Airspeed Instrument

- Eliminates Flash Counting
  - Ten-flight memory
  - No added airborne weight
  - High-speed data transfer
- Enables In-Flight
  Capturing of Altitudes
  or Airspeeds
  - Capture up to 9 points
    per flight – triggered by
    your R/C transmitter
  - Easy post-flight viewing

Add convenience and capability
to your *How High* Altimeter:

How High™
Model Aircraft Altimeter

SPECIFICATIONS

Output Method:
Grouped light flashes

Output Activation:
Power cycle or finger wave

Peak Altitude Range:
50 to 7000 ft. (15 to 2150 m) AGL

Internal Resolution:
0.46 ft. (0.14 m) @ sea level

Report Resolution:
1 ft. (1 m) Above Ground Level

Voltage Input:
3.2V min., 12.0V max.

Current Input:
1.2 mA typ., 5.9 mA LED on

Size (Circuit Board):
.8 × .6 × .16 in. (20 × 15 × 4 mm)

Weight:
0.08 oz. (2.2 grams)

How High™
Model Aircraft Altimeter

VERSION 2
- Now Easier to Use -
- Feet/Meter Selectable -

- **Reports Peak Altitude**
- **1 ft. (1 m) Resolution**
- **No Computer Needed**
- **Works on its own or
  with the *See How*™
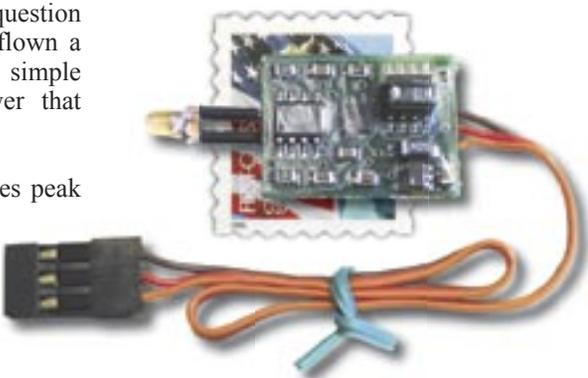 display unit.**

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How High™
Model Aircraft Altimeter

<div>Version 2</div>

How High? It's a common question for anyone who has ever flown a model aircraft. Now there is a simple and inexpensive way to answer that question with accuracy.

The *How High* altimeter provides peak altitude readings when they are most useful – at the field, right after a flight. A single light-emitting diode (LED) reports altitude data through a series of flashes.

The *How High* unit is complete. It does not require the use of a computer, ground-based receiver, or any other equipment. It needs only a 3.2V to 12V power source. Plug it into any available channel on your R/C receiver, or run it off a separate battery. Smaller than a postage stamp and lighter than a dime (2.2g), the *How High* altimeter easily installs into almost any flying model.

Like the altimeter in a full-scale aircraft, the *How High* altimeter determines altitude by sensing tiny changes in atmospheric air pressure. It uses a state-of-the-art pressure sensor and proprietary calculation techniques to provide a level of accuracy previously unavailable in such a low cost instrument.

OPERATION

Understanding how the *How High* operates will help you decide where to install the unit – so, we will cover this topic first.

Using the *How High* is easy:

1) Turn the unit on
2) Make your flight
3) Read the peak altitude

1) Power Up

Apply power to the *How High*. If you have it plugged into your R/C receiver, this is as simple as turning on your receiver switch. The LED will light up for about 3 seconds indicating the feet/meters setting. A flickering LED indicates 'meters' mode; a steady LED indicates 'feet' mode.

The unit will then report the peak altitude of your last flight using a series of flashes. For example, an altitude of 423 feet (or meters) will report as 4 flashes followed by a pause, 2 flashes, another pause, then 3 flashes.

flash-flash-flash-flash
flash-flash
flash-flash-flash

Each group of flashes represents one digit. Leading zeros are suppressed, so 89 will report as 8 flashes, pause, 9 flashes. Altitudes as high as 7000 feet (2150 meters) can be reported. A zero is represented by a quick double flash (you will know it when you see it). After the last flash of the altitude report, the LED will remain off for 4 to 6 seconds so you will know the report is complete. New units

will initially display a factory test value between 1000 and 1100.

2) Your Flight

After the altitude report, the *How High* will enter measurement mode and the LED will output a brief flash every 2 seconds. This "heartbeat" lets you know the unit is on and all is well. Throughout the flight the *How High* is making high-resolution measurements of the atmospheric pressure and temperature every second.

