

Kestrel[®] 4500

Pocket Weather[®] Tracker

with Backlight

*In a hurry?
Be sure to read pages
5-8 to ensure that
your Kestrel is setup
properly!*



Instruction Manual for Kestrel 4500 & Kestrel 4500 NV Models

www.kestrelweather.com

800.784.4221

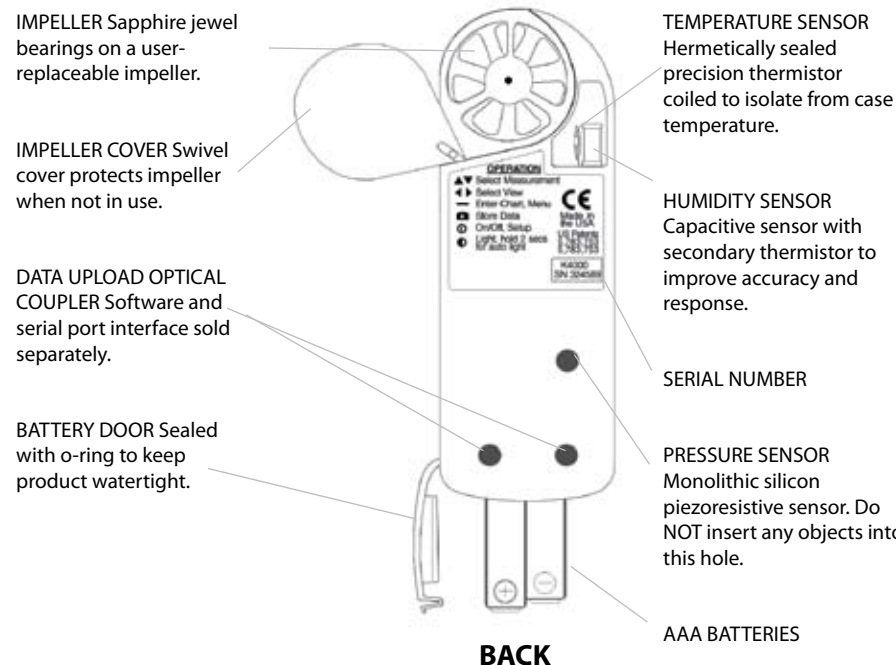
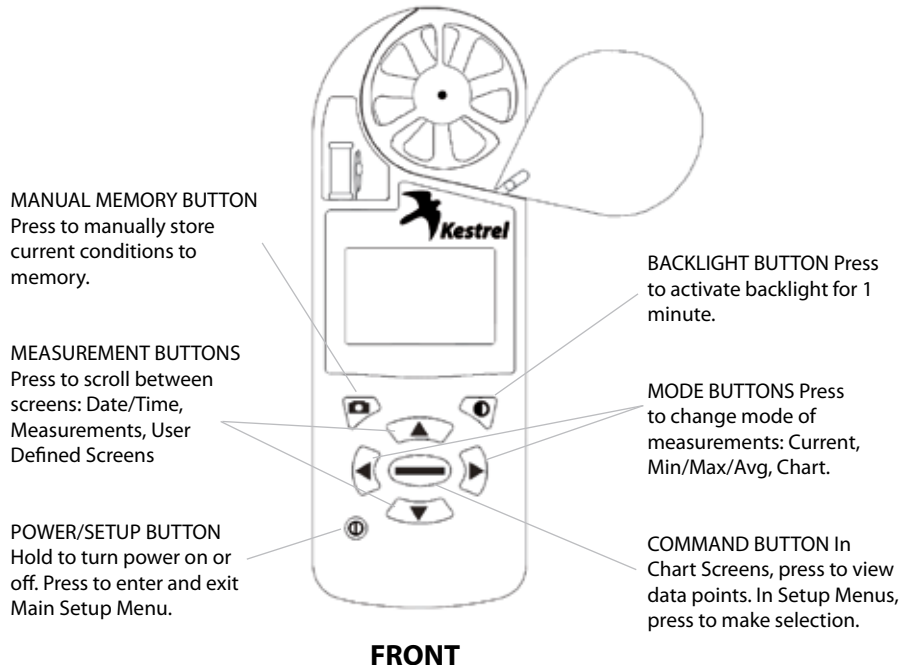


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Congratulations on the purchase of your Kestrel 4500 Pocket Weather Tracker! The Kestrel 4500 is our newest and most comprehensive weather meter. It not only measures EVERY environmental condition easily, accurately, and right in the palm of your hand, but now also integrates a digital compass to indicate wind direction, cross wind and headwind/tailwind.

While the Kestrel 4500 is user-friendly and simple to use, reading the instruction manual is recommended in order to use the Kestrel 4500 to its fullest potential.

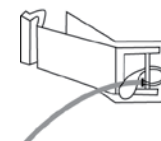
NK, manufacturer of Kestrel Pocket Weather Meters, is available to answer questions and provide support. Contact NK by phone: 610.447.1555, fax: 610.447.1577, email: info@nkhome.com, or web: www.nkhome.com.



