Set up and use of the Kestrel 4500 Applied Ballistics system
AB mode

Main operating home screen

Elevation based on Range and Environment settings – MILS or MOA based on operator units selection

Windage based on Range and environmental settings – MILS or MOA based on operator units selection

Tgt = Target data – here it displays 25 deg DOF to a 1000m target is 8.81 mils elevation from zero

0.57 = hold Right .57 mils on the 1000m target based on a 4mph wind coming from 2 o’clock in reference to the direction of fire of 25 deg.

W = Wind 1 (0.57 mils) / Wind 2 (3.18 mils) hold R or right for the 1000m target IF WINDS ARE AS ENTERED IN WIND SETTING

Wind setting – displays wind from 2 o’clock, Wind 1 of 4mph, Wind 2 is under wind settings

Hold 8.81 Mils Elevation, Right .57mils for a 4mph wind/spin/coriolis

Target 1000m

Wind from 2 O’clock at 4 Mph

25 Degrees
Battery level will be inaccurate if the wrong type battery is selected in system. System defaults to lithium battery. Only Lithium should be used. Alkaline may leak and damage the system if the unit is stored in kit with a button depressed over a period of time.

Turn on Defaults into AB mode at turn on

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Turn on

Applied Ballistics

Iss 4.80

Battery 47%

Kestrel

Backlight, Space, Double tap Shortcut between WX and AB mode

capture / delete

up

left

enter

on/off escape/back

Menu

Weather mode

AB mode

Gun selection

select φ exit

User Screens

System

Date & Time

Language

Restore

select φ exit

Measurements

Graph Scale

Units

select φ exit

Graph Scale

Units

select φ exit

Go to MENU – MEASUREMENTS – to turn off Wx screens not used. Use MENU - USER SCREENS to set desired data on each user screen.

Scroll to BARO and set Ref altitude to 0 so Baro reads Station Pressure for Density Altitude adjustment.

Scroll to WIND SPD and hit escape back to main menu. This ensures each time to go to WX mode through the menu or shortcut key Wind SPD is first screen up. All other Environmental settings will be done in the AB mode Environment screen.
Capture DOF/Wind

Highlight Target – hit capture button – TGT changes to T with Arrow – keep oriented on target until you are satisfied with the reading then hit capture again to lock in azimuth. All shooting solutions will use this azimuth until you change it.

Highlight Wind – hit capture button – point into wind – read for 5 to 10 seconds and hit the capture button to lock in data. You have now recorded the winds Angular difference from DOF, the cosine will be applied against the wind read for the 5 to 10 seconds. The 2 wind readings will now be the high and low wind seen during the 5-10 Second reading. All shooting solutions will use this data until you change it.

REMEMBER – this data is only from your firing position and not down range winds – it is a good start point to determine shooter value winds. Capture overwrites manual wind settings and will remain until reset or a new wind capture.

Wind capture from wind setting
Target inputs

With Tgt is highlighted hit enter to set parameters

Range can be adjusted using the left and right arrows on this main screen but the range will move slowly as the system is calculating as you adjust. If you adjust range inside the target mode it moves quickly without calculations until you stop.

Set target Speed and Direction of travel – solution found only in Range card

Don’t forget this setting! it will be used in all solutions

Set “O’clock” wind is coming from. Set desired wind speed 1 and 2 that will be displayed on the main screen in AB mode – if you capture winds these values will be overwritten

Set up or down angle - Ideg – inclination degrees to target – Icos – inclination cosine will populate automatically once you input angle

Hit escape – you will be prompted to save range to target range or forget range found using estimate

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Set “O’clock” wind is coming from. Set desired wind speed 1 and 2 that will be displayed on the main screen in AB mode – if you capture winds these values will be overwritten

Set magnetic Azimuth to target – this is for Coriolis calculation

Enter TR to change / convert yards/meters

Enter Est to determine range to target based on target size and measured mils
Wind inputs

When Wind is highlighted hit enter to set parameters

Enter Wind when highlighted and use the arrow keys to change wind data

After entering wind you can select wind direction degrees or clock value

Set “O’clock” / “degrees” based on where the wind is coming from. Set desired wind speed 1 and 2 that will be displayed on the main screen in AB mode.
Environment inputs

With Environment highlighted hit enter to set parameters

When you select update Yes the Kestrel is reading the environment real-time and will give real-time data to the ballistic engine. To guard against solar loading, heat or cold syncing providing bad data spin the kestrel at the end of the lanyard to expose sensors to actual air temp and then immediately turn off update. While shooting update as environment changes.

