Kestrel® 3500
Pocket Weather® Meter
with Backlight

Thank you for purchasing the Kestrel 3500 Pocket Weather Meter. This instrument will measure the following environmental conditions:

- wind speed
- maximum wind gust
- average wind speed
- temperature (air, water, snow)
- wind chill
- relative humidity
- heat stress index
- dewpoint
- wet bulb temperature
- barometric pressure
- altitude

Plus additional features:

- clock
- data hold function
- automatic power-down function
- 3-hour pressure trend
- backlight
- waterproof and floats

INSTRUCTION MANUAL

Revised 07/28/10

1.800.561.8187 www.itm.com information@itm.com

OPERATION

1. **Slide off cover.**
2. **Turn on**. Press the center button (◐) to turn on the unit.
3. **Select operating mode**. Press the right arrow (▶) to scroll through the measurements listed below. Press the left arrow (◀) to scroll through the measurements in reverse order. The instantaneous measurements will be displayed. Each measurement screen is preceded by a brief hint to clarify which measurement is being displayed. (See *Understanding the Measurements* section for more information.)
4. **Select the unit of measure**. While holding ◐, press ▶ to scroll through the units of measure listed below.

pressure rising quickly (rise more than +0.18 inHg)
pressure rising (rise within +0.06 inHg and +0.18 inHg)

Mode	Hint	Icon	Units of Measure
Clock	---	---	12-hr, 24-hr
Wind Speed	SPd		m/s, ft/min, km/h, mph, kt, B
Max Gust	SPd	MAX	m/s, ft/min, km/h, mph, kt, B
Avg Speed	SPd	AVG	m/s, ft/min, km/h, mph, kt, B
Temperature	dEG		C, F
Wind Chill	chill		C, F
Mode	**Hint**	**Icon**	**Units of Measure**
Humidity	r.h.	%	%
Heat Stress Index	H.I.	%	C, F
Dewpoint	d.P.		C, F
Wet Bulb Temp	bulb		C, F
Barometric Pressure*	bAro		hPa, inHg
Altitude	Alt		m, ft

** Only one of the pressure icons will be displayed, indicating the 3-hour pressure trend.*

↑
↗ *pressure stable (remain within -0.06 and +0.06 inHg)*
→ *pressure falling (drop within -0.06 inHg and -0.18 inHg)*
↘ *pressure falling quickly (drop more than -0.18 inHg)*
↓

5. **Hold mode**. While holding ◐, press ◀ to hold the time and all of the measured values. The word "HOLD" will blink to indicate the Hold Mode. Press ◀ or ▶ to view the other measurements in Hold Mode. While holding ◐, press ◀ to exit the Hold Mode. This mode can be useful for taking measurements when unable to view the display.
6. **Turn on the backlight**. Press ◐ to activate the backlight for 10 seconds. If ◀ or ▶ are pressed while the backlight is illuminated, the backlight will remain illuminated for another 10 seconds. Press ◐ while the backlight is illuminated to manually turn off the backlight.
7. **Adjust the clock**. Simultaneously press ◀ and ▶ to adjust the clock. While the clock is blinking, press ◀ or ▶ to adjust the clock. Hold ◀ or ▶ to adjust the times quickly. Simultaneously press ◀ and ▶ to exit the clock adjustment.
8. **Turn off**. Hold ◐ for 2 seconds to manually turn off the unit. The unit will automatically turn off if no buttons have been pressed for 45 minutes.

UNDERSTANDING THE MEASUREMENTS

Wind Speed - average over the previous three seconds. The measurement will be accurate for air flow through the front or rear of the unit.

Maximum Wind Gust - maximum 3 - second wind speed since the unit was turned on.

Average Wind Speed - average wind speed since the unit was turned on.