GETTING STARTED

Pouch and Lanyards

Wrist and neck lanyards and a small pouch have been provided. To install the lanyard, feed the thin end of the lanyard around the metal post on the battery door (as shown in diagram). Feed the thick end of the lanyard through the loop on the thin end. Using tweezers can help.



Battery Installation

AAA batteries have a magnetic signature that is strong enough to influence compass readings. In order to negate the batteries effect, it is important that the Kestrel 4500's batteries remain in the same orientation as they were when the unit was calibrated. To accomplish this, the Kestrel 4500 has a flexible thin shim that slides in between the two batteries to keep them in place. Insert the batteries in the orientation indicated on the battery door, then insert the shim between the new batteries with the clear tab out and folded toward the end of the battery with the positive pole (the "bump") pointing up. Press the tab down over the battery with the "bump" through the hole (it will not remain completely flat). Close the door tightly. When changing the batteries, lift the clear tab folded over the positive pole of the battery, remove the shim, and then remove the batteries and replace them with new ones. *Please be careful when changing batteries not to lose the shim!*

After installing the batteries, the Kestrel Meter will automatically start in the Date and Time Setting mode. (See Date and Time Setup.) Custom settings and chart data will be saved during a battery change; only the date/time and MMA values will be lost.

Turning the Kestrel Meter ON and OFF

To turn the Kestrel Meter ON, press **⏻** the button. To turn the Kestrel Meter OFF, hold the **⏻** button for two seconds. Or, press the **⏻** button, then press the **⏻** button with the word OFF highlighted. (Note: your unit will continue to automatically store data when the power is turned off.) When first turned on, the Kestrel

Meter will display a splash screen displaying the model number, the battery indicator, and the code version. This battery indicator will indicate the percentage of battery life remaining, which is helpful in preventing unexpected dead batteries.



Date and Time Setup

The first time that you turn on your Kestrel Meter, as well as after a battery change, you will need to set the date and time. The Introduction Screen will appear for 3 seconds, followed by the Date/Time Setup Screen. Press the ▲ and ▼ buttons to scroll through the settings. Press the ◀ and ▶ buttons to scroll through the setting options. After entering the date and time, press the Ⓜ button to exit the Date/Time Setup. Then press the Ⓜ button again to exit the Main Setup Menu.

Calibrating the Digital Compass

Due to the magnetic signature of the AAA batteries, the Kestrel 4500's digital compass must be calibrated, or "taught" to correct for the magnetic field of the batteries. This must be done each time the batteries are changed or the battery door is opened. If your unit has not been calibrated, it will display "uncalibrated" at the base of the Direction, Crosswind and Headwind screens and will not display or log any values until it has been calibrated.

When calibrating the compass, be sure to choose a location that is not near metal or magnetic materials. For example, you cannot calibrate the Kestrel Meter reliably on a metal desk. Also, keeping the Kestrel Meter vertical (front/back and left/right) is crucial to accurate calibration. The foam stand included in the Kestrel Meter's packaging will help to stabilize the unit during calibration. (The piece is also handy for standing the Kestrel Meter up while taking readings in the field.) Finally, removing the impeller during calibration is recommended. (Simply press on the edges of the impeller to pop it out, then press it back in after calibration is complete. Align the small triangle on the impeller housing with the matching triangle near the hinge of the impeller cover on the front of the unit.)

Too Fast: The unit was spun too quickly during the calibration routine. Press the Ⓜ button to remove the error screen, and then follow the directions on the screen to calibrate.

NAVIGATION

Measurements use ▲ and ▼

- Ⓜ Direction
- 🌀 Wind Speed
- ☞ Crosswind
- ☞ Headwind/Tailwind
- 🌡 Temperature
- ✳ Wind Chill
- 💧 Humidity
- 🌡 Heat Index
- ☁ Dew Point
- 💧 Wet Bulb
- 🌡 Barometric Pressure
- ⬆ Altitude
- ⬆ Density Altitude

The Kestrel 4500 is set up to display 13 Measurements (some are calculations) in 3 Modes.

The Measurements are listed here with their corresponding screen icon. In addition to these Measurements and Modes, there are also 3 User Screens, which simultaneously show 3 current measurements, and the Date & Time Screen, which gives the current date and time. Use the ▲ and ▼ buttons to scroll through the various Measurements, followed by the 3 User Screens and the Date/Time Screen. Any of these screens can be turned off so that you can customize your Kestrel Meter to show the screens that your application requires. (See the Measurements section in the Main Menu.)

The Modes are displayed below. Use the ◀ and ▶ buttons to scroll through the various Modes. From any mode, you may still scroll to a different Measurement by pressing the ▲ and ▼ buttons.

Current - Displays the instantaneous reading.

To calibrate the unit's digital compass, press the Ⓜ button to enter into the Main Menu, and use the ▼ button followed by the — button to select System. In the System menu, select "Compass Cal." Following the screen prompts, place the Kestrel Meter in the foam stand and slowly spin it around three full times. Each rotation should take approximately 10 seconds. "Cal Complete" will be displayed on the screen when the calibration is finished. Press the Ⓜ button to exit out of the Menus.

