

C-2000

v2.0, 2.1

owner's manual



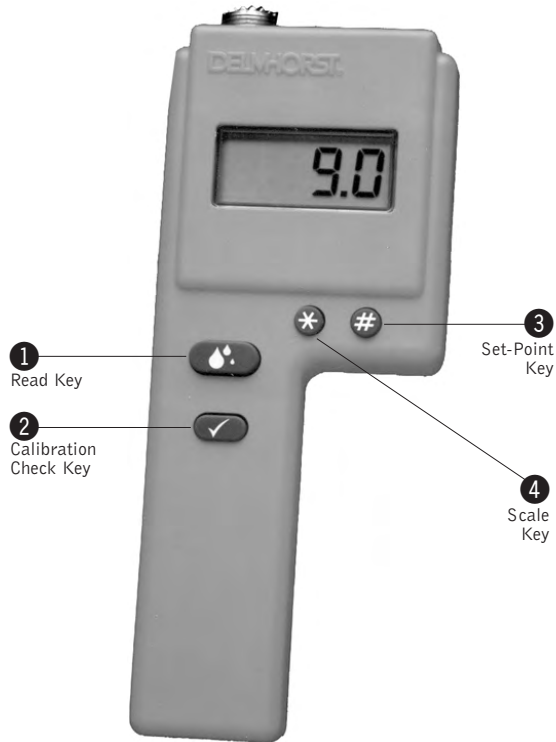
DELMHORST
INSTRUMENT CO.
WHEN ACCURACY IS THE POINT.™



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DELMHORST C-2000



C-2000 FEATURES

- ▶ Designed primarily to check the moisture content (%MC) in lint cotton and seed cotton. Versions 2.0 and higher include scales for viscose rayon and wool.
- ▶ Resistance technology recognized around the world as the most accurate method for measuring moisture.
- ▶ Proven microcontroller circuit
- ▶ Averages up to 100 accumulated readings
- ▶ MC ranges - lint cotton 4%-16%, seed cotton 6%-20%, viscose rayon 6%-25%, wool 12%-30%.
- ▶ Includes (1) 9-volt battery
- ▶ One-year warranty

KEY FUNCTIONS

1 Read:

Reads the % MC value.

2 Check:

Checks the meter calibration. Displays the average of up to 100 accumulated readings; displays the highest stored reading; erases the readings from memory.

3 Set-Point:

Displays the current set-point. Also acts as an arrow (scroll) key to increase the set-point value in 1% increments. A buzzer will alert you if the meter reads higher than the selected %MC value.

4 Scale:

Displays the meter scale as #1 (Lint cotton), #2 (Seed cotton), #3 (Viscose Rayon), #4 (Wool). Also acts as an arrow key to decrease the set-point value.

CHECK CALIBRATION

- ▶ Press the calibration check key **2** and read key **1** simultaneously. Meter is in calibration if it displays 10.8% \pm 0.2, regardless of the scale setting.

When checking calibration, there is no need to disconnect the electrode.

If you check the calibration and the display does not read 10.8, it is likely an indication of a low battery. If this occurs, change the battery immediately. Continued use with a low battery may cause the meter to go out of calibration. If you have a fresh battery and the instrument still does not indicate an acceptable calibration, return it to DELMHORST for service. See "Service for Your Meter" section.

Note: When the battery is removed and then reconnected, the meter displays its software version for one second and then turns itself off. After replacing the battery, you must reset the meter as described in the "Resetting the Meter" section.

A hard Reset is required if, after changing the battery, the display is frozen. This is sometimes caused by the interruption of contact between the battery and the battery lead wire. Resolve this as follows:

Disconnect the battery. Press and hold the Read key for 15 seconds. Press and hold the Check key for 15 seconds. Release the Check key. Connect a fresh battery to the lead wire in a single action, making sure to align the poles properly and without interrupting contact. If the display remains frozen, repeat the procedure. If this procedure does not solve the problem, refer to the Service for Your Meter section.

TO SET THE SCALE

Set the scale for the material being tested: #1 Lint cotton, #2 Seed cotton, #3 Viscose Rayon, #4 Wool.

- ▶ **To change the scale**, press the scale key **4**. The meter will display the current scale for one second.
- ▶ **Press and hold the scale key 4** to toggle through the four scales.
- ▶ **Release the scale key 4** to stop at the desired scale.

Changing the scale will automatically reset the set-point value to the default setting for that particular scale. Default settings are as follows:

Lint cotton - 10%	Viscose Rayon - 18%
Seed cotton - 10%	Wool - 20%

TO CHANGE THE SET-POINT

- ▶ **To change the set-point value** press the set-point key **3**. The meter will display the current set-point value for the scale you have chosen for one second.
- ▶ **To scroll forward** to a higher value for that scale hold the set-point key **3** while the current set-point is displayed and scroll to the set-point value desired.
- ▶ **To scroll backward** through the set-point values, press and release the set-point key **3**. Within one second, press and hold the scale key **4**. Continue to hold the scale key **4** and the set-point will decrease.
- ▶ **When scrolling in either direction**, release the key to stop at your desired set-point.
- ▶ **A buzzer sounds** if the meter reads a %MC higher than the set-point.