Temperature - instantaneous temperature of the thermistor, which is located at the end of the long coiled leads in the open cavity below the impeller. The exposed thermistor will respond quickly to changes in temperature when air flows past it. For fastest response, either hold the unit into the wind or wave the unit side to side for 15 seconds. Readings should be taken in the shade. Water and snow temperatures can be taken by hold the unit in the water or snow.

Wind Chill - combination of wind speed and temperature, as defined by the US National Weather Service. Wind chill is the effective temperature on a human or animal at low temperatures due to wind speed. Wind chill readings will be the same as the temperature readings above 45ºF or below 3 mph.

Relative Humidity - amount of moisture in the air compared to the amount of moisture the air can hold for the given temperature, represented as a percent. Because relative humidity is also a function of the temperature, the response time will be dependent on the temperature response time (see temperature section above). Readings should be taken in the shade.

Heat Stress – combination of temperature and humidity, as defined by the US National Weather Service. Heat stress is the effective temperature on a human or animal at high temperatures due to humidity. Heat stress readings will be the same as the temperature readings below 70ºF.

Dewpoint – calculated based on temperature and humidity measurements, as a measure of moisture content in the air. If the dewpoint is very close to the temperature, the air is humid. If the temperature and dewpoint are the same, dew will form. If this happens below freezing, frost will form.

Wet Bulb Temperature - calculated based on temperature and humidity measurements, as a measure of evaporation rate. If the wet bulb temperature is very close to the air temperature, the air is humid. Wet bulb temperature is typically measured by swinging a mercury thermometer with a wet sock on its end for several minutes.

Altitude and Barometric Pressure - the Kestrel 3500 will measure station pressure in order to calculate barometric pressure and altitude. Changes in either air pressure or altitude will affect these readings, so it's important to make adjustments as necessary.

ABOUT BAROMETRIC PRESSURE AND ALTITUDE ADJUSTMENTS

The Kestrel Meter measures "station" pressure, the actual air pressure in the measurement location, and uses this value to calculate barometric pressure and altitude. Station pressure changes in response to two things—changes in altitude and changes in the atmosphere. Because the Kestrel Meter is constantly changing location and altitude, it is important to enter adjustments or "references" when accurate pressure and altitude readings are needed.

Barometric pressure is station pressure corrected to sea level. In order to make the correction, the Kestrel Meter needs an accurate reference altitude. Altitude is the height above sea level. In order to correctly calculate altitude, the unit needs an accurate barometric pressure reference, also known as an "altimeter setting". Fortunately, you only need to know ONE of these values (current barometric pressure or current altitude) in order to set your Kestrel Meter up to show accurate readings.

Starting with the known barometric pressure for your location

You can obtain your current barometric pressure by checking an internet weather site for a nearby location, or contacting a local airport. Set this value as your reference pressure on the ALTITUDE screen to determine your correct altitude: simultaneously press ◀ and ▶ buttons to adjust the reference pressure. Press ◀ or ▶ to adjust the reference pressure, or hold ◀ or ▶ to adjust the value quickly. You will notice that the altitude will change with changes in the reference pressure. Simultaneously press ◀ and ▶ to exit the reference pressure adjustment. Set your Kestrel Meter down on a table and allow the altitude reading to stabilize. (Note: very small changes in pressure generate noticeable changes in altitude. In order to provide meaningful readings for activities where altitude changes quickly, the Kestrel Meter features rapid altitude response. This is why the altitude readings tend to fluctuate by a few feet.) After obtaining a current altitude from the ALTITUDE screen, move to the BARO screen and enter this value as your reference altitude by following the same procedure. Both readings will now be accurate.

Starting with a known altitude for your location

You can obtain your altitude from a topographical map or local landmark. Google Earth is an excellent free program that provides the exact altitude for any given address: www.earth.google.com/. Set this value as your reference altitude on the BARO screen to determine your barometric pressure: simultaneously press ◀ and ▶ buttons to adjust the reference altitude. Press ◀ or ▶ to adjust the reference altitude, or hold ◀ or ▶ to adjust the value quickly. You will notice that the barometric pressure will change with changes in the reference altitude. Simultaneously press ◀ and ▶ to exit the reference altitude adjustment. Again, allow the Kestrel Meter to stabilize, then enter the value from the BARO screen as your reference pressure on the ALTITUDE screen by following the same procedure. Both readings are now accurate.

