

In a Hurry?
Be sure to read pages 5-6 to ensure that your Kestrel is setup properly!

Kestrel® 4500 Pocket Weather Tracker®

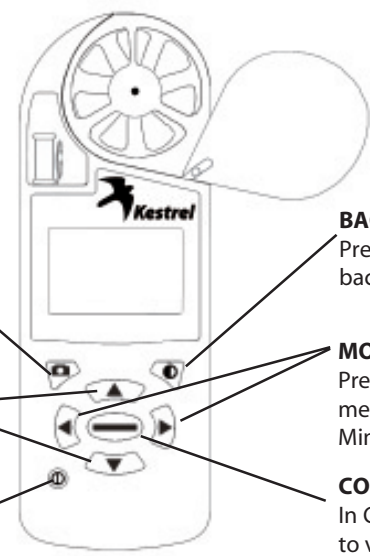
Instruction Manual

Kestrel 4500 & Kestrel 4500 NV Models

NK

Kestrel® 4500 Pocket Weather™ Tracker™

FRONT



MANUAL MEMORY BUTTON
Press to manually store current conditions to memory.

BACKLIGHT BUTTON
Press to activate backlight for 1 minute.

MEASUREMENT BUTTONS
Press to scroll between screens: Date/Time, Measurements, User Defined Screens

MODE BUTTONS
Press to change mode of measurements: Current, Min/Max/Avg, Chart.

POWER/SETUP BUTTON
Hold to turn power on or off. Press to enter and exit Main Setup Menu.

COMMAND BUTTON
In Chart Screens, press to view data points. In Setup Menus, press to make selection.

Kestrel® 4500 Pocket Weather™ Tracker™

BACK

IMPELLER
Sapphire jewel bearings on a user-replaceable impeller.

TEMPERATURE SENSOR
Hermetically sealed precision thermistor coiled to isolate from case temperature.

IMPELLER COVER
Swivel cover protects impeller when not in use.

HUMIDITY SENSOR
Capacitive sensor with secondary thermistor to improve accuracy and response.

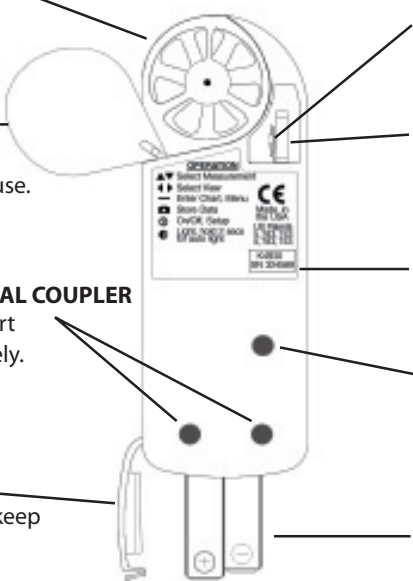
DATA UPLOAD OPTICAL COUPLER
Software and serial port interface sold separately.

SERIAL NUMBER

BATTERY DOOR
Sealed with o-ring to keep product watertight.

PRESSURE SENSOR
Monolithic silicon piezoresistive sensor. Do NOT insert any objects into this hole.

2 AAA BATTERIES



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.

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Getting Started

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 plastic 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!

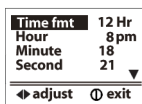
After installing the batteries, the Kestrel 4500 will automatically start in the Date and Time Setting mode. (See Date and Time Setup below.) Custom settings and chart data will be saved during a battery change; only the date/time and MMA values will be lost.

Turning the Kestrel 4500 ON and OFF

To turn the Kestrel ON, press **⏻** button. To turn the Kestrel 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.)

Date and Time Setup

The first time that you turn on your Kestrel 4500, 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 reliably on a metal desk. Also, *keeping the Kestrel vertical (front/back and left/right) is crucial to accurate calibration.* The foam stand included in the Kestrel packaging will help to stabilize the unit during calibration. (The piece is also handy for standing the Kestrel 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.)

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 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 Menu.

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 vertically, verify the Kestrel's 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 and the compass far enough away from each other that they do not interfere. You should expect the Kestrel's readings to be within $\pm 5^\circ$ of the reference compass or better. If the Kestrel'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 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.

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 **▲▼**

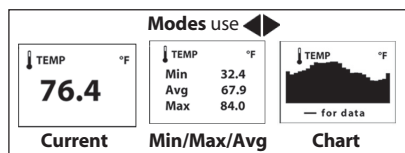
- Direction
- Wind Speed
- Crosswind
- Headwind/Tailwind
- Temperature
- Wind Chill
- Humidity
- Heat Index
- Dew Point
- Wet Bulb
- Barometric Pressure
- Altitude
- Density Altitude

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

The Measurements are listed to the left with their corresponding screen icon. In addition to these Measurements and Modes, there are also 3 User Screens, which simultaneously show 3 current measurements (see pages 8 and 15 for more information); 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.

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.

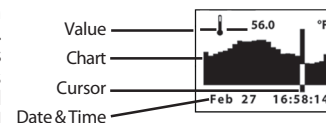
- Current** - displays the instantaneous reading
- Min/Max/Avg** - displays the Minimum/Maximum/Average readings from stored data. If there is no stored data, the values will be displayed as --.
- Chart** - displays a graphical representation of up to 1400 stored data points for each measurement. If there is no stored data, the axis will appear, but the chart will be blank. (See the following page for information on Chart Navigation.)



