



# **Kestrel<sup>®</sup>**

**Shooter's Weather Meter**  
*with Applied Ballistics*

## INSTRUCTION MANUAL



AVAILABLE WITH



**Bluetooth**  
Wireless Data Transfer

[NKhome.com](http://NKhome.com)

800.784.4221



**Your Kestrel Ballistics Weather Meter is designed to provide accurate measurement of current conditions only. Depending on your location and environment, conditions may change rapidly.**

*Rapid temperature and humidity changes (i.e., moving your meter from indoors to outdoors) may cause inaccurate readings of temperature and humidity as well as all readings that rely on either of these values. Before relying on a Kestrel Ballistics Weather Meter readings, use care to either a) force air flow over the sensors by waving or slinging your meter through the air; or b) wait until your unit's readings have stabilized, indicating it has equilibrated to its new environment.*

**To maximize the accuracy and reliability of your readings:**

- *Ensure that your Kestrel Ballistics Weather Meter is in good repair and within factory calibration.*
- *Take readings frequently and carefully according to the guidelines above.*
- *Allow your meter's readings to stabilize after significant changes in temperature or humidity (i.e., changing location from indoors to outdoors).*
- *Allow a margin of safety for changing conditions and reading errors (2-3% of reading is recommended).*

***Use extra care and good judgment when referring to your Kestrel Ballistics Weather Meter to make any decisions regarding safety, health or property protection.***

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\*for BLUETOOTH®-enabled models ONLY














## WEATHER MODE

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NK, manufacturer of Kestrel brand Ballistics 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](mailto:info@NKhome.com); or web: [NKhome.com](http://NKhome.com)

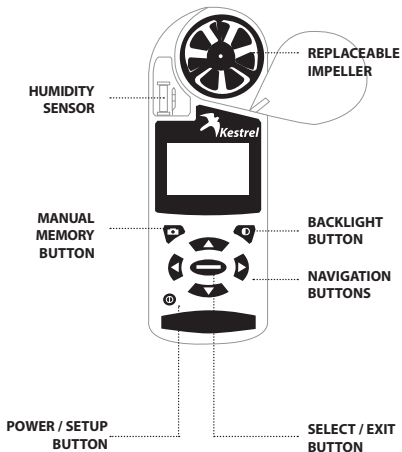
## FEATURES & OPTIONS

Standard ● | Optional ○

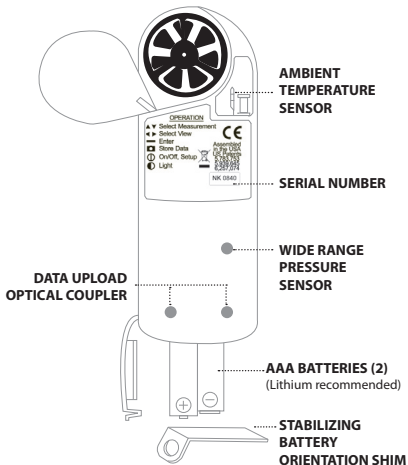
Measurement/ Units of Measure	Icon	4500 w/Applied Ballistics
Wind Direction (Cardinal Points, Degrees)		●
Wind Speed   Air Speed (mph   fpm   Bft   m/s   km/h   kt)		●
Crosswind Calculation (mph   fpm   Bft   m/s   km/h   kt)		●
Headwind   Tailwind (mph   fpm   Bft   m/s   km/h   kt)		●
Temperature* (°F   °C)		●
Wind Chill (°F   °C)		●
Relative Humidity (Gpp   G/kg)		●
Heat Stress Index (°F   °C)		●
Dewpoint Temp (°F   °C)		●
Wet Bulb Temp (°F   °C)		●
Barometric Pressure (inHg   hPA   psi   mb)		●
Altitude, m   ft		●
Density Altitude, m   ft		●
Pressure Trend		●
Backlit Display		●
Data Storage Points		2900
BLUETOOTH®		○
NV Backlight		●

## GETTING TO KNOW YOUR KESTREL

### FRONT



### BACK





Even when the Kestrel display is off, the unit will still automatically collect and store data at the defined rate (see "Memory Options"). To completely power down the unit, you must remove the batteries (and lose time / date and other settings)

\* All Kestrel Meters with temperature measurement allow you to measure air, water and snow temperature.







- Insert batteries into bottom of Kestrel unit as shown on battery door.
- Snap door closed.

### Turning ON and OFF

- Press  to turn on the meter.
- Hold  for 3 seconds to turn off the meter.

☐ *You can also select "Off" on the Main Setup Menu options.*

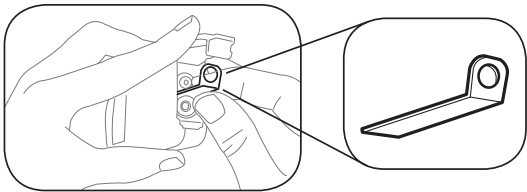
### Date & Time

- Press  to enter the Main Setup Menu.
- Use  or  to highlight Date & Time.
- Press  to enter the Date & Time Screen.
- Press  or  to change each value.

## KESTREL 4500:

AAA batteries have a magnetic signature strong enough to affect the Kestrel 4500's compass readings. Please follow this extra step to ensure the batteries stay in proper orientation.

Before closing the door, push the plastic shim (provided with unit) between batteries and place clear ring on end over positive battery "bump."



☐ *When replacing batteries in the Kestrel 4500, always keep the shim and re-insert with new batteries as described.*

In addition to Wind Speed and Wind Chill, the **Kestrel with Applied Ballistics Software** also measures Direction, Headwind/Tailwind and Crosswind.

### Digital Compass Calibration

□ *The Kestrel meter's digital compass must be calibrated to correct for the AAA batteries' magnetic field. It must be re-calibrated every time the battery door is opened, and it will not display or log any direction values until calibration is complete.*



*\*\*Impeller should be removed during calibration for best results.*

- Remove the impeller by pressing the edges to pop it out (reinsert after calibration is complete).

#### To Calibrate:

- In Main Setup Menu, use  or  to highlight "System", then press .
- Press  to highlight "Compass Cal", then press .


#### Follow the prompts on screen:

- Press  to start.
- Slowly spin the upright meter around three (3) full times.
- Each rotation should take approximately 10 seconds.
- When calibration is finished, the screen will read "Cal Complete".
- Press  to exit to Main Menu.

To verify the digital compass' accuracy, test it against a

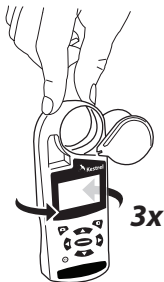
compass; the Kestrel meter readings should be within  $\pm 5^\circ$  of the reference compass or better. If readings appear incorrect, simply run the calibration routine again. Unit should be held vertically with the back facing the direction being measured.

### Calibration Error Messages

There are three error messages that the meter may display during calibration. Press  to exit the error screen and run the calibration again.

- **Magnetic Batteries:** The magnetic field of the Kestrel's batteries is interfering with calibration. Try opening the battery door, rotate one or both batteries, and run the calibration again. If error persists, try using a different brand of battery.
- **Too Slow:** The unit was spun too slowly during calibration.
- **Too Fast:** The unit was spun too quickly during calibration.

 Figure 1









### Measuring Direction

☞ *The Kestrel 4500's digital compass must be vertical to achieve accurate readings. Keep the unit positioned as close to vertical as possible when using any compass-related feature. After opening the battery door, you must re-run the calibration routine or readings will not register. For maximum accuracy, the impeller should be spinning while measuring to eliminate its magnetic pull.*

### True North vs. Magnetic North Readings

The Kestrel 4500's default Direction display mode is Magnetic North.

To view Direction in True North mode:

- Go to weather mode in the Direction screen, press .
- Use  or  to choose your mode.
- If you choose True North, use  to highlight "Variation", then use  or  to input the Variation for your location.





### To measure Direction:


- Hold the unit vertically and point the BACK of the unit toward the direction you want to measure.
- The unit will display the cardinal direction and degrees.