After calibrating, you may wish to verify the digital compass' accuracy with a compass that you know to be operating properly. Being careful to orient the Kestrel Meter vertically, verify the readings at north, south, east and west. (It is possible that some but not all of the directions would be correct if the unit is not calibrated correctly.) Remember to hold the Kestrel Meter and the compass far enough away from each other that they do not interfere. You should expect the Kestrel Meter's readings to be within ±5° of the reference compass or better. If the Kestrel Meter's direction readings do not appear to be correct, simply run the calibration routine again.

Once your unit is correctly calibrated, you do not need to calibrate again unless a) you change the batteries or open the battery door; b) the unit displays "uncalibrated" at the base of the Direction, Crosswind or Headwind screen.

Calibration Error Messages

There are three error messages you may see during calibration. They are:

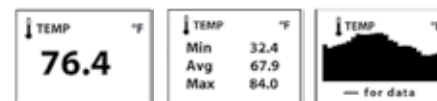
Magnetic Batteries: In some instances, the magnetic field of the batteries is such that the Kestrel Meter cannot accurately calibrate the compass. If this is the case, upon completion of the three rotations the screen will display this error message. Simply open the battery door, rotate one or both of the batteries slightly, and run the calibration again.

Too Slow: The unit was spun too slowly during the calibration routine. Press the Ⓜ button to remove the error screen, and then follow the directions on the screen to calibrate.

Min/Max/Avg - Displays the Minimum/Maximum/Average readings from stored data. If there is no stored data, the values will be displayed as --.-.

Chart - Displays a graphical representation of up to 1400 stored data points for each measurement. If there is no stored data, the axis will appear, but the chart will be blank. (See the following section for information on Chart Navigation.)

Modes use ◀ and ▶



Modes use ◀ and ▶

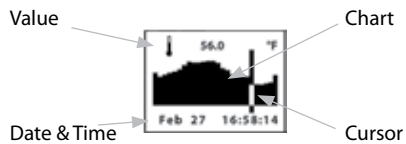
Note: The Direction chart will display the logged direction in degrees, with the base line of the chart representing 0° and the top of the chart representing 360°. The crosswind and headwind charts will have the same graph scale as the wind speed chart. The graph scale can be adjusted in the Main Menu if necessary to ensure that your logged values are displayed on screen.

Navigation of Charts

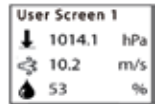
The Kestrel 4500 is capable of storing up to 1400 data points for each measurement. To review the data, press the - button while viewing a chart. A cursor will appear on the most recent data point. Press the ◀ and ▶ buttons to scroll through the data points. The date and time at which the data was stored will be displayed at the bottom of the screen, and the data value will be displayed at the top of the screen. Hold down the ◀ or ▶ button to scroll quickly through the data points.

Press the ▲ or ▼ button to review the data for the other measurements. Please note that the cursor will remain at the same date and time. If new data is stored while viewing chart data, the entire chart will shift left with the new data point charted on the right. The cursor will not shift with the chart.

Press the — button to return to the Chart Mode.



SPECIAL FUNCTIONS



User Screens

The Kestrel Meter has three User Screens that can be customized to display three current measurements simultaneously. These screens can also be turned off. (See the Main Menu section for setup instructions.)

Max/Avg for Wind Speed, Direction, Headwind/Tailwind, Crosswind & Wind Chill

The Max/Avg values for the Wind Speed and Direction values are measured independently from the stored and charted data. (The Direction measurement does not record the Max and Average since it is not applicable, and will display N/A on the Min/Max/Avg screen.)

This allows the user to start and stop the averaging period in the most appropriate manner for their application. Averaging on all wind-related values (Wind Speed, Crosswind, Headwind and Wind Chill) will be started and stopped together.

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Measuring Direction

Before you begin, there are three simple things that are important to understand before using the Kestrel 4500 to take compass readings:

1. Because the Kestrel 4500 is designed primarily to measure wind direction, the digital compass component is aligned to work with the Kestrel Meter held vertically, in the same orientation used when measuring wind. As is the case with all compasses, the compass component must be level to yield accurate readings. To maximize the accuracy of compass readings, the Kestrel 4500 must be positioned as close to the vertical as possible (front/back and left/right) when using any compass-related feature (direction, crosswind, headwind, calibration). For every degree off vertical that the unit is positioned, compass readings may vary up to three degrees.
2. The Kestrel Meter uses two AAA batteries to power the unit. These batteries have a magnetic signature that can influence the compass readings if not properly calibrated. After installing or replacing the batteries, you must execute the simple self-calibration routine (see the Calibrating the Digital Compass section) to ensure that the effect of the batteries is negated. If your unit has not been calibrated, it will NOT measure direction and will post the message "uncalibrated" at the base of any direction screen.
3. The impeller of the Kestrel 4500 also contains a small magnet that may slightly influence the compass readings when the impeller is still or rocking slightly. For maximum accuracy of compass readings, the impeller should be spinning (or removed).

Taking a Compass Reading

To take a compass reading, simply hold the unit vertical and point the BACK of the unit toward the direction that you wish to measure. (You can sight through the sensor opening to confirm the direction alignment.) The unit will display the cardinal direction and degrees.