If you are planning a day hike would like to track your altitude, you'll need to enter the correct reference pressure on the ALTITUDE screen as described above. You can now track the altitude changes as you hike. In this instance, you should ignore the values on the BARO screen, since the pressure changes will be due to changes in elevation far more than to changes in the weather.

In general, changes in barometric pressure associated with weather changes are small over the course of one day, but they will affect the accuracy of the altimeter over time. This is why aircraft reset their altimeters at every airfield by entering the field's "altimeter setting"

or reference pressure. Accordingly, if accurate altitude readings are your primary interest, you should reset the reference pressure on your Kestrel Meter regularly. If you encounter an elevation landmark, you can adjust the reference pressure until the altitude matches the landmark elevation. This will correct the altitude for any pressure changes due to the weather. (Or, you can obtain an updated reference pressure from the sources described above.)

Some final notes - If you wish to know the actual or station pressure for your location (such as for engine tuning), simply set the reference altitude on the BARO screen to "0". In this case, the Kestrel Meter will not make any adjustment and will display the measured value. (Engine tuning and ballistics software sometimes refer to atmospheric or station pressure as "absolute pressure." These applications are concerned with the actual air density, as opposed to pressure gradients relating to weather, so barometric pressure is less useful.)

Also, the above discussion applies to ALL pressure altimeters, including one you may have in a watch or other device, but not to GPS altimeters, which use satellite triangulation to determine altitude. Note that with present GPS technology, pressure altimeters remain more accurate for measuring altitude change. This is why airplanes still rely on pressure altimeters, not GPS.

MAINTENANCE & TROUBLESHOOTING

Environmental

Every Kestrel Meter is fully waterproof and floats, and has passed mil-spec drop testing.

Storing Your Kestrel

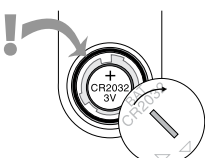
Avoid storing your Kestrel where it will be exposed to temperatures below -30°C [-22°F] or above 60° C [176° F] for extended periods of time. Doing so may cause permanent damage. (Note that the inside of a car parked in the hot sun can reach very high temperatures.)

Use of the Lanyard and Cover

The cover can be captured on the lanyard to avoid loss. First, remove the cord poplock. Then feed the lanyard end through the large opening in the over and out the slot. Replace the poplock on the lanyard.

Replacing the Battery

When your display becomes dim or disappears, replace the battery. Use a large coin to open the battery compartment. Use only new CR2032 coin cell batteries (available where watch batteries are sold). Wipe the battery clean of any fingerprints and insert the positive (+) pole up, angling the battery downward and pressing it firmly into place. When replacing the battery door, be sure to keep the black rubber o-ring seated in the groove on the case back.



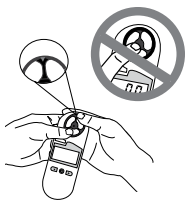
Replacing the Battery

Why does the Impeller Appear Imbalanced?

It is NORMAL for the impeller to oscillate as it comes to a stop. It is NOT imbalanced. Rather, it contains a very small magnet that responds to the earth's magnetic fields. This does not affect the accuracy of the wind speed readings because the magnetic field applies both a braking and an accelerating force which cancel each other. The impeller has been calibrated to provide wind speed readings accurate to within at least ± 3%.

High Speed Use
After numerous hours of sustained operation over 25 M/S (~49 KT, 90 KM/H, 56 MPH or 4,923 FPM), the Kestrel will lose some accuracy due to wear of the pivot and bearings in the impeller.