3) Reporting Peak Altitude

After landing, you can view the maximum altitude of your flight using any of three different methods:

A. Cycle the power. Simply turn the unit off, and then turn it back on. It will perform the power-up sequence described previously; blinking the LED to report peak altitude. It does not matter how long you have the power off (one second or one year).

B. Wave your finger. With the LED pointing toward the sun, or the brightest part of the sky if its cloudy, wave your finger back and forth across the LED. (See the "Finger Wave Technique" box on the next page.) When the unit recognizes your wave, the LED will come on for 4 seconds. At this point, stop waving and start counting! The unit will report the peak altitude by flashing the LED just like in the power-up case. You do not have to cycle the power. After the altitude report, the *How High* is ready for your next flight.

C. Use the See How Display. Hold the *See How* Display (sold separately) up to the LED and your flight data is transferred and displayed digitally. This optional accessory features a 10-flight memory and

adds the ability to view up to 9 additional altitudes captured during your flight.

Notes on Operation

The altitude information is saved in non-volatile memory, so you can view it as often as you like. Simply cycle the power or wave your finger over the LED.

When your next flight reaches an altitude of about 50 feet (15 meters) <u>above the ground</u>, the *How High* will allow the old flight data to be overwritten by new flight data. Your plane must fly at least this high for the flight to be recorded.

The *How High* always reports altitude above ground level (AGL). The ground-level (zero) reference is taken after the flight when the altitude report is activated or when power is removed.

INSTALLATION

The best place to mount your *How High* altimeter is inside your model's fuselage. On most planes, the air pressure inside the fuselage is equal to the pressure of the surrounding air -- which is exactly what we want to measure. When this is not possible, the *How High* can be mounted externally. Be aware that air flowing over a surface creates a localized area of low pressure. To reduce errors, choose a location where surface airflow is minimized. For example, mounting the unit on the fuselage side behind the wing can often give acceptable results, while mounting it on

Figure 1A

Figure 1B

Bend Slowly

Finger Wave Technique
- Make sure the LED is pointed directly at the sun, the brightest area of a cloudy sky, or other light source – and not blocked by your shadow.
- Briskly wave your finger back and forth in front of the LED.
- Come very close to the LED as your finger passes over.
- Move your finger completely past the LED on each side by two or three inches (50-75 mm).
- Don't go too slow. About two "round trip" cycles per second is good.
- Flexing your hand at the wrist works better than just moving your finger.
- Usually, only 2 or 3 passes are needed. If it is not working, try re-aiming the LED toward the light.

the airfoil surface on top of the wing will produce large errors (after all, airplanes fly by producing low pressure above the wing).

The unit's light mass and rugged surface-mount construction allow mounting with double-sided foam tape ("servo" tape) or sticky-backed Velcro®.

For easy viewing, drill a 1/8" (3mm) hole so that the LED can protrude through the fuselage. Keep in mind that for finger wave activation the LED will need to be pointed toward a bright area of the sky. On most planes, it is best to position the unit so that the LED comes through the top of the fuselage. If you have a small hand-held plane, the fuselage side or bottom could be considered, since you can turn the plane over as needed. You can also place the unit under a hatch, but you will need to open the hatch to view the report.

For flexibility in mounting, the LED leads can be bent. Figure 1A shows the unit as shipped, while Figure 1B shows the leads of the LED bent to a right angle. Bend the leads slowly to prevent damage. Figure 2 shows the unit, with the bent LED, flipped over and mounted under the top of the fuselage.

There are many alternative mounting methods. With the LED in the straight position, the unit can be mounted vertically to the fuselage side, or to a bulkhead, with the LED still protruding through the top of the fuselage. If you wish to avoid using adhesives, you can wrap foam around the unit and wedge or band it into position.

Electrical Connection

Plug the unit into any unused servo channel on your R/C receiver. The supplied universal connector works with most radio brands. If all your channels are in use, you can use a Y-harness to share a channel

Top of Fuselage

Figure 2

Mounting Tape

1/8 Dia. Hole

with an existing servo. For DSC compatible receivers, do <u>not</u> use the "DSC" or "DSC/battery" slot.

For free-flight (and other stand-alone applications), you will need to provide a battery. The *How High* works across a wide range of voltages (from 3.2V to 12V). Any battery in this range can supply power. The average current draw is about 1.5mA, so very small batteries can be used. Just add an appropriate connector and, if desired, a power switch. Connect the RED wire to the POSITIVE (+) battery terminal. Connect the BROWN and ORANGE wires to the NEGATIVE (-) battery terminal.