While viewing the Min/Max/Avg screen for any of these measurements, hold the unit into the wind, and press the — button when the screen displays "--average" to begin collecting data for all measurements, and again when the screen displays "--stop" to stop collecting data and hold the values on the display. Press the — button when the screen displays "--clear" to clear the data. This routine will work simultaneously for all measurements, regardless of which one is displayed while the routine is run. The Max/Avg for these wind values will not affect any other Min/Max/Avg or stored data.

Manual Data Storage

To manually store data, press the ■ button. One of the following will appear: Data Stored (data has been captured and will appear on chart), Full (Overwrite is off and data log is full), or Off (Manual Store button has been disabled). (See the Main Setup Menu section for more information on memory.)

Backlight

The Kestrel Meter has a high-visibility green backlight, which makes the display easily read in low-light conditions. The Kestrel 4500 NV is olive drab with a night-vision preserving backlight. The backlight incorporates an optical filter to reduce overall brightness and minimize blue and green spectrum light to preserve night vision of users such as military personnel, pilots and night fishermen. (Note: This backlight appears soft greyish pink, not "red", and is still in the visible spectrum, so 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. This unit's backlight is also much dimmer than a standard backlight, making it more difficult to detect with the naked eye in night operations.

Press the ● button to activate the backlight. The light will remain activated for one minute. Press the ● button within one minute to deactivate the light manually.

True vs. Magnetic North - Entering Variation/Declination

"True north" is the northern axis of rotation of the Earth. It is the point where the lines of longitude converge on maps. "Magnetic north" is the point on the Earth's surface where its magnetic field points directly downwards. Magnetic north does not exactly coincide with true north, and its location changes over time. The difference between Magnetic North and True North is called "Declination" or "Variation". These values for your location can be obtained on the internet. The NOAA website is an excellent resource for this information: www.ngdc.noaa.gov

The Kestrel 4500, just like any other compass, will measure Magnetic North. However, True North can be displayed by simply programming the Variation for your location. When viewing the Direction in Magnetic North mode, the display will show "Magnetic North" below the reading. When viewing the Direction in True North mode, the display will show "True N #.# E", where #.# is the variation setting.

To switch between these modes, press the — button. Then use the ◀ and ▶ buttons to toggle between Magnetic and True. To enter the variation for your location, press the ▼ button to highlight Variation, then ◀ and ▶ to adjust the value.

Measuring Crosswind & Headwind/Tailwind

The Kestrel 4500 automatically calculates crosswind or headwind with respect to a runway or target direction. To use either of these screens, you must first set the "heading", or direction of the runway or target as described below. You then measure the wind in the normal way, pointing the Kestrel into the wind. The large number shown on the display will be the effective Crosswind or Headwind (depending on the screen selected) for the target direction.

Note: Tailwinds are displayed as negative values on the Headwind screen. The full value wind speed and direction are displayed below the Crosswind or Headwind for reference.

To enter the runway or target heading, press the **—** button while on the Crosswind or Headwind screen. The adjustment screen will always display the Magnetic North heading along the top, even if you have the Kestrel set to True North. (If you selected True North mode in the Direction screen, this selection will still be preserved when you return to the Direction screen.) Use the **▲** and **▼** buttons to select Auto Set or Manual Set, and the **—** button to enter the selection of your choice, then follow the instructions on the screen to set the Magnetic Heading either automatically or manually.

- *Auto Set* allows you to point the Kestrel down the runway or in the direction of the target, and it automatically enters the reference heading. Point the Kestrel down the runway or target, and press the **—** button.
- *Manual Set* allows you to enter the known heading of the runway or target. In Auto Adjust, follow the prompts on the screen to have the Kestrel automatically set the heading. Use the **◀** and **▶** buttons to enter the runway or target heading. Press the **—** button to enter the selection of your choice.

Relative Humidity

The Kestrel Meter is capable of measuring RH to a high accuracy: +/- 3% RH between 5 and 95%. To ensure operation within these specifications, please follow these recommendations:

- Avoid taking measurements in direct sunlight, which will heat the air inside the humidity sensor enclosure and cause inaccurate readings.
- If your circumstances force you to expose the Kestrel Meter to a large temperature swing prior to taking a relative humidity reading (such as when taking a Kestrel Meter stored inside at 70° F outside to a temperature of 40° F), you will need to take additional steps to ensure that the Kestrel Meter's external temperature sensor is in thermal equilibrium.
 - Ideally, provide an airflow of at least 1 M/S (2.2 MPH), over the temperature sensor - point the Kestrel Meter into the airflow. If there is no airflow, simply wave the unit back and forth so air

passes over the sensors. With airflow over the temperature sensors and humidity chambers, readings within specifications will be provided within two to three minutes, even after a large temperature shift.

- If no airflow can be provided, you must allow sufficient time for the RH value to stabilize. This can take as long as 20 minutes- the greater the temperature change, the greater the time. You can use the logging capability of the Kestrel Meter to confirm that the unit has stabilized to a correct reading: Set the memory options to a relatively short logging interval (20 seconds works well), select the graphical display of RH, and you can see when the value is no longer changing significantly. At that point, the RH value is stable and can be relied upon to be within the accuracy specifications.