☞ *The Direction measurement does not record Max and Average and will display N/A on that mode screen.*

### Measuring Headwind/Tailwind & Crosswind

The Kestrel 4500 automatically calculates Headwind and Crosswind with respect to a runway or target direction. You must first set the "Heading" to view these measurements:

- Press  while on the Headwind or Crosswind screen.
- Use  or  to choose "Auto Set" or "Manual Set", then press .

**In Auto Set:** *Point the unit down the runway or target, then press  to automatically set the heading.*

**In Manual Set:** *Use  or  to enter the known runway or target heading, and press  to save.*

☞ *Both screens will always display the Magnetic North heading at the top (even if the Direction screen is set to True North mode).*

- After setting the heading, scroll to the desired parameter and orient the Kestrel so the wind blows directly through the impeller.

Info for Wind Speed & Direction of fire for ballistic solutions can be found on pg 16.



## Setting Barometric Pressure & Altitude

The Kestrel meter measures “station pressure”, which changes in response to both changes in altitude and changes in atmosphere. Barometric pressure is a measurement of the air pressure adjusted to sea level.

- ☐ *Station pressure is displayed if the reference altitude is set to zero. This is needed for ballistics solutions as well.*
- ☐ *Be sure to adjust your reference measurements for altitude and/or barometric pressure when you change your location or when there have been dramatic changes in weather conditions.*

### Obtaining Station Pressure

- In the Main Setup Menu, use or to highlight “Weather Mode”, then press .
- Use or to scroll to highlight the “BARO” screen
- Press to enter the “REF BARO” screen
- Set the reference altitude to zero for station pressure. Set it to your current altitude if you want barometric pressure

Baro—Displays current Barometric Pressure

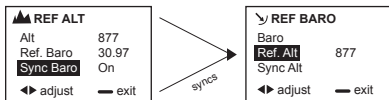
Ref Alt—Use or to set the known Altitude

Sync Alt—Use or to switch “On” and sync the Baro reading to the “Altitude” screen

When “Sync Alt” is turned “On,” the current

- ☐ *“Density Altitude” screen data is calculated from the absolute values of station pressure, relative humidity and temp., and is not affected by the reference values entered in the “Baro” and “Altitude” screens.*

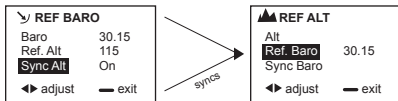
Barometric Pressure data is automatically used as a reference for Altitude, and both screens will show accurate readings.



### Setting Altitude

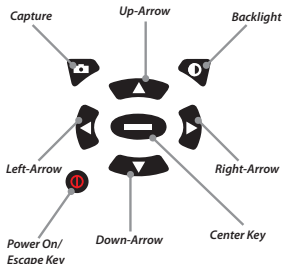
- In the Main Setup Menu, use or to highlight “Weather Mode”, then press .
- Use or to highlight the “Baro” screen
- Press to enter the “REF ALT” screen
- Set the reference altitude to your current altitude.

When “Sync Baro” is turned “On,” the current Altitude data is automatically used as a reference for Barometric Pressure, and both screens will show accurate readings.



## BASIC NAVIGATION & GETTING STARTED

### THE KESTREL HAS SEVEN NAVIGATION KEYS:



#### Quick Tips:

Your Shooter's Weather Meter with Applied Ballistics (AB) can operate in Weather mode or AB mode. For instructions related to Weather Mode, see page 23.

Compass must be calibrated in order for directional features to work in AB mode. Compass calibration can be done from the main menu screen. See page 7.

Pressing will allow you to exit out of a particular screen.

When a ballistics parameter is underlined, this indicates that the value cannot be changed manually on the current screen. This is either because it is a calculated value or determined by the sensors. Press and hold for 2 seconds to power down the Kestrel regardless of current

screen. Press twice in rapid succession to instantly change between Weather mode and AB mode. Any changes in information are automatically saved upon exiting the current screen. There are four exceptions to this rule where an "accept" screen appears upon exiting: the Target Range estimator, the Target Speed estimator, and the MV and DSF Calibration screens.

### Getting started with AB Mode

The three main data input groups are gun, target and environment. The aiming solutions for Elevation, Windage and Coriolis are displayed on the Main AB screen.

#### 1. Gun Information

GUN	▶ Laru308
MV	2550FPS
DC	G1
BC	0.475
BW	175gr
BD	0.308in
BL	1.240in
ZR	100m
BH	2.75in
ZH	
ZO	
RT	11.25in
RTd	Right
EUNIT	mil
Eclck	n/a
Wunit	mil
Wclck	n/a
Cal MV	
Cal DSF	
View DSF	
Clear DSF	

#### 2. Target

TARGET	
Active	Yes
TR	1000
DoF	000°
Ideg	0°
Icos	1.000°
TS	0mph
TD	L-R
WD	12oc
WS1	5mph
WS2	10mph

A box indicates amount of data shown on display.

Data below box indicates additional information available by pressing .

\*Note: Please see p. 28 for abbreviation glossary.

## GUN SELECTION

### 3. Environment

ENVIRONMENT	
Update	No
Lat	42°N
Temp	75°F
SP	29.48inHg
RH	50%
Dalt	1729ft
SpnDft	Yes
Wcap	Onetgt

These three main data groups determine an accurate firing solution. The first step in getting a firing solution is selecting your gun.

#### Gun Selection

The Gun Selection screen allows you to choose a preconfigured gun or build your own. You may create and

store up to 16 guns. A user-created gun is defined as a gun that has been modified for one or more parameter values of the New Gun or any of the preconfigured guns. A preconfigured gun is any gun loaded onto the Kestrel using the AB Gun Loader software.

When a New Gun is modified, the name instantly changes to UserGunX (where X is a number suffix to ensure the name is unique). If a preconfigured gun (whose name ends in a letter) is modified, a number will appear at the end to create a unique name. If a preconfigured gun (whose name ends in a number) is modified, a letter will appear at the end to create a unique name.

- Turn on the unit. From the Main AB screen, press to access the Main Setup Menu.

Off
Weather Mode
AB Mode
<b>Gun Selection</b>
select  exit

- Press to highlight "Gun Selection."
- Press to enter Gun Selection Screen. Here, you may choose a preconfigured gun or build your own.

#### To Choose a Preconfigured Gun:

- Press or to scroll through the different guns.
- Press to turn your selected gun "on" or "off." "On" means the gun is available to be selected in AB mode. "Off" means the gun is not available to be selected. For example, setting multiple guns to "On" allows you to quickly switch gun configurations without going back to the Main Setup Menu.

Gun select	11
▶Laru308	On
▶User Gun2	On
▶User Gun	Off
▶300WinMag2	Off

- Pressing on a gun gives you the option to edit or delete this gun.

#### To Build A Gun:

You can build and name your gun on the gun selection screen.

- Use to highlight New Gun and press .
- This will take you to the gun information screen where you may adjust all gun parameters. Press up or down to highlight the gun parameters.
  - Use and to adjust each value.
- To name your gun, scroll up to highlight "Gun" and press .
- You will see a cursor appear under the first letter of New Gun.
- Use the and buttons to scroll through the alphabet and numbers 0-9 and several symbols. Pressing inserts a space between characters.

Gun select	11
▶MaruGun308	On
▶AR15a	On
▶300WinMag1	Off
▶New Gun	Off

GUN	New Gun
MV	2900fps
DC	GI
BC	0.533
BW	1909r

## GUN LIBRARY & INFORMATION SCREEN

- Once you're on the desired letter, use **▶** to move the cursor to the next space in the gun name. Continue until the gun name is complete.
- When gun name is complete, press **⏎** button to save. (Gun will also automatically save upon exiting screen.)
- Press **⏏** to exit from the current screen.