When the Environment is in update No the user can manipulate variables to see affects in different conditions. This is a good tool to answer questions on what environmental affects will do to the shooting solution. Simply change the variables and go back to the AB home screen to see how new variables affecting the shooting solution.

When Spin drift is Yes it automatically calculates Spin drift into the wind solution. Turn off and spin drift is not calculated into the shooting/wind solution.

There is no need to enter into the kestrel weather mode for environment information beyond reading wind speeds. All environmental necessities for shooting are located here under environment.
Gun selection / inputs

As of 5 Dec 2015

NEW GUN
selected to build
a new gun
All Guns “On”
are selectable
from the home
screen under
Gun, simply use
left and right
button

With Gun highlighted in the home
screen hit enter to set parameters

NEW GUN
selected to build
a new gun
All Guns “On”
are selectable
from the home
screen under
Gun, simply use
left and right
button

Choose Coefficient – G1, G7, or custom curve
Switching a G1 to G7 converts G1 to G7

If you choose a
custom curve
profile it locks DC,
BC, Bullet Weight,
Bullet Length

BW = Bullet Weight
BD = Bullet Diameter
BL = Bullet Length
ZR = Zero Range

BH = Bore Height – Center of barrel to center of scope
ZH = Zero Height – offset from zero for Sup / alt ammo
ZH = Zero Offset – offset from zero for Sup / alt ammo

RT = Rate of Twist
RTD = Rate of Twist Direction

Us the up and down arrow to Highlight
the variable you want, to change use
the left and right button to change to
the desired data

Select unit for Scope/Reticle
Elevation and Windage scale
Mil/true moa/shooter moa, clicks

See the following
pages for Truing MV
and DSF
Truing Muzzle Velocity (MV) at the Transonic threshold

As of 5 Dec 2015

Predictive 13.8 Mil elevation

Actual 14.1 Mil elevation

Rounds impacts .3 mil low

1372m

Rounds Reaches Trans based on current weapons and environmental settings

Target Range and Drop actual based on bullet impact

New Muzzle velocity

It is critical that your Zero elevation is precise and set correctly under gun ZR settings, and you can determine Mean Point of Impact of your downrange shots to an accuracy of 0.1 mil.

If your Scope Turret has not been verified to deliver correct adjustments you cannot dial in elevation corrections for truing – use the gridded reticle for the accurate hold.

Accept data and your Algorithm is trued. Return to home screen and the new data is displayed.
DSF calibration (Subsonic)

Target Range and Drop predicted based on Settings

Select Gun enter

Select Cal DSF enter

DSF Cal 1628m Range 1630m Drp 19.58 mil Cal DSF 1.000

Predictive 19.58 Mil elevation

Actual 19.75 Mil elevation

Rounds impacts .2 mil low

1630m

Select View DSF enter

Move to Cal, enter

DSF for new setting

Accept data and your Algorithm is trued. Return to home screen and the new data is displayed

Select Clear DSF enter

Actual drop at target based on bullet impact

Rounds Reaches 0.9 Mach based on current weapons and environmental settings

Actual drop at target based on bullet impact

Accept DSF Cal: 1.009 Yes No

E 19.75 lA W 1.81/3.07L Wind 9 oc 4 mph

GUN *PSR300 230 Cal Mu Cal DSF View DSF Clear DSF

1 1.180 1.000
2 0.998 1.000
3 0.000 1.000
4 0.000 1.000

Select Gun enter

Select Cal DSF enter

DSF Cal 1628m Range 1630m Drp 19.75 mil Cal DSF 1.000
Range Card Function

Enter Range Card when highlighted and use the left and right buttons to scroll through – change the last column to the range cards available data

Enter in Range card to select increments 10, 20, 25, 50, 100
Enter Ballistics when highlighted and use the Up and Down buttons to scroll through ballistic data for the range designated.