Barometric Pressure and Altitude Adjustment

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". 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.

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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: Press the **—**

button to enter the reference setting mode. Press the **▶** button to increase the reference pressure or the **◀** button to decrease the reference pressure. You will notice that the altitude will change with changes in the reference pressure. Press the **—** button to exit the adjustment mode. 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: Press the **—** button to enter the reference setting mode. Press the **▶** button to increase the reference altitude or the **◀** button to decrease the reference altitude. You will notice that the barometric pressure will change with changes in the reference altitude. Press the **—** button to exit the adjustment mode. 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.

When reviewing stored data, remember that changes in pressure AND changes in location/altitude will affect the stored values. When tracking pressure changes relative to weather, set the reference altitude on the BARO screen and keep the Kestrel Meter in one location. Your graph history will now show trends in barometric pressure. Your altitude as shown on the ALTITUDE screen will change as the weather changes, but you can ignore this screen for this purpose.

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 in "starting with the known barometric pressure." 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.

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.

Finally, the DENSITY ALTITUDE screen is calculated from the absolute values of station pressure, relative humidity and temperature, and is not affected by the reference values entered in the BARO and ALTITUDE screens.

MAIN SETUP MENU

You can customize your Kestrel Meter in multiple ways. Press the **ⓘ** button to access the Main Setup Menu. Press the - button to select the highlighted setting. The Main Setup Menu contains: OFF, Memory Options, Measurements, Graph Scale, Units, User Screens, System, Date & Time, Language and Restore.

Off
Press the **ⓘ** then the **—** button to turn the display off. Even when the Kestrel Meter’s display is turned off, the unit will continue to automatically store data at the defined Store Rate. The battery life will be decreased if data is stored frequently. The only way to completely shut off the unit is to remove the batteries. Custom settings and data will be stored when the batteries are removed.

Memory Options
These settings control the data storage properties.

Setting	Description	Operation
Clear Log (Go/Done)	All stored data is cleared. This will also clear Min/Max/Avg data.	Press ◀ or ▶ to clear the log.
Reset MMA (Go/Done)	All Min/Max/Avg data is cleared. Chart data will remain intact.	Press ◀ or ▶ to clear the MMA.

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will continue to log data for all measurements. If you wish to see the logged data for measurements that are hidden, simply enter the Measurement screen and turn them back on. The data will be stored in the same manner as all other measurements, as specified in the Store Rate.

Graph Scale
These settings control the chart limits of your Kestrel Meter. Depending on the conditions, the lower and upper limits of the chart scale may need to be adjusted in order to get the best view of the data. Highlight the desired measurement by pressing the **▲** or **▼** button. Select the highlighted measurement by pressing the **—** button. Press the **◀** or **▶** button to increase or decrease the value of the limits. Press the **▲** or **▼** button to change between the upper and lower limits. Press the **ⓘ** button to exit and return to the Measurement Selection screen. Press the **ⓘ** button to return to the Main Setup Menu.

Units
The units of measure can be adjusted to best suit the application. The following units are available:

Wind Speed	Temperature, Dewpoint, Wet Bulb Temp, Wind Chill & Heat Index	Pressure	Altitude, Density Altitude
m/s meters per second	°C Celsius	InHg inches mercury	m meters
km/h kilometers per hour	°F Fahrenheit	HPa hectopascals	ft feet
kt knots		psi pounds per square inch	
mph miles per hour		mb milibar	
ft/m feet per minute			
Bft Beaufort			

Auto Store (On/Off)	When On, data is automatically stored at preset Store Rate. When Off, data is only stored when manually captured with the Ⓢ button.	Press ◀ or ▶ to toggle between On and Off.
Store Rate* (2 sec – 12 hr)	The frequency at which data sets are automatically stored. (Battery life may be shortened if data is stored frequently.)	Press ◀ or ▶ to increase or decrease Store Rate frequency.
Overwrite (On/Off)	This setting only applies when the data log is full. When On, oldest data point is discarded to allow memory for the new data point. When Off, new data points are not saved.	Press ◀ or ▶ to toggle between On and Off.
Man Store (On/Off)	When On, data is stored when the Ⓢ button is pressed. When off, the Ⓢ button is disabled.	Press ◀ or ▶ to toggle between On and Off.

When unit is off, data is NOT stored for 2 sec and 5 sec Store Rates.

Measurements
Measurement screens can be turned off, or “hidden” from the normal measurement navigation. For example, if wind chill is not of interest, it can be hidden. Press the **◀** or **▶** button to toggle between ON and OFF for each individual measurement. Press the **▲** or **▼** button to highlight the desired measurement. Press the **ⓘ** button to return to the Main Setup Menu. Even when measurements are hidden, the Kestrel Meter

Highlight the desired measurement by pressing the **▲** or **▼** button. Press the **◀** or **▶** button to scroll through the available units. Press the **ⓘ** button to return to the Main Setup Menu.

User Screens
The three User Screens can be reconfigured to display the most appropriate information for your application. For example, if you need to monitor the wind speed, humidity and barometric pressure, a User Screen can display these current measurement values on the same screen for quick reference. Only current measurements can be selected for the User Screens - Min/Max/Avg and Charts are not available.