### Gun Library

There is room in the Kestrel for up to 16 guns. While it is possible to copy a preconfigured gun to your Kestrel and modify the parameter, you should use New Gun and input all the parameters to ensure MV and DSF Cal are accurately inputted. You can build a gun library on a computer using the AB Gun Loader software, and download the new gun library to the Kestrel (either via Bluetooth® connection or the Kestrel wired interface). Downloading a new gun library will automatically overwrite the previous guns in the Kestrel.

*\*Note: You should upload any user-created guns to the AB Gun Loader software that you want to save before downloading new guns. The new guns will overwrite current stored Kestrel guns.*

### Gun Information Screen

Once you have selected your gun, you're now ready to enter or modify all relevant parameters pertaining to the set-up of your rifle. These parameters include muzzle velocity, drag curve, ballistic coefficient, bullet weight, bullet diameter, bullet length, zero range, zero height, zero offset, bore height, rifle twist, rifle twist direction and sight adjustment (click).

- On the Gun Information screen, use buttons to

highlight the gun parameters.

- Use **◀** and **▶** to adjust the value.
- Press **⏎** to enter the highlighted parameter's screen. Here you are also able to adjust the parameter's value as well as the unit of measure. (For example, meters per second to feet per second.)
- Press **⏏** to exit to Main AB screen once all values are correct.

See below for more information on Muzzle Velocity, Drag Curves and Calibration.

### Muzzle Velocity

- Use **▲** and **▼** to highlight "MV."
- Press **⏎** to enter MV screen.
- Use **◀** and **▶** to adjust the value.

### Notes on Muzzle Velocity

- When a bullet is in the transonic range, a small dot will appear to the left of the muzzle velocity value (figure 1).
- When a bullet is in the subsonic range, a larger dot will appear to the left of the muzzle velocity value (figure 2).

GUN	▶ Laru308
MV	-1360fps
DC	GI
BC	0.470
BW	1759r



Figure 1


GUN	▶ Laru308
MV	•1103fps
DC	GI
BC	0.470
BW	1759r

Figure 2

- In cases where the bullet is supersonic, there are no dots next to the muzzle velocity value.








**MV-Temp Table**

This allows you to enter and maintain a table of muzzle velocities based on temperature. If an entry is input into the table, the muzzle velocity is applied at all temperatures (this means that the value is then locked and cannot be altered by using  and  on the gun information screen). If two or more entries are input into the table, the Kestrel uses the linear interpolation and the temperature sensor to determine the appropriate muzzle velocity. (Note: this value will only change if the temperature changes and you exit and re-enter the gun information screen; once a muzzle velocity value is entered for a particular temperature, you can not make another muzzle velocity value for the same temperature.)

- To access MV-Temp table, scroll to MV (Muzzle Velocity) to highlight it and press , then use  to scroll to MV-Temp and press  to enter.



Muzzle velocity	
MV	2900fps
feet per sec	
MV-Temp	

Table item	
Temp	10°F
MV	2900fps
Clear	

- Press  while "New entry" is highlighted to enter the Table Item screen.
- Use  or  to scroll to "Temp" and "MV." Use  and  to adjust each value.
- To clear a Table Item, scroll down to Clear and press .
- Press  to exit to return to the Gun Information screen.

**Drag Curves**

The Kestrel with Applied Ballistics allows you to use G1 or G7 drag curve model, or AB's custom drag curves.

- To select the appropriate drag curve, scroll to "DC."
- Use  and  to scroll through options.
- If a custom drag curve is used, no further adjustment is necessary. If using G1 or G7 drag curves, you must adjust the BC by scrolling down and editing to the proper value.

For more information on the custom drag curves, please see page 18.









**Calibrate Muzzle Velocity**

This allows you to calibrate your muzzle velocity based on the actual drop of a round at a range where the bullet is supersonic. With the range and the drop entered, the Kestrel automatically adjusts muzzle velocity to match.

- To access the muzzle velocity Cal, scroll to Cal MV to highlight it and press .

MV Cal	1398m
Range	1275m
Drp	9.35mil
-Cal	
MV	2826fps

*The number shown to the top right of the screen is the suggested range distance at which to calibrate muzzle velocity. This range is calculated from when the bullet is at a speed of Mach 1.2.*

- Use  and  to adjust the range at which you are firing. The Drop will update with the range.
- Use  to scroll to "Drp." Use  and  to adjust the value to match the observed drop of the bullet at range.
- Use  to scroll to "Cal" and press . The Calculated Calibrated Muzzle Velocity value will be displayed at the bottom of the screen.
- Press  to exit to return to the Gun Information


## GUN INFORMATION SCREEN (CONT.)

screen. The Kestrel will ask if you want to accept the MV Calibration. Selecting "Yes" will use the Cal MV to update the MV listed in the Gun Information screen.

For more information on Ballistics Calibration, please see page 18.








### Drop Scale Factor (DSF)

This allows you to enter and maintain a table of drop scale factors (DSF) that utilize observed drop at range to calibrate the elevation computation. The number shown to the top right of the screen represents the suggested range distance at which to apply a drop scale factor for transonic flight. Additional drop scale factors can be added to the DSF table by shooting at greater distances including subsonic flight. Attempting to enter an additional drop scale factor that is closer in range distance than existing DSF table entries will invalidate and erase the existing entries.

- To access the DSF Calibration, use and to scroll to "Cal DSF" on the Gun Information screen.
- Highlight it and press .

DSF Cal	1581m
Range	1275m
Drp	9.35mil
-Cal	
DSF	0

*The number shown to the top right of the screen represents the suggested range distance at which to apply a drop scale factor for Transonic flight (Mach 1.0). Additional drop scale factors can be added to the DSF table by shooting at greater distances including subsonic flight. Attempting to enter an additional drop scale factor that is closer in range distance than existing DSF table entries will invalidate and erase the existing entries.*

- Use  and  to adjust the range at which you are firing
- Use  to scroll to "Drp." Use  and  to adjust the value to match the observed drop of the bullet at range.
- Use  to scroll to "Cal" and press . The Calculated Drop Scale Factor will be displayed at the bottom of the screen.

## TARGET SCREEN

- In order to accept the Calibrated DSF value, press and select "Yes" by pressing .

	Mach	DSF
1	0.000	1.000
2	0.000	1.000
3	0.000	1.000
4	0.000	1.000

The first row of the DSF table will be prepopulated with the mach value at which muzzle velocity was calibrated and a drop scale factor of 1.00. If ballistics calibration was not completed, a default value of 1.0 will be entered for you. However, calibrating your muzzle velocity after establishing DSF table

will update the first row of your DSF table accordingly without clearing the rest of your DSF table entries.

- Press to exit to return to the Gun Information screen. The Kestrel will ask if you want to accept the DSF Calibration.
- To view the DSF table, scroll to "View DSF" in the Gun menu and press to see what DSFs have been stored. You may repeat this step for up to six DSF values. Please remember that entering DSF values at ranges closer than previously entered will invalidate DSF values at those longer ranges.

### Target screen:

You can customize up to five targets for location, distance, direction, declination and wind.

- From the Main AB screen, use or to highlight "Tgt" and press to enter the Target screen.
- Use and to highlight a parameter.
- Use and to adjust values for each parameter.
- Press to enter the highlighted parameter's screen.

TARGET	A
Active	Yes
TR	998m
DoF	000°
Ideg	0°

Here you are able to adjust the parameter values as well as the unit of measure. (For example, yards to meters.)

### Multiple Targets

- You may create up to five targets (A-E) by highlighting "Target" and pressing or to move on to the next target. After changing targets, the parameters can be changed by repeating the steps outlined above.

### Active

- The "Active" status of Target A defaults to "Yes" because the Kestrel must have at least one active target at all times.
- To make a target active, on the Target screen use or to highlight "Active" and use or to change to "Yes." To make a target inactive, use or to change to "No."
- Setting a target's "Active" status to "Yes" allows you to view the firing solution for that target on the Main AB screen.
- If multiple targets are active, you can use or to scroll between all active targets (and their respective firing solutions) on the Main AB screen.

