

Relative Humidity Calibration Kit

for the Kestrel 3000, 3500 & Kestrel 4000

RH Calibration Procedures

Factory Calibration

Each Kestrel Pocket Weather Meter is individually calibrated after assembly. In essence, each unit is “taught” what the correct relative humidity (RH) values should be for given signals from the RH sensor.

NK calibrates at RH = 32.8% and RH = 75.3%. Calibration is done in two sealed environmental chambers maintained at 25°C. The humidity is held constant with saturated aqueous salt baths: magnesium chloride for the 32.8% chamber and sodium chloride for the 75.3% chamber. Chamber temperatures are held constant at 25°C ± 0.5°C.

The temperature and RH of each chamber is independently monitored using a precision chilled mirror dew point hygrometer (EdgeTech Model 2002) accurate to ± 0.1°C and NIST (National Institute of Standards and Technology) traceable.

A proprietary auto calibration routine controls the calibration process. After 60 minutes this routine stores a calibration value which forces the Kestrel to be correct at the RH value of the chamber.

The response of the humidity sensor is a highly reproducible, non-linear curve. This non-linear characteristic is stored in the microprocessor used to compute RH, and in this manner we are able to maintain an accuracy of ± 3% of scale over the relative range 5% - 95%.

1

Field Calibration

The Kestrel should be recalibrated if the RH sensor has shown drift in its RH measurement.

This manual explains the steps for calibrating the humidity measurement for the Kestrel. This process will take approximately 3 hours, including setup and calibration.

Contents of the Humidity Calibration Kit

The RH calibration kit includes the following items:

- two clear, sealable containers
- one bag with magnesium chloride solution
- one bag with sodium chloride solution

The large containers are used to create a stable environment. The small containers are used to hold the saturated salt solution. The saturated salt solutions generate well-defined humidities when they are confined to a contained environment.

**Please read the entire instruction manual before
attempting to calibrate your Kestrel.**

2

Setting Up the Humidity Chambers

1. Open the sodium chloride bag and move all of the contents into one of the large containers. Mark this container “Sodium Chloride.”
2. **Tightly** screw the lid on the large container.
3. Open the magnesium chloride bag and move all of the contents into the other large container. Mark this container “Magnesium Chloride.”
4. **Tightly** screw the lid on the large container.
5. Let these containers sit closed, containing the salt solutions, for **at least 12 hours**. Any less than 12 hours is insufficient for the chamber to settle and will yield poor calibration. Furthermore, do not perform the calibration if the temperature in the environment is not stable.

Standard Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions
ASTM Designation: E104-85 (reapproved 1996).

3

Calibrating the Kestrel 3000 Pocket Weather Meter

Programming the Expected Humidity Chamber Values into the Kestrel Weather Meter

Before recalibrating the Kestrel, the expected humidity values must be programmed into the unit:

1. Turn on the Kestrel 3000. Press the MODE button until the unit is in dew point mode (☼).
2. Hold the ON and MODE buttons simultaneously until the display reads "P 1" (approximately 6 seconds).
3. Press the ON button. The display will show a value with the last digit blinking. This value represents the expected humidity of the sodium chloride chamber. If the value reads 75.3, simply press the ON button twice and skip to step 4. Otherwise, the value must be changed to 75.3 as described in the following 2 steps:
 - a. Press the MODE button to change the value of the rightmost digit. When the desired value is displayed, press the ON button to move to the middle digit.

4

Running the Calibration Routine

Once the expected RH values have been programmed, the unit may be recalibrated:

1. Press the MODE button until the unit is in relative humidity mode(☼%).
2. Hold the ON and MODE buttons simultaneously until the display reads "C 1" (approximately 6 seconds).
3. Press the MODE button. The display will alternate between "C 1" and a value, this will continue for 60 minutes. Place the unit into the sodium chloride chamber and immediately close the lid tightly. After 60 minutes, the unit will display "C 2", indicating that the first humidity chamber routine is complete, and the unit is ready for the second chamber.
4. Remove the unit from the sodium chloride chamber and press the MODE button. The display will alternate between "C 2" and a value, this will continue for 60 minutes. Wipe the sodium chloride from the unit. Place the unit into the magnesium chloride chamber and seal it immediately. After 60 minutes, the unit will display "End", indicating that the second humidity chamber routine is complete, and the unit has been calibrated.
5. Remove the unit from the magnesium chloride chamber and press the MODE button. The Kestrel is now fully calibrated and ready to take accurate humidity measurements.

If the ON button is pressed at any time during the above routine, the unit will shut off and the re-calibration will be aborted.

6

- b. Press the MODE button to change the value of the middle digit. When the desired value is displayed, press the ON button to exit setting.
4. The display will read "P 2". Press the ON button.
5. The display will again show a value with the last digit blinking. This value represents the expected humidity of the magnesium chloride chamber. If the value reads 32.8, simply press the ON button twice and skip to step 6. Otherwise, the value must be changed to 32.8 as described in the following 2 steps.
 - a. Press the MODE button to change the value of the rightmost digit. When the desired value is displayed, press the ON button to move to the middle digit.
 - b. Press the MODE button to change the value of the middle digit. When the desired value is displayed, press the ON button to exit setting.
6. The display will return to the normal dew point mode. Please note that the RH measurement will NOT be any different than before setting the calibration values. The unit is now ready for calibration.