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.



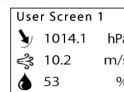
Press the **▲** or **▼** button to review the data for the other measurements. Please note that the cursor will remain at the same date and time. If new data is stored while viewing chart data, the entire chart will shift left with the new data point charted on the right. The cursor will not shift with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

Press the **⏻** button to return to the Chart Mode.

Special Functions

User Screens

The Kestrel 4500 has three User Screens which can be customized to display three current measurements simultaneously. (See page 15 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.



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 Min/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 page 14 for more information on Memory.

Backlight

The Kestrel 4500 has a high-visibility green backlight, which makes the display easily read in low-light conditions. The Kestrel 4500 NV has a visible red backlight which preserves the natural night vision of users such as military personnel and pilots. 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 red 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.





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 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 4500 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 “Calibration” on pages 5-6) to ensure that the effect

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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 4500 is capable of measuring RH to a high accuracy: +/- 3% RH. To ensure the Kestrel 4500's ability to operate within these specifications, 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 to a large temperature swing prior to taking a relative humidity reading (such as when taking a Kestrel stored inside at 70° F outside to a temperature of 40° F), you will need to take additional steps to ensure that the Kestrel'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, moving from the back of the unit towards the front. (In other words, point the Kestrel into the airflow.) If there is no airflow, simply wave the Kestrel 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 4500 to confirm that the unit has stabilized to a correct reading: Set the memory options to

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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.

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.

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a relatively short logging interval (20 seconds works well, see page 14 for instructions), 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.

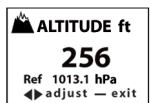
Barometric Pressure and Altitude Adjustment

The Kestrel 4500 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 4500 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 4500 needs an accurate reference altitude. Altitude is the height above sea level. In order to correctly calculate altitude, the Kestrel 4500 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 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: 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 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 4000 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: 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

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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 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 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 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 will not make any adjustment and will display the measured value. And, 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 4500 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 Ⓞ or the — button to turn the display off. Even when the Kestrel's display is turned off, the unit will continue to automatically store data at the defined Store Rate. Wind speed will NOT be stored when the unit is off. To continuously measure wind speed, turn the auto shutdown off, and see page 8 for more information on how this data is stored. 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.
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 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.

Graph Scale - These settings control the chart limits of your 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 Alt.
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 pound per square inch	
mph miles per hour		mb millibar	
ft/m feet per minute			
Bft Beaufort			

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 the application. 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 ▲ and ▼ 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.

System - The display Contrast and Auto Shutdown can be reconfigured as required. The relative humidity and pressure sensors can also be recalibrated. Press the ▲ and ▼ 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).

Baro Cal - 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 on page 9). Then adjust the calibrating setting on the Baro Cal screen to the known mean sea level barometric pressure. *Recalibration of this sensor is not typically required, and it is not recommended that you recalibrate without speaking to an NK technician.*

Humidity Cal - 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. *Recalibration of this sensor is not typically required, and it is not recommended that you recalibrate without speaking to an NK technician.*

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 page 5 for instructions on how to set the date and time.) 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 ▲ and ▼ 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 page 21 for a list of the default settings.) Press the ▲ or ▼ button to highlight the desired default setting: Metric, Imperial or Defaults. Press the ◀ or ▶ button to reset the factory setting. Press the Ⓞ to return to the Main Setup Menu.

Application Examples

This section provides examples of applications where a Kestrel 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 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 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.

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HVAC - Environmental Monitoring

Auto Store On
Store Rate 5 min
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	Store Rate	Total Memory
2 sec	46 min, 40 sec	10 min	9 days, 17 hr, 20 min
5 sec	1 hr, 56 min, 40 sec	20 min	19 days, 10 hr, 40 min
10 sec	3 hr, 53 min, 20 sec	30 min	29 days, 4 hr
20 sec	7 hr, 46 min, 40 sec	1 hr	58 days, 8 hr
30 sec	11 hr, 40 min	2 hr	116 days, 16 hr
1 min	23 hr, 20 min	5 hr	291 days, 16 hr
2 min	1 day, 22 hr, 40 min	12 hr	700 days
5 min	4 days, 20 hr, 40 min		

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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 4500 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 4500 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 race care 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 our ability to cool ourselves by evaporating perspiration is reduced.

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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.

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 wind chill is based on the National Weather Service standards as of November 1, 2001.

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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	FACTORY DEFAULT
Automatic Data Store	On
Data Store Rate	1 hour
Data Overwrite	On
Manual Data Store	On
User Screen 1	wind speed, temperature, humidity
User Screen 2	humidity, dewpoint, wet bulb
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 PC Interface, NK part number 0804.

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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). Cost of repairs and other important information can be found here.

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.

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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 is designed and manufactured at NK's facility in Boothwyn, PA. We guarantee every Kestrel Pocket Weather Meter to be free of defects in materials and workmanship for a period of TWO 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 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 repair 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 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 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

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

NK

NIELSEN-KELLERMAN

610.447.1555

www.kestrelweather.com

info@kestrelweather.com

Instruction Manual for Kestrel 4500 version: 4.15 ALL

Please register your Kestrel at www.KestrelWeather.com