<table>
<thead>
<tr>
<th>BALLISTIC DATA</th>
<th>Range 1000 m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E1v 8.81 mil</td>
</tr>
<tr>
<td></td>
<td>Wnd1 R 0.57 mil</td>
</tr>
<tr>
<td></td>
<td>Wnd2 R 3.18 mil</td>
</tr>
</tbody>
</table>

- Set Target range
- Elevation based on all settings
- Wind 1 based on settings
- Wind 2 based on settings

<table>
<thead>
<tr>
<th>BALLISTIC DATA</th>
<th>Wnd2 R 3.18 mil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lead R 1.46 mil</td>
</tr>
<tr>
<td></td>
<td>vCor -0.05 mil</td>
</tr>
<tr>
<td></td>
<td>hCor R 0.06 mil</td>
</tr>
</tbody>
</table>

- Lead based on settings
- Vertical Coriolis component - auto added into elevation
- Horizontal Coriolis component - auto added into Wind

<table>
<thead>
<tr>
<th>BALLISTIC DATA</th>
<th>RemV 1351 fps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RemE 770 ft/lb</td>
</tr>
</tbody>
</table>

- Spin Drift based on settings
- Remaining Velocity at 1000m
- Remaining Energy at 1000m

<table>
<thead>
<tr>
<th>BALLISTIC DATA</th>
<th>Drf -346.95 in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rtrns 1001 m</td>
</tr>
</tbody>
</table>

- Time of Flight to 1000m
- Maximum Ordinate – highest point the bullet passes in the trajectory (50% of range plus 10% or in this case 550m)
- Total drop if the round drop is measured from the muzzle

- Bullet reaches Transonic, Mach 1.2, based on all settings
  TRUE MV HERE +/- 10% of this range
- Bullet reaches 75% of the range between Transonic and Subsonic based on all settings
- Bullet reaches Subsonic, Mach 1, based on all settings
  TRUE DSF beyond this range
Use the Kestrel Determine Tremor 2/3 wind dot Value

- Turn off spin drift
- 2 wind dots is .95 mil at 4 mils
- Determine the range that gives a 4 mil elevation for your rifle and ammo
- Determine wind speed that gives a .95 mil correction at 4 mils elevation
- Divide this by two and you have wind dot value for your gun/load
Use the Kestrel to determine your Guns Aerodynamic jump

- Turn off spin drift
- Set range at 100m
- Adjust wind speed (3 or 9 o'clock)
- Adjust the wind speed until you get 0.1 mil elevation change.
- The Wind speed that results in 0.1 mil elevation value equals crosswind your crosswind jump variable/speed. For example if its 8mph then for every 8 MPH you get 0.1 mil jump.
- Apply to your shooting solution using LARS (Left Add Right Subtract)
  - Wind from the left add crosswind jump
  - Wind from the right subtract crosswind jump
  - REMEMBER – Cosines matter!
Use the Kestrel to determine your Guns Wind Bracket value for the Accuracy1st wind formula

- Baseline 500m = .5 mils of wind – what value of wind at 500m gives you .5 mils wind drift? That is your rifle wind bracket
- Turn off spin drift
- For the rifle and ammo selected set range to 500m
- Adjust wind direction to (3 or 9 o'clock)
- Adjust the wind speed 1 until you get 0.5 mil wind correction
- What is that speed? That is your Wind bracket value for your weapon and ammo

Example: 300mag, 230grBH, 2770fps, DA 0ft
Range 500m, 9 O’clock wind 4 MPH wind = .44mil

Adjust wind to 7 mph return to home screen

7 mph = .49 mil value at 500m,
This guns wind Bracket = 7 Mph
Review - Normal use

• Turn on
• Do an environmental update – turn on and off to prevent heat or cold loading the device
  – SWING IT AT THE END OF THE LANYARD TO GET TRUE AIR TEMP
• Select gun – TURN OFF GUNS NOT IN USE
• Find target at transonic +/- 10% (for high BCs > G1 .65 can push into trans 20-40%)
• Input range to target within 1 m – Double check the range, bracket with the LRF
• Shoot data – you need to see exact bullet impact to determine MPI for group
  – Remember effects of Aerodynamic Jump on truing – Left add, Right Subtract gun jump per AJ variable for your rifle and ammo – LARS
  – It is critical you determine actual bullet strike elevation within 0.1 mil
  – Calibrate MV to true the algorithm – change the predictive polynomial curve to your actual curve
  – Change ammo, change lots, you must re-true
  – This data is only for the weapon and ammo being trued
• Calibrate DSF for ranges beyond Subsonic
• Change DOF when shooting over 600m – capture wind direction and speed
  – Corriolis, spin drift, Aero Jump
• Once trued simply range target to within 1 m and shoot the data
  – Ensure you conduct environmental updates as environment changes
  – For extreme range shots ensure you update for shot as well as input actual DOF and Latitude, wind speed, and wind direction

• Spin drift on/off – turn it off and winds are pure for determining wind dot value
• When you swap batteries you do not loose your data, but Range defaults to 457m, Latitude defaults to 38th parallel, and the environment update is on.