5

Calibrating the Kestrel 3500 Pocket Weather Meter

Setting Up the Kestrel 3500

Before recalibrating the Kestrel, the expected humidity values and calibration time must be programmed into the unit:

1. Begin with the unit turned off.
2. Hold the left button while pressing the center button. The display will read "P1". Press the center button to continue.
3. The display will show the first calibration point. Adjust the first calibration point by using the left and right buttons, and press the center button to continue.
4. The display will read "P2". Press the center button to continue.
5. The display will show the second calibration point. Adjust the second calibration point by using the left and right buttons, and press the center button to continue.

7

Running the Calibration Routine for the Kestrel 3500

1. The display will read "C1". Press the center button to begin the calibration count-down. The display will toggle between "C1" and the number of minutes remaining in the calibration.
2. Place the unit into the magnesium chloride jar. After 60 minutes, the display will read "C2".
3. Remove the unit from the magnesium chloride jar and wipe away any excess salt. Press the center button to begin the calibration count-down for the second point. The display will toggle between "C2" and the number of minutes remaining in the calibration.
4. Place the unit into the sodium chloride jar. After 60 minutes, the display will read "End".
5. Remove the unit from the sodium chloride jar and wipe away any excess salt. Press the center button to return to the normal mode of operation.

If the unit is turned off at any time during the above routine, the re-calibration will be aborted.

Calibrating the Kestrel 4000 Pocket Weather Tracker

Setting Up the Kestrel 4000

Before recalibrating the Kestrel, the expected humidity values and calibration time must be programmed into the unit:

1. Turn on the Kestrel. Press the **Ⓚ** button to enter the main menu. Select the Humidity Cal option from either the main menu or the System menu (depending on which version Kestrel).
2. With the menu option Period highlighted, adjust the length of time that the Kestrel will remain in the each humidity chamber by pressing the left and right arrow buttons. It is recommended to use one hour.
3. Press the down arrow to highlight the RH Point 1 option. Adjust the humidity value to the expected humidity reading in the magnesium chloride chamber by pressing the left and right arrow buttons.
4. Press the down arrow to highlight the RH Point 2 option. Adjust the humidity value to the expected humidity reading in the sodium chloride chamber by pressing the left and right arrow buttons.

Running the Calibration Routine for the Kestrel 4000

1. With the menu option Start 1 highlighted, press the left or right arrow button to begin the calibration period.
2. Place the unit into the magnesium chloride chamber and immediately close the lid tightly. After the preset length of time (factory setting is 60 minutes), remove the unit from the chamber. Wipe the magnesium chloride off the unit.
3. With the menu option Start 2 highlighted, press the left or right arrow button to begin the calibration period.
4. Place the unit into the sodium chloride chamber and immediately close the lid tightly. After the preset length of time (factory setting is 60 minutes), remove the unit from the chamber.

Your Kestrel 4000 is now recalibrated and ready to take accurate measurements.

If the unit is turned off at any time during the above routine, the re-calibration will be aborted.

Verification of the RH Values

It is possible to test the Kestrel at humidity values other than 32.8% and 75.3%. To set up a test at another RH value, simply use a different saturated salt solution in the humidity chamber. Refer to the table on page 10 for various salts and their corresponding RH values.

To test the accuracy of the Kestrel at various RH values:

1. Set up a large container with a saturated salt solution using any one of the salts from the table on page 10.
2. Turn on the Kestrel and put it into relative humidity mode (**📊** %).
3. Place the Kestrel inside the sealed large container and let it sit for at least 30 minutes. After 30 minutes, the Kestrel should display an RH value within $\pm 3\%$ of the chart listing.

SALT BATH**PUBLISHED RH AT 25 ° C**

LITHIUM BROMIDE	6.37%
LITHIUM CHLORIDE	11.30%
POTASSIUM ACETATE	22.51%
MAGNESIUM CHLORIDE	32.80%
POTASSIUM CARBONATE	43.16%
MAGNESIUM NITRATE	52.89%
SODIUM BROMIDE	57.57%
POTASSIUM IODIDE	68.86%
SODIUM CHLORIDE	75.30%
POTASSIUM CHLORIDE	84.34%
POTASSIUM SULFATE	97.30%

** Based on: Humidity Fixed Points of Binary Saturated Aqueous Solutions, Greenspan, Lewis; Journal of Research of the National Bureau of Standards-A. Physics and Chemistry, Vol. 81A, No. 1, p. 89 January-February 1977*

Technical Support

Please call 610-447-1555 or e-mail support@nkhome.com with problems. You will also find technical information online at www.nkhome.com.



Nielsen-Kellerman
610.447.1555
www.nkhome.com
info@nkhome.com