Highlight the desired User Screen by pressing the **▲** or **▼** button. Press the **—** button to select the highlighted User Screen. Press the **▲** or **▼** buttons to change lines, and the **◀** or **▶** button to scroll through the available measurements for each highlighted line. Press the **ⓘ** button to return to the User Screen Setup Menu. Repeat above process for the other User Screens or press the **ⓘ** button to return to the Main Setup Menu. The User Screens may also be hidden if not needed.

System
The display Contrast and Auto Shutdown can be reconfigured as required. The relative humidity and pressure sensors can also be recalibrated. Press the **▲** or **▼** buttons to highlight the appropriate selection, and the **◀** or **▶** button to adjust or select.

The Contrast can be adjusted for better visibility depending on the ambient lighting conditions. Press the **◀** or **▶** button to increase or decrease the contrast from 0 to 20 (0 is lightest, 20 is darkest).

The display can be set to automatically turn off in order to conserve the battery life. Auto Shutdown will only occur after the preset time has elapsed without any button presses. Press the **◀** or **▶** button to scroll through the Auto Shutdown options (15 minutes, 60 minutes, Off). Battery life will be shortened if the Auto Shutdown is turned to Off.

Baro Cal - *Recalibration of this sensor is not typically required, and it is not recommended that you recalibrate without speaking to an NK technician.* The pressure sensor can be calibrated if necessary. It is extremely important to know the precise altitude and mean sea level barometric pressure at the time of calibrating the sensor. First, set the reference altitude on the BARO measurement screen to the known altitude (see Pressure Adjustment section for instructions). Then adjust the calibrating setting on the Baro Cal screen to the known mean sea level barometric pressure. If recalibration is desired, the unit may also be returned to NK for service.

Humidity Cal - *Recalibration of this sensor is not typically required, and it is not recommended that you recalibrate without speaking to an NK technician.* The humidity sensor can be calibrated by “teaching” it the correct humidity. Some special equipment is required for this calibration, including two hermetically sealed containers and saturated salt solutions. NK offers a calibration kit, and instructions are available on www.nkhome.com. If recalibration is desired, the unit may also be returned to NK for service.

Date & Time

The date and time, as well as date and time formats, can be adjusted. The Time Formats available are 12 hour and 24 hour. The Date formats available are day/month/year and month/day/year. (See the Date and Time Set Up section for instructions.) Press the **Ⓜ** button to return to the Main Setup Menu.

Language

Displayed text can be set in one of five languages: English, French, German, Italian or Spanish. To choose a language, use the **▲** or **▼** buttons to highlight the desired language. Press the **—** button to select the language and return to the Main Setup Menu. Otherwise, press the **Ⓜ** button to return to the Main Setup Menu without changing languages.

Restore

Default settings for units of measure, date and time formats, and system settings can be restored. (See the Factory Default Settings section for more information.) Press the **▲** or **▼** button to highlight the desired

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make it to the top of a mountain. For more detailed information on your trip, set the Store Rate to 2 hours overnight, and 10 minutes during the day.

Soaring/Hang Gliding

Auto Store	On
Store Rate	2 min
Overwrite	Off
Man Store	On

These settings will allow you to track all conditions for 46 hours. Chart your altitude changes, watch how the temperature and humidity vary with altitude, and log your apparent speed. Data will no longer be stored once the log is full, in order to preserve it until it can be reviewed later. Be sure to clear the data log just before your flight.

Skydiving

Auto Store	On
Store Rate	2 sec
Overwrite	Off
Man Store	Off

These settings will allow you to record a detailed account of your jump. Be sure to clear the data log just before jumping. As you descend toward the ground, you will be tracking the altitude every two seconds, as well as the conditions at that altitude. The chart will clearly show the point at which the parachute opens, as well as the point you get back on the ground.

HVAC - Environmental Monitoring

Auto Store	On
Store Rate	5 min

default setting: Metric, Imperial or Defaults. Press the **◀** or **▶** button to reset the factory setting. Press the **Ⓜ** button to return to the Main Setup Menu.

APPLICATION EXAMPLES

This section provides examples of applications where a Kestrel Meter might be used, and the appropriate memory settings.

Weather Monitoring

Auto Store	On
Store Rate	1 hr
Overwrite	On
Man Store	Off

These settings will allow you to track conditions for 2 months. When the memory is full, each new measurement will be stored in place of the oldest data point. The charts will provide a quick look at the recent weather conditions. Keep an eye out for falling barometric pressure, which indicates that a storm is coming.

Hiking/Camping for the Weekend

Auto Store	On
Store Rate	20 min
Overwrite	Off
Man Store	On

These settings will allow you to track the conditions for almost 20 days. Measurements will be stored every 20 minutes, and stop storing when the log is full. This will let you review the trip at your convenience when you return. You can also manually store the conditions, in case you get caught in 40 mile per hour winds or

Overwrite	On
Man Store	Off

These settings will record conditions every five minutes, for a total storage of almost 2 days. You can monitor the conditions in a laboratory or manufacturing plant, both day and night, to determine if the climate control is working properly. Or you can examine the effect on the environment when employees enter and exit the building.