Replacing the Impeller
You may recalibrate the wind speed readings by replacing the impeller. Press FIRMLY on the sides of the black impeller housing with your thumbs to remove the entire assembly. When inserting the new impeller, be sure the arrow is facing the display side of the unit, and is aligned with the top of the meter. Press on the sides of the housing rather than the center.



Replacing the Impeller

Taking Accurate Humidity, Heat Stress and Dewpoint Measurements
The patented system for measuring relative humidity allows for extremely fast and accurate readings. The sensor is located in the large hole on the rear of the unit. Even extreme and abrupt changes in the surrounding humidity will be measured within several minutes. To test this, place your hand around the rear of the unit. Within several seconds, the humidity will increase dramatically. After removing your hand, the humidity will quickly begin to decrease. Next, place your hand near the rear of the unit and wave the unit back and forth. The humidity will not change because the air flow is diluting the humidity from your hand.

This example shows the importance of keeping air flow past the sensor while taking a measurement. If there is no natural air flow past the sensor, wave the unit back and forth. It is also reasonable to lay the unit down on a solid surface for several minutes to allow the sensor to adjust.

Sensor Calibration
All the sensors have been factory calibrated to be accurate within specifications. For recalibration, you may either return it to Nielsen-Kellerman for factory calibration, or contact NK for field calibration instructions. Humidity Field Calibration Kits are also available for sale online.

About the Backlight
The Kestrel 3500 has an aviation green electroluminescent backlight. The Kestrel 3500 NV has a night-vision preserving backlight which helps users to sustain natural night vision. The NV's backlight incorporates an optical filter to reduce overall brightness and minimize blue and green spectrum light to preserve night vision. Additionally, the backlight is much dimmer than a standard backlight, making it more difficult to detect with the naked eye in night operations. This backlight appears soft greyish pink (not red) and is still in the visible spectrum, so it is not compatible with night-vision equipment.

It takes 30 to 45 minutes for the average eye to adapt to darkness and maximize night vision. Even a short burst of white, yellow, green or blue light "bleaches out" the rod cell photoreceptors in the eye and causes night blindness until the entire adaptation process can take place again. Light in the red spectrum does not cause this "bleaching out", preventing night blindness and night vision fatigue.

BEAUFORT SCALE

The Beaufort Scale is a system for estimating wind force without the use of instruments based on the visible effects of the wind on the physical environment. The behavior of smoke, waves, trees, etc., is rated on a 13 point scale. The scale was devised in 1805 by the British naval Commander Sir Francis Beaufort (1774-1857) and is still commonly used by mariners.

Force	Description	Kts
0	Calm	0
1	Light Air	1-3
2	Light Breeze	4-6
3	Gentle Breeze	7-10
4	Moderate Breeze	11-16
5	Fresh Breeze	17-21
6	Strong Breeze	22-27
7	Near Gale	28-33
8	Gale	34-40
9	Strong Gale	41-47
10	Storm	48-55
11	Violent Storm	56-63
12+	Hurricane	64+

KESTREL POCKET WEATHER METERS 5-YEAR LIMITED WARRANTY

NK does not believe in "disposable electronics." We know that Kestrel Meters don't typically lead pampered lives, and we design them for years of performance in tough conditions. Every Kestrel is designed and manufactured at NK's facility in Boothwyn, Pennsylvania, to be the accurate, reliable weather instrument you need for your application. If for any reason you are not satisfied with the performance or operation of your Kestrel meter in the first 30 days, you may return it to your place of purchase for a full refund.

We guarantee every Kestrel Pocket Weather Meter to be free of defects in materials and workmanship for a period of FIVE YEARS from their date of first consumer purchase. NK will repair or replace any defective product or part when notified within the warranty period, and will return the product via domestic ground shipping or NK's choice of method of international shipping at no charge.

The following shall be excluded from warranty coverage: damage due to improper use or neglect (including corrosion); damage caused by severe or excessive impact, crushing or mechanical harm; modifications or attempted repairs by someone other than an authorized NK/Kestrel repair agent; impeller failure not caused by a manufacturing defect; normal usage wear; failed batteries; and accuracy issues resolvable by recalibration. Recalibration is provided free of charge within thirty (30) days of purchase if necessary.