**Elevation**

E	49.24	A
W	1.36/3.03	R
Tgt	000°	100 m
Wind	3oc	5mph

**Windage**

E	16.58	B
W	0.68/1.46	R
Tgt	000°	549 m
Wind	3oc	5mph

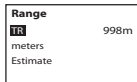
Target A is current active target. **HOLD** Target B is current active target.

## TARGET SCREEN (CON'T)

### Target Range

- Use or to highlight "TR."
- Use and to adjust the value.

### Target Range Estimator



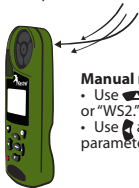
This function estimates the range of a target based on size, image and calculated range.

• When "TR" is highlighted, press button to enter Range screen.

- Use to highlight "Estimate" and press to enter Range Estimate screen.
- Use or to highlight a parameter.
- Use and to adjust values for each parameter.
- When all parameters are set, press to escape.
- An "Accept" screen will appear, scroll to "Yes" if you would like to accept values. Use to select the highlighted option.

### Wind Direction & Wind Speed

There are two wind speed measurements on the target screen (WS1 and WS2) for minimum and maximum wind speed as well as wind direction (WD). You have the option to manually adjust the wind speed and wind direction values or use the capture feature to automatically get a reading.



#### Manual mode

- Use or to highlight "WD," "WS1" or "WS2."
- Use and to adjust values for each parameter.

### Capture mode

- In the Target screen, press to enter into either the "WD," "WS1" or "WS2" screen.
- Press to enter into capture mode.
- Face the back of the Kestrel meter directly into the wind and press to start and stop the capture mode. Please ensure Kestrel impeller cover is open.
- The data collected in capture mode will automatically adjust the "WD," "WS1," and "WS2" values in the Target screen.

*\*Note: WS1 can never be greater than WS2 value. The WS2 value will automatically adjust to ensure that this remains true.*

### Direction of Fire

Direction of Fire (DoF) is an absolute frame of reference to true north. The value is the direction the gun barrel is pointing with respect to the values on a compass. Direction of Fire can be manually adjusted or obtained using the "Capture" feature.

#### Manual mode

- Use or to ensure that "DoF" is highlighted.
- Use and to adjust the value.

#### Capture mode

- When "DoF" is highlighted, press to enter the DoF screen.
- Use to scroll to "Capture."
- Press to enter into the capture mode.
- Face the back of the Kestrel directly toward the target and press .
- The data collected in capture mode will automatically adjust the DoF value in the Target screen.

*\*Note: Compass must be calibrated in order to capture DoF. See p. 7 for calibration steps.*



## TARGET SCREEN (CON'T)

### Inclination Angle

Inclination angle is the angle between the target and the horizontal as seen by the shooter. This variable is expressed in the Target screen as "Ideg" or "Icos," where Ideg is in degrees, and Icos is the cosine angle. These can be manually adjusted by highlighting one and using the and to change the value. Changing one will automatically change the other appropriately.

### Target Speed

- Use or to highlight "TS."
- Use and to adjust the value.

#### Speed of motion

TS 0mph  
miles per hour  
Estimate

### Target Speed Estimator

This function estimates the speed of a target based on range, movement, and time.

- When "TS" is highlighted, press to enter Speed of Motion screen.

- Use to highlight "Estimate" and press to enter Speed Estimate screen.
- Use or to highlight a parameter.
- Use and to adjust values for each parameter.
- When all parameters are set, press to escape.
- An "Accept" screen will appear, scroll to "Yes" if you would like to accept values. Use to select the highlighted option.

### Target Direction

- Use to highlight "TD."
- Use and to adjust "L-R" (left to right) or "R-L" (right to left).

## ENVIRONMENT SCREEN

### ENVIRONMENT SCREEN:

The Environment screen contains all atmospheric parameters, such as temperature, station pressure, and relative humidity. Setting the "Update" parameter to "Yes" automatically imports the Kestrel's sensor data into the Environment screen. The "Update" parameter can also be set to "No" when it is highlighted by using or ; while in this setting the temperature (Temp), station pressure (SP), and relative humidity (RH) can be manually adjusted.

- Use or to highlight a parameter.
- Use and to adjust the values for each parameter.

#### ENVIRONMENT

Update	No
Lat	42° N
Temp	75° F
SP	29.48inHg

Spin Drift will default to "Yes" unless you manually change it to "No." When on the "Yes" setting, the Spin Drift is taken into account for the ballistics solutions.

Coriolis affects all automatically calculated in the ballistic solutions. In order to turn off Coriolis effects, please set the Latitude and Direction of Fire to zero.

*\*Note: station pressure ("SP") is pressure reading that is unadjusted for sea level. Sometimes, this is mistakenly called barometric pressure in ballistics software. Barometric pressure is a pressure reading adjusted for sea level. When shooting, station pressure is required. Station pressure can be measured with the Kestrel by setting the reference altitude to zero on the Barometric Pressure screen in weather mode; although, the ballistics solution will use station pressure regardless of the altitude settings.*

## RANGE CARD SCREEN

### RANGE CARD SCREEN

The Range Card screen shows detailed information about the ballistic solution at various ranges that apply to the currently selected target and gun. The screen displays three columns comprised of the Range and Elevation (in the left two columns) and one other variable. The other variable that can be displayed is ballistics solutions based on "Wnd1", "Wnd2", "Lead"; or further information on bullet flight characteristics such as remaining velocity ("RemV"); remaining energy ("RemE"); time of flight ("ToF"); and maximum ordinate, or height above the line of sight to the target ("MaxO"). Please see Page 29 for a sample Range Card.

- Use or to scroll to a particular range.
- Use and to scroll across and view all available parameters.

RANGE CARD		
Rng	Elv	Wnd1
300	5.50	L0.13
400	9.42	L0.19
500	14.06	L0.27

RANGE CARD		
Rng	Elv	RemV
300	5.50	1991
400	9.42	1823
500	14.06	1666

*Example: "Rng" and "Elv" columns remaining fixed while third column can be changed.*

### Range Increment

- Use while in the Range Card to enter the Range Settings screen.
- Use and to adjust the range increment to the desired value. You may adjust the increments to show in 10, 20, 25, 50, or 100 units of measure (yards or meters).

- Press to exit "Range Increment" screen.



*Note: The Range Card will display range values up to 4000 yards, or the closest equivalent in meters, depending on the range increment.*





### Remaining Velocity

- A small dot will appear to the left of the remaining velocity value to indicate the bullet is in the transonic range.
- A larger dot will appear to the left of the remaining velocity value to indicate the bullet is in the subsonic range.

RANGE CARD		
Rng	RemV	RemE
800	.1272	629
900	.1177	538
1000	.1101	471

**BALLISTICS SCREEN**

The Ballistics screen displays complete information about the ballistic solution that pertains to the currently selected target and gun. The only parameter whose value can be altered in this screen is the “Range” (this can be done by using  and  to adjust the value).

- Use  or  to scroll to a particular parameter.
- Use  to enter into a parameter screen for further information about it or change unit of measure.
- Use  to return to the Ballistics screen.

*Note: An R or an L will appear beside each solution to indicate which side of the target you should aim.*

### **APPLIED BALLISTICS' SIGNATURE FEATURES AUTOMATED BALLISTICS CALIBRATION & CUSTOM DRAG CURVES**

In an ideal world, shooters would go into the field knowing exactly how their chosen combination of gun and ammunition will perform, calculated ballistic solutions would always be correct, and a properly delivered shot would always hit the target. In the real world, ballistic data is often imperfect, and even well delivered shots often miss. The best way to deal with this is to allow ballistic parameters to be adjusted to reflect what is actually observed. When this is done correctly, overall accuracy can be significantly enhanced. Ballistics calibration is used to calibrate the inputs of the ballistic model to match the actual rifle and round used for shooting. In particular, the most significant

parameter is the muzzle velocity of the round (since the Kestrel is measuring environmental conditions, and the other specifications of the rifle are well known). By firing at a target at a range where the round is supersonic (Mach number greater than 1.2), the muzzle velocity can be determined from the drop of the bullet at that range. This works because the drag of the bullet is well understood and accurately measured in the supersonic region. Muzzle velocity calibration is the most important calibration procedure, and should be performed if a difference in observed and calculated drop is noticed in the supersonic region.