HVAC/R - System Balancing

Auto Store	Off
Store Rate	—
Overwrite	Off
Man Store	On

These settings will require you to press the Manual Store Button in order to store any data at a duct, hood, vent, or other air system. The meter will not store any data automatically. Be sure to record the location and date/time of storage for reference when reviewing the data. After storing the conditions at each location, simply review the data and balance the system.

MEMORY CAPABILITIES

Store Rate	Total Memory
2 sec	46 min, 40 sec
5 sec	1 hr, 56 min, 40 sec
10 sec	3 hr, 53 min, 20 sec
20 sec	7 hr, 46 min, 40 sec
30 sec	11 hr, 40 min
1 min	23 hr, 20 min

2 min	1 day, 22 hr, 40 min
5 min	4 days, 20 hr, 40 min
10 min	9 days, 17 hr, 20 min
20 min	19 days, 10 hr, 40 min
30 min	29 days, 4 hr
1 hr	58 days, 8 hr
2 hr	116 days, 16 hr
5 hr	291 days, 16 hr
12 hr	700 days

GLOSSARY

The below definitions have been greatly simplified in order to keep this section brief. We strongly recommend that anyone who wishes to make use of these measurements refer to one of the many excellent weather references available for a more in-depth definition. On the internet, visit www.usatoday.com or www.noaa.gov. Or, locate the USA Today publication, The Weather Book. Please note that any words in a definition printed in italics are themselves defined in this glossary.

Altimeter Setting

An aviation term for the local barometric pressure. Same as reference pressure.

Altitude

The distance above sea level. The Kestrel Meter calculates altitude based on the measured station pressure and the input barometric pressure - or "reference pressure".

Barometric Pressure

The air pressure of your location reduced to sea level. Pressure will change as weather systems move into your location. Falling pressure indicates the arrival of a low pressure system and expected precipitation or

storm conditions. Steady or rising pressure indicates clear weather. A correct altitude must be input for the Kestrel Meter to display barometric pressure correctly.

Declination

Also called variation, is the angle between magnetic north and true north. Declination is considered positive east of true north and negative when west. Declination changes over time and with location.

Density Altitude

The altitude at which you would be, given the current air density. Often used by pilots in order to determine how an aircraft will perform. Also of interest to individuals who tune high performance internal combustion engines, such as racecar engines.

Dewpoint

The temperature to which air must be cooled in order for condensation to occur. The difference between dewpoint and temperature is referred to as the "temperature/dew point spread". A low dewpoint spread indicates high relative humidity, while a large dewpoint spread indicates dry conditions.

Heat Index

A practical measure of how hot the current combination of relative humidity and temperature feels to a human body. Higher relative humidity makes it seem hotter because the body's ability to cool itself by evaporating perspiration is reduced.

Magnetic North

The point on the Earth's surface where the Earth's magnetic field points directly downwards. This pole is constantly wandering.

Reference Pressure

The local barometric pressure. Input to the altitude screen to provide correct altitude readings. Also known as the altimeter setting.

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Relative Humidity

The amount of water vapor actually in the air divided by the maximum amount of water vapor the air could hold at that temperature, expressed as a percentage.

Station Pressure

The air pressure of your location, NOT reduced to the sea level equivalent.

Temperature

The ambient air temperature.

True North

True north is a navigational term referring to the direction of the North Pole relative to the navigator's position. The direction of true north is marked in the skies by the celestial north pole.

Wet Bulb Temperature

The lowest temperature to which a thermometer can be cooled by evaporating water into the air at constant pressure. This measurement is a holdover from the use of an instrument called a sling psychrometer. To measure wet bulb temperature with a sling psychrometer, a thermometer with a wet cloth covering over the bulb is spun rapidly through the air. If the relative humidity is high, there will be little evaporative cooling and the wet bulb temperature will be quite close to the ambient temperature. Some exercise physiology guides use wet bulb temperature, rather than heat index, as a measure of the safety of exercise in hot and humid conditions.

Wind Chill

The cooling effect of combining wind and temperature. The wind chill gives a more accurate reading of how cold it really feels to the human body. The Kestrel Meter's wind chill is based on the National Weather Service standards as of November 1, 2001.

DEFAULT SETTINGS

UNIT	METRIC	IMPERIAL
Wind Functions	M/s	mph
Temperature Functions	°C	°F
Barometric Pressure	hPa	inHg
Altitude Functions	M	Ft
Time Format	24 hour	12 hour
Date Format	Day/month/year	Month/day/year

SETTING

Automatic	FACTORY DEFAULT
Data Store On	Data Store On
Data Store Rate	1 hour
Data Overwrite	On
Manual Data Store	On
User Screen 1	Direction, wind speed, temperature
User Screen 2	Temperature, Humidity, dewpoint
User Screen 3	Pressure, altitude, density altitude
Display Contrast	10
Automatic Shutdown	15 minutes
Language	English

PC Upload

Stored data may be uploaded to a PC with the optional Kestrel Interface.

FREQUENTLY ASKED QUESTIONS

How do I set my Kestrel Meter to read the correct barometric pressure and altitude?