Except for the warranties set forth herein, NK disclaims all other warranties, expressed, implied or statutory, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose. Any implied warranties that may be imposed by applicable law are limited to the term of this warranty. In no event shall NK be liable for any incidental, special or consequential damages, including, but not limited to, loss of business, loss of profits, loss of data or use, whether in an action in contract or tort or based on a warranty, arising out of or in connection with the use or performance of an NK product, even if NK has been advised of the possibility of such damages. You agree that repair, and (upon availability) replacement, as applicable, is your sole and exclusive remedy with respect to any breach of the NK Limited Warranty set forth herein. All **product *liability*** and ***warranty*** options are governed exclusively by the laws of the ***Commonwealth of Pennsylvania*.**

Your warranty period will be measured from your date of purchase. **The best way to ensure full warranty coverage is to REGISTER your NK product promptly on our website: www.kestrelweather.com**. We keep your registration information strictly confidential and do not sell it, share it, or use it for anything but product-related information bulletins (which

you may decline receiving). If you do not register and cannot provide proof of purchase, your warranty period will be measured from our date of manufacture, determined by serial number.
We request that you contact NK if you feel your product is not working properly. We can often solve product issues by phone or e-mail, saving you the time and expense of returning the unit. If we require the product to be returned, we will issue a Return Authorization to expedite the handling of your warranty claim.
The Kestrel Pocket Weather Meters are covered by the following patents: 5,783,753, 5,939,645, 6,257,074, and 7,059,170.

LIFETIME CUSTOMER CARE WARRANTY

NK wants you to be an NK customer for life, so we take care of you even beyond the terms of the above warranty with our Customer Care Program. Trade-in any Kestrel Pocket Weather Meter, no matter the age or condition, and receive a generous discount on the replacement product (same model only). Our Customer Care Program applies only as long as we manufacture the product, and does not cover product upgrades.

CALIBRATIONS, CERTIFICATIONS AND SERVICE

Every NK product is tested and calibrated before it leaves our factory. We guarantee that it will perform within specifications when you receive it. Each Kestrel comes with a Certificate of Conformity, with the stated specifications for that product on the back. If you feel an NK product is not meeting specs when you receive it, call us and we'll make sure you are operating it correctly. If it still appears that it may be out of spec, return it to us within 30 days of purchase and we will test and recalibrate all values at no charge. Beyond 30 days, we offer reasonably-priced tests, calibration services and N.I.S.T. certified calibrations as well as Kestrel tune-ups.

All of our measurements are traceable to the National Institute of Standards and Technology, ensuring the highest level of accuracy. Our primary Calibration Standards are sent for calibration in accordance with N.I.S.T. requirements and based on a regular schedule. Only approved laboratories and N.I.S.T themselves are used for these calibration services. Incoming and outgoing data is supplied with the certificate of calibration.

We also offer full factory service on every product we manufacture for as long as we make the product (and as long after as component availability permits). If we can't repair a product, we will offer you a brand-new replacement under our Customer Care Program (even for accidental damage and misuse).

ADDITIONAL INFORMATION

What is a "Kestrel"? The American Kestrel is the smallest North American falcon. Beautiful and highly adaptable, it can be found virtually everywhere in North America. It is unique among falcons for its ability to both hover at very low speeds and dive at very high speeds.

Assembled in the USA. The Kestrel 3500 is protected by US Patent 5,783,753, 5,939,645 and 6,257,079. Nielsen-Kellerman reserves the right to change product specifications. ©2010. Kestrel, the Kestrel logo, Pocket Wind, NK and the NK logo are trademarks of the Nielsen-Kellerman Co.

Register your Kestrel® Pocket Weather® Meter online at www.kestrelweather.com.

NK

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