For longer range shots, in the transonic (Mach number between 0.8 and 1.2) and subsonic (Mach number less than 0.8) regions, additional calibration may be necessary to compensate for variations in the flight of the bullet. This is where drop scale factors are utilized to refine the trajectory of the bullet to match observed drops at longer ranges, but **after verifying that the muzzle velocity has been calibrated at supersonic range**. DSF calibration should be performed if a difference in observed and calculated drop is noticed at ranges greater than the calibrated muzzle velocity range.

Applied Ballistics' model allows for the input of a single BC when using a G1 or G7 curve. Once the appropriate BC (provided by the bullet manufacturer) has been entered, muzzle velocity calibration should be performed, followed by DSF Calibration (if necessary) for longer range shooting. It is recommended that custom drag curves be used whenever possible for maximum accuracy.

## CALIBRATION & CUSTOM DRAG CURVES

The AB Kestrel includes two automated ballistic calibration tools that dramatically increase accuracy at long range. First, muzzle velocity is calibrated by firing at a range where the round is supersonic. The user enters the actual drop at that range, and the AB solver computes the calibrated muzzle velocity automatically. Second, for long range shooting - where the round is transonic or subsonic - AB uses the actual drop at another range to automatically compute the drop scale factor (DSF).







This DSF provides a finer level of control in the transonic and subsonic flights than BC-Mach/Dist tables, especially when used with the custom drag curves that Applied Ballistics has computed for many common bullets. While AB's solver supports the use of G1 and G7 ballistic coefficients, these custom drag curves offer a new level of accuracy that cannot be matched by the conventional G1/G7 ballistic tables.

Custom drag curves are accessible through the AB Gun Loader software. See page 21 for download location.

## BLUETOOTH SETUP

To transfer your Kestrel's real-time and logged data wirelessly and automatically to a laptop, PDA or smartphone (Android only at this time), follow these setup steps. If you do not have a Bluetooth unit you will need the PC Interface cable.

### Enable the Kestrel's BLUETOOTH Capability

- Press  to enter the Main Menu.
- Use  or  to highlight "Bluetooth," then press .
- Use  or  to change from "Off/Disabled" to "On/Ready."

### Set BLUETOOTH Range



In Bluetooth screen:

- Use  or  to highlight "Range".
- Use  and  to adjust the range to "Low" (3ft) or "High" (30ft). NK recommends using "High".

### Obtain your Kestrel BLUETOOTH PIN and ID

For added security, each Kestrel comes with a unique PIN and ID number to ensure proper pairing.

In the Bluetooth screen:

- Use  to highlight "Info," then press  to view your unique ID and PIN.

### Pair Your Kestrel with Your Computer

First, make sure your Kestrel unit's Bluetooth and your computer's Bluetooth are enabled. Open the Bluetooth management software on your computer to add a Bluetooth connection and follow the prompts to enter the PIN. A COM Port will be assigned in the communicator software. To understand which COM Port is being used, please check your computer control panel settings.\*

## BLUETOOTH SETUP(CON'T)

☞ *This is a general guideline for pairing your Kestrel with your computer. Individual Bluetooth software programs and navigation may vary, and some computers do not come equipped with Bluetooth capability and will need additional products to communicate via Bluetooth.*

\* A "Bluetooth Error" screen will appear on the Kestrel if pairing is unsuccessful.

Please see connecting my Kestrel using Bluetooth on [www.nkhome.com](http://www.nkhome.com) for further information.

### Set Up Kestrel Communicator Software

- Go to: [www.nkhome.com/support/kestrel-support/manuals-and-downloads](http://www.nkhome.com/support/kestrel-support/manuals-and-downloads). Download and install the Kestrel Communicator Software from this link.
- Once installed, the "Kestrel Communicator" icon will appear on your desktop. Click on the icon and use the "Help" tab to find full instructions for use.

### Set Up Applied Ballistics Gun Loader Software

- The Applied Ballistics unit comes pre-loaded with six custom curves. In order to gain access to the full library of available custom curves, you will need to download this application and ensure that you have the ability to load guns to your Kestrel unit from your PC via Bluetooth connection or IR Docking Station.
- Go to [www.nkhome.com/support/kestrel-support/manuals-and-downloads](http://www.nkhome.com/support/kestrel-support/manuals-and-downloads) to download and install the Applied Ballistics Gun Profile Loader PC application.
- Profile Loader instructions can be found at [www.nkhome.com/support/kestrel-support/manuals-and-downloads](http://www.nkhome.com/support/kestrel-support/manuals-and-downloads)




## QUICK KEYS: DIRECTION OF FIRE & WIND SPEED

The Direction of Fire (DoF) and Wind Speed (WS1 & WS2) Quick Key feature allows you to quickly and easily




## QUICK KEYS: DIRECTION OF FIRE & WIND SPEED

change the values of these parameters from the Main AB screen without entering into the Target screen. It minimizes the number of button presses and time by instantly capturing these values from one screen- the Main AB screen.

### Direction of Fire Quick Key

- Pressing the  button while Tgt is highlighted will enter the DoF setting mode.
- The Tgt heading will change to  to indicate the setting mode.
- The direction will be continuously updated on the target line.
- Pressing the  button again will capture the current direction as DoF.

### Wind Speed Quick Key

- Pressing the  button while Wind is highlighted will enter the Wind setting mode.
- The Wind heading will change to  to indicate the wind setting mode.
- The moving 5-second average for windage and wind speed will be continuously updated on the wind line.
- The moving 5-second average for wind solution will be continuously updated.
- Pressing the  button again will capture the current wind speed.
- The Wind heading will return to its normal state.
- The Wind line will show the captured relative wind direction and wind speed.
- After capturing wind speed, DoF is not automatically selected. Use Manual DoF first if you need to manually adjust both values.






## WEATHER MODE

### SETUP & OPTIONS

#### Main Setup Menu

- When unit is on, press  to access the Main Setup Menu which is used to customize preferences.
- Press  and  to scroll through the options.
- Press  to select the highlighted option.

#### Date and Time Setup



- After battery installation, the meter will automatically enter the Date and Time Setting mode.
- Press  and  to scroll to each option.
- Press  and  to adjust each option.
- Press the  button to exit to the Main Setup Menu.

#### System



Contrast, auto shutdown, and calibrations can be reconfigured as needed in the System screen.


- Use  or  to highlight one of the following options:

#### Contrast


- Press  or  to increase or decrease the display contrast from 0 (lightest) to 20 (darkest).

#### Auto Shutdown

- Press  or  to set the time at which the display will automatically shut off after non-use (choose 15 min, 60 min, or Off to de-activate auto shutdown).


 *Battery life will be shortened if the Auto Shutdown is turned to "Off."*

#### Baro Cal







 *Recalibration of this sensor is not recommended without speaking to an NK technician. See "Barometric Pressure*

*& Altitude Setup" section on page 9 for calibration instructions.*

#### Humidity Cal




 *Recalibration of this sensor is not recommended without speaking to an NK technician. Full humidity calibration instructions are provided with the Kestrel RH Calibration Kits. The unit may also be returned to NK for calibration. Visit [www.nkhome.com](http://www.nkhome.com) for more information.*

#### Date & Time

- Press  to enter the Main Setup Menu.
- Use  or  to highlight Date & Time.
- Press  to enter the Date & Time Screen.
- Press  or  to change each value.

#### Language

Display text can be set to 1 of 5 languages: English, French, German, Italian, and Spanish.

- Press  or  to scroll the desired language.
- Press  to select the highlighted language.



#### Restore

This menu contains options for global settings of all units to metric or imperial, and returning the reference values for the Alt and Baro screens to default (0 ft, 29.92 inHg).

To change units:

- Press  or  to scroll to the desired setting and press .