To measure these values accurately, you must know either your current pressure or altitude. If you know the current barometric pressure, go to the altitude screen, and press the **—** button to enter the reference pressure. As you adjust the reference pressure, you will notice that the altitude will change. Once the reference pressure is entered, note the new altitude, and go to the barometric pressure screen. Press the **—** button to enter this altitude as the reference altitude. Your Kestrel Meter is now displaying the accurate pressure and altitude. (If you start with a known altitude, simply start with entering this value as the reference altitude on the barometric pressure screen. The adjust the reference barometric pressure on the altitude screen.)

You will need to update the reference pressure and altitude as you change altitude or the weather changes. For more information on this topic, see the Barometric Pressure and Altitude Adjustment section under “Special Functions.”

Why is my Kestrel Meter is not registering wind speed?

It probably just needs a replacement impeller. You can verify this by removing the impeller (press firmly on the sides of the impeller), and turn the unit on to the wind speed screen. Hold the Kestrel Meter near a television, computer monitor or some electronic device and it will display a wind speed. Or, wave a magnet (like a refrigerator magnet) back and forth by the Kestrel Meter. If the Kestrel Meter is working properly, you will register a wind speed reading, even though there is no impeller installed. Simply purchase a new impeller and your Kestrel Meter's wind speed readings will be restored to factory calibration.

What is the best way to take accurate temperature and humidity readings?

Avoid taking measurements in direct sunlight, and be sure there is airflow over the sensors. Especially if you expose the Kestrel Meter to a large temperature swing prior to taking a reading (such as taking a Kestrel Meter from the indoors to the outdoors in the winter), airflow over the sensors is necessary to measure

accurate temperature and humidity readings. You can ensure airflow by either placing the Kestrel Meter in a breeze, or by waving it back and forth. If no airflow can be provided, you must allow up to 20 minutes for the values to stabilize and accurate readings to be displayed.

Can my Kestrel Meter measure water speed by placing it in wind speed mode and submerging it?

Even though your Kestrel Meter is fully waterproof and can be submerged without damage, the viscosity of water is different than that of air. The Kestrel Meter will display a value, but the readings will not be the accurate water speed.

Why does my screen turn black in the heat? Why does screen become sluggish or blank in the cold?

The liquid crystal display used in Kestrel Meters has an operational temperature range of -49.0 to 257.0°F (-45.0 to 125.0°C). Above this temperature, the whole screen will turn black. Below this temperature, the liquid crystals will freeze and not display a reading. Even in these conditions, your Kestrel Meter will still continue to measure and record readings as specified by the automatic and manual data storage rates, you will just not be able to read the display until the environment's temperature is within the operational range. In cold environments, you can keep the Kestrel Meter warm in your pocket and remove it only to take readings. Be sure to wave the unit back and forth to create airflow over the sensors to ensure the most accurate reading possible.

Why doesn't my Kestrel Meter match the local Weather Report?

Obtaining a weather report from a local television station, airport or internet site will give you the weather where those instruments are, which is not necessarily the same as where you are. Your Kestrel Meter is measuring the conditions right where you are. The nature of microclimates and weather fronts is that they are varied, and even locations as close as a mile apart can have different weather readings. You can certainly use these weather reporting services for good estimates of what the conditions will be, but for the most accurate readings at your particular location, the Kestrel Meter is better.

CUSTOMER SERVICE

Kestrel Pocket Weather Meters 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 Meter is designed and manufactured at NK's facility in Boothwyn, Pennsylvania, USA. We guarantee every Kestrel Pocket Weather Meter to be free of defects in materials and workmanship for a period of FIVE YEARS from your date of purchase. We will repair or replace any defective product or part when notified within the warranty period, and will return the product via domestic ground shipping at no charge. Additionally, each Kestrel Meter has a 30-day money back guarantee.

The following issues do not result from a manufacturing defect and are not covered under this warranty: damage due to improper use or neglect (including corrosion), impact damage, modifications or attempted repairs by someone other than an authorized NK repair agent, impeller failure not caused by a manufacturing defect, normal wear from use of the product, failed batteries, and re-calibration beyond 30 days from your date of purchase.

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 4500 is covered by the following US patents: 5,783,753, 5,939,645, 6,257,074, and 7,059,170.

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 Meter 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 Meter 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). Cost of repairs and other important information can be found on our website.

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 claim.

Visit www.kestrelweather.com for more information and pricing for these services.

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.

Need Help?

Our NK Knowledge Center has answers to many common questions, along with tips and tricks for using NK products. It's available 24-7 at www.nkhome.com/knowledgecenter/.

For email assistance with the installation or operation of your NK product, write techsupport@nkhome.com.

For help with an apparent malfunction, or to arrange or inquire about a repair, write repairs@nkhome.com.

Or call 800.784.4221 (610.447.1555 outside of the USA), Monday to Friday, 9 to 5, East Coast Time.

Kestrel® Pocket Weather® Meters are designed and manufactured in the USA by:



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Email: kestrel@nkhome.com

Instruction Manual for Kestrel 4500 version: 4.15 ALL

Please register your Kestrel Meter at www.KestrelWeather.com



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