To return the reference values for the Baro and Alt screens to default:

- Scroll to Defaults and press  or .

## SETUP & OPTIONS (CONT.)


### Memory Options

- Press  or  to scroll to one of these options:

Clear Log	Go	Press  or  to clear stored data (will also clear Min/Max/Avg log).
Reset MMA	Go	Press  or  to clear Min/Max/Avg data (Chart data will remain intact).
Auto Store	On	Press  or  to turn "On" (data will automatically store at Store Rate) or "Off" (data will only store when manually captured with the button).
Store Rate*	1 hr	Press  or  to increase or decrease frequency at which data is stored (from 2 sec - 12 hr).
Overwrite	On	Press  or  to turn "On" (will discard oldest data point to capture new data when log is full) or "Off" (will not capture new data when log is full).
Man Store	On	Press  or  to turn "On" or "Off" (Off will disable  button).

\*When unit is off, data will continue to be stored unless the 2 sec or 5 sec Store Rates have been selected.

### Data Storage

To manually store data, press the  button. The screen will confirm data storage status.





- **Data Stored:** verifies that data was captured and will appear on chart.
- **Full:** indicates overwrite is off and data log is full.
- **Off:** indicates that the Manual Store button has been disabled.

 See Main Setup Menu for more information on memory.

### Measurements








Use this setup to "hide" unwanted Measurement screens from the normal Measurement navigation.

## SETUP & OPTIONS (CONT.)

- Use  or  to scroll to the desired Measurement screen.
- Press  or  to turn screen "On" and "Off".





□ *The Kestrel Meter will continue to log data for hidden measurements. To view logged data of the hidden measurement, go to Measurement setup, select the Measurement screen you want to view, and turn it back "On."*

When the Kestrel is in Chart mode, the upper and lower limits of the graph scale may need to be adjusted to fully view all data points. You can customize these value limits using the Graph Scale setup.

- Press  or  to scroll to the Measurement you want to adjust, then press .
- In the new screen, use  or  to highlight "Set High" or "Set Low".
- Press  or  to adjust the value limit of your chosen option.










### Units

This setup option lets you select units of measure to best suit your application.




- Use  or  to scroll to each measurement.
- Press  or  to change the unit of measurement.

### User Screens

The Kestrel allows you to set up to 3 customized User Screens that will display 3 **current** Measurement values on the same screen. These screens are helpful for quick reference if you need to monitor multiple measurements at once. The User Screen option allows you to customize your user screens.

- Press  or  to highlight. User Screen 1, 2 or 3, then press .
- Use  or  to set your preferred measurement option.
- Press  or  to highlight the remaining lines, and use  or  to set those Measurement options.

Repeat these steps to set up the other User Screens. When accessed through the Measurement navigation, each User Screen will display current data for the chosen measurements as programmed.

User	Screen 2
	22.5 °F
	48.6 %
	1014.6 inHg

Sample User Screen



## SCREEN NAVIGATION

### Measurement Screens

- Press or to scroll through the Measurement screens.

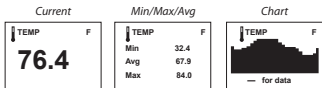
### Measurement Modes

- From your chosen Measurement screen, use or to scroll through the Mode options:

*Current:* Displays instantaneous reading.

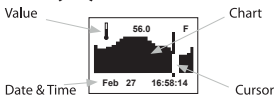
*Min/Max/Avg:* Displays the Minimum, Maximum, and Average readings from stored data (Displays -- if no data has been stored).

*Chart:* Displays graph of stored data points for each measurement.



### To View Chart Data:

- Press while viewing a chart. A cursor will appear on the most recent data point.
- Press or to scroll through saved data:



The data value will be displayed at the top of the screen. The date and time when each data point was stored will be displayed at the bottom of the screen.

- Press or to review the chart data for other measurements.

### MAX/AVG FUNCTIONS - Wind Speed & Wind Chill

These values are measured independently from stored and charted data to allow the user to start and stop the averaging period in the manner most appropriate for their application. Averaging on all wind-related values will be started and stopped together.

### To measure these values:

- Press or to scroll to a wind measurement screen, then use or to select Min/Max/Avg screen.
- Press to begin collecting data.
- Press again to stop data collection and display the Maximum and Average values.

- This routine will work simultaneously for both measurements, regardless of which one is displayed when run. No other Min/Max/Avg or stored data will be affected.
- To clear data, press when the screen says "-- clear".

- Other measurements will display min / max / avg data based on the data stored in the log (using either auto-stored or manually captured data). This data can be cleared by using "Reset MMA" under memory options.

### Backlight

- Press to activate backlight for one minute.
- Press again to deactivate the light manually.

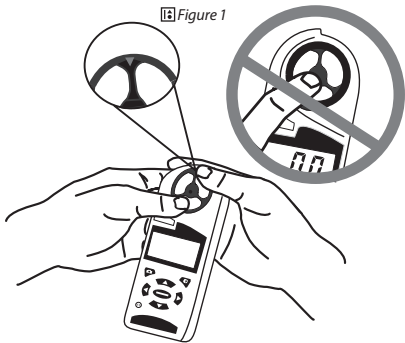
### Replacing the Kestrel Impeller

☐ Press only the sides of the impeller when removing and inserting to avoid damaging the precision hub bearing. [

Figure 1].

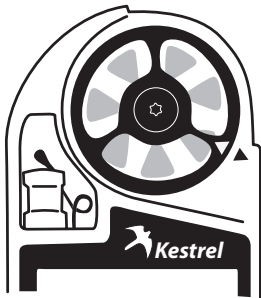
- Press FIRMLY on the impeller module to remove it.
- Insert the new impeller so the side that has the small triangle (close to the perimeter) faces the front of the Kestrel when installed.

Figure 1



- Orient one “arm” of the module straight up. [
- Figure 2]. The impeller can be pushed in from either side.

Figure 2



## USING THE BOOTLOADER

When new software updates become available, users can update their Kestrel using the NK Bootloader software. To do so, please follow these instructions;

*Note: You will need to have either a Bluetooth capable Kestrel or the PC Interface cradle and cable in order to upgrade your Kestrel software.*

1. Set up your PC to talk to the Kestrel using either Bluetooth or the PC Interface Cradle.
2. Download the NK Bootloader software from Applied Ballistics page on the NK website: [www.nkhome.com/support/kestrel-support/manuals-and-downloads](http://www.nkhome.com/support/kestrel-support/manuals-and-downloads). Extract the zip file to the desktop of the PC.
3. Click on Setup.exe and follow the instructions to install the NK Bootloader software.
4. Once you've installed the file, click on the start button. Locate and start the NK Bootloader software.
5. Click on File in the top left. Find the folder location of where the BIN file was extracted from step 3 and select that file.
6. Make sure your Bluetooth is enabled and Kestrel is turned on and in range of the PC. If you are using the PC Interface cradle, please have the Kestrel turned on in the cradle and connected to the PC.
7. Select the correct COM port number and click start download. It will take about 5 to 10 minutes to update the Kestrel Software. You should see "REFLASH" on the Kestrel unit while updating the code.
8. Once the progress bar is complete, the Kestrel software has been updated and is ready for use.

## GLOSSARY OF TERMS

**Active gun:** When a gun is made active, ballistic solutions for that gun pertaining to all active targets are readily displayed. Ballistic solutions for guns that are inactive are not displayed.

**Aiming/Ballistic solution:** This consists of sight corrections for windage, elevation, and in the case of a moving target, lead for a selected active gun and target, along with other calculated values such as bullet velocity and energy. On the main AB screen, only elevation and windage are displayed. On the Range Card and Ballistic Info screens, detailed ballistic solution data is available.

**Subsonic:** The speed at which the bullet is slower than the speed of sound. Bullet velocities in this range will be displayed with a large dot to the left of the value.

**Supersonic:** The speed at which a bullet is going faster than the speed of sound. Bullet velocities in this range will have no dot next to them.

**Target:** A target is characterized by its direction, range, inclination angle, and applicable wind; a moving target has a direction and speed of motion. Targets are identified by a single letter: up to five can be created, designated by the letters A through E. It's important to note that wind is specific to a target – each active target has its own wind specification.

**Transonic:** The speed at which the bullet slows to the speed of sound. This is also seen as the boundary between supersonic and subsonic. Bullet velocities in this range will be displayed with a small dot to the left of the value.

## BALLISTIC & ENVIRONMENTAL QUICK REFERENCE

### Target Screen

**Active** – tells whether this target is currently active

**TR** – target range

**DoF** – direction of fire (relative to true north)

**Ideg** – inclination angle (negative means the target is below the shooter)

**Icos** – inclination cosine (cosine of the inclination angle)

**TS** – target speed

**TD** – target direction of movement

**WD** – current wind direction (direction from which wind is blowing, relative to DoF)

**WS1** – minimum current wind speed

**WS2** – maximum current wind speed

### Gun Screen

**MV** – muzzle velocity

**DC** – drag curve. The amount of drag (air resistance) applied to the bullet across various bullet speeds.

**BC** – bullet ballistic coefficient

**BW** – bullet weight

**BD** – bullet diameter

**BL** – bullet length

**ZR** – zero range

**BH** – bore height

**ZH** – zero height. If your Point of Aim does not exactly equal your Point of Impact at the zero range, you can enter how much the group is off center. In other words, if you have 1/4 MOA clicks on a scope and the zero is 0.1" high, you can enter this here to account for the error that's less than 1 click. A negative value indicates down.

**ZO** – zero offset. Same as above for the horizontal direction; use a negative value to indicate left.

**RT** – rifling twist rate (distance in which bullet achieves 360 degrees of rotation)

**RTd** – rifling twist direction (right = clockwise from the shooter's perspective)

**Click** – assigns an angular value to sight clicks

## BALLISTIC & ENVIRONMENTAL QUICK REFERENCE

**DSF** – drop scale factor

**Eunit** – elevation unit – The units used for elevation adjustments (Eclick). Can be mils, clicks, tmoa (True Minute of Angle), smoa (Shooter's Minute of Angle).

**Eclick** – elevation adjustment necessary for the firing solution in the units specified above.

**Wunit** – windage unit – The units used for windage adjustments (Wclick). Can be mils, clicks, tmoa (True Minute of Angle), smoa (Shooter's Minute of Angle).

**Wclick** – windage adjustment necessary for the firing solution in the units specified above.

### Environment Screen

**Update** – controls whether values for temperature, barometric pressure, and relative humidity are obtained automatically (yes) (from the Kestrel's weather-meter functions) or are manually set by the user (no)

**Lat** – allows the user to specify the latitude that will be used when calculating Coriolis corrections

**Temp** – temperature

**SP** – station pressure (actual pressure at the gun's location)

**RH** – relative humidity

**Dalt** – density altitude (calculated from pressure, temperature & humidity)

**Spin Drift** – controls whether Spin Drift corrections are included in ballistics calculations

**Wcap** – toggles between applying windage correction to just the current active target (one tgt) or to all targets

### Range Card Screen

**Elv** – the elevation sight correction

**Wnd1** – the windage sight correction based on WS1

**Wnd2** – the windage sight correction based on WS2

**Lead** – the lead sight correction (for a moving target)

**RemV** – the downrange bullet velocity

**RemE** – the downrange bullet energy

**ToF** – the bullet's time of flight

**SpnD** – the amount of Spin Drift being applied to the bullet

### Ballistics Data Screen

**Range** – the range for which the ballistic solution is calculated

**Elv** – elevation correction

**Wnd1** – windage correction (based on WS1)

**Wnd2** – windage correction (based on WS2)

**Lead** – lead correction, based on specified target motion

**vCor** – vertical Coriolis correction

**hCor** – horizontal Coriolis correction

**Drft** – bullet drift correction

**RemV** – remaining velocity

**RemE** – remaining energy

**ToF** – time of flight

**MaxO** – maximum ordinate (highest point the bullet reaches in flight)

**Drp** – total drop distance

**Rtrns** – range at which transonic velocity transition begins

**Rt 75%** – distance at which a bullet is 75% through the transonic range

**Rsubs** – range at which bullet velocity

becomes subsonic

calculation

### Range Estimation Screen

**Target** – the size of the target on which estimation is based

**Image** – the apparent size of the target as it appears in a telescopic sight

**Range** – the calculated range, based on the target and image sizes

### Speed Estimation Screen

**Range** – the range at which the speed estimation will be done

**Mvmt** – the apparent movement of the target as it appears in a telescopic sight

**Time** – the time (in seconds) during which movement was measured

**Speed** – the calculated speed, based on range, movement and time

### Cal MV Screen

**Range** – the range at which test firing is being done

**Drp** – the elevation correction calculated for the specified range, updated by user with observed drop

**MV** – the muzzle velocity used in the current elevation calculation

### Cal DSF Screen

**Range** – the range at which test firing is being done

**Drp** – the elevation correction calculated for the specified range, updated by user with observed drop

**DSF** – the drop scale factor used in the current elevation

## FULL RANGE CARD DATA SAMPLE

Sample of full Range Card data relative to data seen on display.

Rng	Elv	Wnd1	Wnd2	Lead	RemV	RemE	ToF	SpnD
50	2.42	0.06R	0.10R	1.06R	2727	2891	0.059	0.02R
100	0.62	0.09R	0.17R	1.07R	2633	2695	0.120	0.02R
150	.079	0.12R	0.26R	1.09R	2541	2509	0.183	0.02R
200	3.52	0.16R	0.34R	1.11R	2450	2332	0.249	0.02R
250	6.93	0.20R	0.44R	1.13R	2361	2164	0.317	0.02R
300	10.79	0.24R	0.53R	1.16R	2272	2006	0.388	0.02R
350	14.98	0.28R	0.63R	1.18R	2188	1861	0.461	0.02R
400	19.55	0.33R	0.73R	1.20R	2101	1716	0.538	0.02R
450	24.37	0.37R	0.83R	1.23R	2021	1588	0.617	0.02R
500	29.59	0.42R	0.95R	1.25R	1937	1459	0.700	0.02R
550	35.10	0.47R	1.06R	1.28R	1859	1343	0.786	0.02R
600	40.98	0.52R	1.18R	1.31R	1781	1233	0.876	0.02R

**FULL RANGE CARD DATA SAMPLE (CON'T)**

Rng	Elv	Wnd1	Wnd2	Lead	RemV	RemE	ToF	SpnD
650	47.24	0.57R	1.31R	1.33R	1705	1130	0.970	0.35R
700	53.92	0.63R	1.44R	1.36R	1631	1034	1.068	0.35R
750	60.99	0.68R	1.57R	1.40R	1560	946	1.170	0.35R
800	68.55	0.74R	1.71R	1.43R	1491	863	1.278	0.35R
850	76.62	0.80R	1.86R	1.46R	1423	787	1.390	0.35R
900	84.40	0.87R	2.01R	1.50R	1358	716	1.508	0.35R
950	93.51	0.93R	2.17R	1.54R	-1295	652	1.631	0.35R
1000	103.3	1.00R	2.33R	1.57R	-1236	593	1.760	0.35R
1050	113.8	1.07R	2.50R	1.61R	-1178	539	1.896	0.35R
1100	125.2	1.14R	2.68R	1.66R	-1127	494	2.038	0.56R
1150	137.3	1.21R	2.86R	1.70R	-1089	461	2.187	0.56R
1200	150.0	1.28R	3.03R	1.74R	-1062	438	2.337	0.70R



# SPECIFICATIONS

	Feature	Abbreviation	Units	Minimum	Maximum
Target	Active Targets	N/A	A through E	1	5
	Target Range	TR	yards	25	4000
			meters	23	3658
	Wind Direction	WD	o'clock	1	12
			degrees	0	360
	Wind Speed	WS1 or WS2	mph	0	50
			m/s	0	22
			km/h	0	80
			fps	0	73
			knots	0	43
	Direction of Fire	DoF	degrees	0	360
			o'clock	1	12
	Inclination Angle	Ideg	degrees	-60	60
	Inclination Cosine	Icos	no units	1.000	0.500
	Target Speed	TS	mph	0	50
m/s			0	22	
km/h			0	80	
fps			0	73	
knots			0	43	
Target Direction of Movement	TD	Left to Right OR Right to Left			
Gun	Name Characters	N/A	0 through 9; A-Z; a-z; -+/:.&* and space		
	Muzzle Velocity	MV	fps	300	4500
			m/s	91	1372
	Ballistic Coefficient	BC	no units	0.100	2.000
	Bullet Weight	BW	grains	10	1500
grams			0.6	97.2	

# SPECIFICATIONS

	Feature	Abbreviation	Units	Minimum	Maximum
Gun	Bullet Diameter	BD	inches	0.10	1.00
			mm	2.54	25.40
	Bullet Length	BL	inches	0.10	3
			mm	2.54	76.2
	Zero Range	ZR	yards	25	1000
			meters	23	914
	Bore Height	BH	inches	0.10	5.00
			cm	0.25	12.70
	Rifling Twist	RT	inches/revolution	1.00	36.00
			cm/revolution	2.54	91.44
	Muzzle Velocity	MV	fps	300	4500
	Twist Direction	RTd	Left OR Right		
	Rifling	Click	/mil	1	10
/tmoa			1	10	
/smoa			1	10	
Environment	Station Pressure	SP	inHg	12.00	32.00
			mb	406.4	1083.6
			hPa	406.4	1083.6
			psi	5.89	15.72
	Relative Humidity	RH	%	1	100
			meters	-3271	9987
	Station Pressure	SP	inHg	12.00	32.00
			mb	406.4	1083.6
			hPa	406.4	1083.6
	Spin Drift	SpnD	Yes OR No		

## CHOOSING & USING BATTERIES FOR YOUR KESTREL

Your Kestrel meter is powered by two AAA size batteries. Here is a guide to selecting the right chemistry/type of battery for your meter:

BATTERY TYPE	EXAMPLE BRAND NAMES	SELECTION CONSIDERATIONS
Lithium AAA Recommended by Kestrel for most applications!	Energizer® Ultimate Lithium *Energizer owns a patent on Lithium chemistry batteries in the USA.	<ul style="list-style-type: none"> <li>Improved cold-weather operational range.</li> <li>Best capacity when streaming data via Bluetooth®.</li> <li>Relatively high cost. (Note: because the Kestrel is a low power circuit, there is little advantage to the higher priced "Ultimate" batteries.)</li> <li>Somewhat less available – need to purchase spares in advance.</li> </ul>
Low Self-Discharge Rechargeable NiMH	Eneloop® Duracell® StayCharged® Tenergy® Centaura® Energizer® Recharge PowerPlus®	<ul style="list-style-type: none"> <li>Precharged rechargeable batteries which hold their charge for up to one year.</li> <li>Lowest capacity option.</li> <li>Option to charge multiple sets for use in the field offers cost savings, particularly with Bluetooth® data streaming.</li> <li>LESS likely to leak and cause corrosion when left in the Kestrel.</li> </ul>
Alkaline AAA	Duracell® Ultrapower Duracell® Procell® Energizer® Max Rayovac® (many others)	<ul style="list-style-type: none"> <li>Lowest cost option. Most readily available.</li> <li>Easy to obtain and use for intensive, short-term operations.</li> <li>Restricted cold weather performance – Kestrel circuitry will not operate below 0°F/-18°C.</li> <li>Environmental impact of disposal.</li> <li>MOST likely to leak and cause corrosion when left in the Kestrel. Follow below guidelines for storage and removal carefully!</li> </ul>









## CHOOSING & USING BATTERIES FOR YOUR KESTREL (CONT.)

We ship every Kestrel 4000 Series Meter exclusively with Made in the USA Energizer® Brand Ultimate Lithium AAA batteries for improved reliability, capacity, cold-weather performance and weight. We strongly recommend that you use only Energizer Ultimate Lithium batteries in your Kestrel Meter.

NK no longer installs or recommends installing “regular” alkaline batteries in your Kestrel Meter. Alkaline batteries are prone to leaking potassium hydroxide, particularly as they near full discharge due to the pressure of the hydrogen gas formed internally. Once a leak has occurred, the potassium hydroxide and carbon dioxide from the air form potassium carbonate crystals that grow and follow along the metal electrodes to the circuit board, causing oxidation of the circuit and components. This damage is usually irreversible.

**IF YOU CHOOSE TO USE ALKALINE BATTERIES** due to cost or availability, you **MUST**:

- Remove the batteries for long-term storage (more than one month of non-use). If you have your Kestrel set to log data while off, it will slowly drain the batteries, increasing the likelihood of leaking.
- Set your system battery selection to “Alkaline” to obtain accurate capacity readings:
  - » Press  to enter the setup menu.
  - »  to “System”,  to enter,  to “Battery.”
  - »  to select the correct battery type.
  - »  to exit system setup.
- Use US-made, name-brand batteries wherever possible. Do not mix brands of batteries.

- Do not mix batteries of different ages or usage – replace both batteries at the same time with new batteries that have not reached their expiration date.
- Remove batteries for long-term storage (more than one month of non-use). Even when powered down, the Kestrel continues to log data and slowly discharge the batteries.
- To avoid fully discharging your batteries, try to change your batteries when below 20% capacity.
- Inspect your batteries occasionally (at least every three months) and remove immediately if you notice ANY moisture or white crystalline material at either end.

**And remember, always store your Kestrel meter within the specified temperature limits: -22.0 °F to 140.0 °F | -30.0 °C to 60.0 °C. Be particularly careful not to leave a Kestrel meter with any type of batteries installed inside a hot car in the summer.**

### WHAT DO TO IF YOU HAVE A LEAK

If you notice you have a leaking alkaline battery, be careful not to touch it with your bare skin or allow it to come in contact with your eyes as the leaking material is very caustic. Remove and dispose of both batteries. If possible, loosen and vacuum out any white powder. **DO NOT BLOW INTO THE COMPARTMENT TO REMOVE THE POWDER** – it can cause eye or skin damage and will be driven further inside the unit. You may attempt to use a cotton swab moistened with white vinegar to clean the contacts and gently swab out the battery compartment. Do not exert any force against the contacts inside the battery compartment or you may bend or break them.

Allow the battery compartment to dry completely, install fresh batteries, and test the unit.

For units made prior to 2014, and shipped by NK with alkaline batteries installed, NK will provide full warranty coverage for battery corrosion damage for two years.

For units more than two years old, or for units made after January 1, 2014 and shipped with lithium batteries installed, battery corrosion damage is covered under our Customer Loyalty Trade-In Program, which provides a generous discount toward a replacement Kestrel meter. Please contact NK Support to arrange a replacement under this program.

## WARRANTY CERTIFICATE

Your Kestrel Pocket Weather Meter is warranted to be free of defects in materials and workmanship for a period of FIVE YEARS from the date of its first consumer purchase. NK will repair or replace any defective meter or part when notified within the warranty period, and will return the meter via domestic ground shipping or NK's choice of method of international shipping at no charge. The following are excluded from warranty coverage: damage due to improper use or neglect (including corrosion); damage caused by severe or excessive impact, damage caused by failed or leaking batteries, crushing or mechanical harm; modifications or attempted repairs by someone other than an authorized NK repair agent; impeller failure not caused by a manufacturing defect; normal usage wear; failed batteries; and accuracy issues resolvable by recalibration. If no warranty registration or proof of purchase is provided, the warranty period will be measured from the meter's date of manufacture.

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

All **product liability** and **warranty options** are governed exclusively by the laws of the Commonwealth of Pennsylvania.







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**Kestrel® Weather and Environmental Meters  
are designed and manufactured in the USA**

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