INFORMATION ABOUT YOUR READINGS

The meter will accumulate up to 100 readings. After all 100 readings are "stored" it will not add new readings until the memory has been cleared. It will also continue to display the average of all 100 readings as a reminder that the memory is full.

► **To add a reading** to the sum of all the previously stored readings, release the read key **1** within 2 seconds.

When taking and storing readings for a specific material, be sure to clear the meter before moving on to the next scale if you do not want to group all of the readings together.

Moisture content of the samples is the primary factor affecting meter readings. However, readings are also affected by the following:

- Type of cotton
- Area where it is grown
- Impurities
- Compaction (density) around the electrode surfaces
- Temperature of the sample

In order to minimize the effect of these factors and improve the repeatability of the meter readings, keep in mind the following points:

- Use samples with minimum of impurities.
- Optimal accuracy may be obtained if meter readings are checked against %MC by means of properly run oven tests on the particular product being tested.

TO CHECK THE ACCUMULATED READINGS

This feature displays the total number of all accumulated readings for the given material you have chosen, the average of those readings, and the highest stored reading.

► **To view the readings**, press and release the calibration check key **2**. First the meter displays the number of accumulated readings for one second, then the average of those readings for two seconds. Then it displays the highest stored reading for two seconds. The total "cycle" time is five seconds.

- ▶ To keep the accumulated readings in memory release the calibration check key ② before the total cycle time is complete.
- ▶ To erase readings, hold the calibration check key ② for more than five seconds. The total, average and highest readings will be displayed as above, followed by a zero to indicate all readings have been erased.

TO RESET METER

- ▶ Press and release the calibration check key ②.
- ▶ Within one second, press and hold the scale key ②. The meter will display a reset sequence as follows: "110", "8", "10.8". The last number, "10.8" is a calibration check.
- ▶ Resetting the meter clears the memory and restores the default settings of scale #1, set-point 10.

APPLICATIONS

Testing Lint Cotton and Seed Cotton

- ▶ Attach the #52-E/C Sample Cup Electrode to the connector on top of the meter.
- ▶ Set the scale for (#1) Lint cotton or (#2) Seed cotton and select the set point.
- ▶ Place the material in the sample cup. Press the cotton firmly into the cup with your finger. The sample in the cup should be overflowing during the test, even while you are pressing it with your finger.
- ▶ Press the read key ① and read the moisture content on the display. The meter displays the %MC for two seconds.

Readings below 4% lint cotton will be displayed as a negative number. Readings above 16% lint will be displayed as a flashing "16.2%". Both the underrange and overrange readings should be disregarded. They will not be added to the accumulated readings or used in calculation of the average or highest reading.

Readings below 6% seed cotton will be displayed as a negative number. Readings above 20% seed cotton will be displayed as a flashing "20.0%". Both the underrange and the overrange readings should be disregarded. They will not be added to the accumulated readings or used in calculation of the average or highest reading.

Tests made on seed cotton may not be as accurate as those made on lint cotton. This is due to the fact that the seed cotton sample is made up of lint and seed, and the quantity of seed may vary from sample to sample. Also, the moisture content of the seed is usually higher than that of the lint.

When testing seed cotton, direct contact is still made with the cotton fiber only and not with the seed of the sample. Variables in quantities and moisture content of the seed, during calibration and in field tests, may affect the accuracy and repeatability of the meter readings. The seed cotton scale gives an indication of "total" moisture content (the moisture content of the seed and the lint in a sample as determined by oven tests) in the seed cotton sample. This may be of interest only in buying and selling seed cotton where some consideration may be given to the weight relationship between moisture content and dry matter.

Testing Baled Cotton

- ▶ Attach the #30-E/C Electrode to the connector on top of the meter.
- ▶ Slide the plastic spacer over the #491 contact pins from the bottom of the pins, mount the pins in the chucks and tighten the set screws. (The #491 contact pins are not inserted into the chucks for shipping purposes).
- ▶ Set the Scale to #1 Lint cotton and select a set point.
- ▶ Insert the electrode pins into the bale and press the read key **1**.
- ▶ Place the pin spacers near the tips of the pins when contact is first made with the bale. This helps to keep the pins parallel as they are forced into the bale.

The #491 contact pins are insulated, except for 1-3/4" at the tip. The insulation helps to identify the area of moisture, since the reading is obtained from the tip of the pin. Keeping track of moisture readings as the pins are pushed into the bale will give an idea of the uniformity of moisture distribution in the bale. Higher moisture readings near the surface are an indication that the cotton has been exposed to higher moisture after baling.

The C-2000 gives accurate results on normally compressed bales. If the bale is loosely packed, the meter will read lower than the actual moisture content. If the bale is very tightly packed, the readings will be only slightly higher than normal, and as a rule, no correction needs to be made.

Well-conditioned material will give uniform readings; however, material that is baled before it is dry will show a wide range of moisture content. Several tests should be made on each bale, and you should note the average and the highest readings of these tests.

Testing Yarn

- ▶ Connect the #37-E/C multi-pin electrode to the connector on top of the meter.
- ▶ Set the scale to #1 Lint cotton and select a set point.
- ▶ Insert the electrode pins into the yarn and press the read key **1**.

Temperature Correction

The basic calibration assumes the cotton temperature to be 70°F. For best accuracy, apply a temperature correction if the cotton temperature is outside the range of 60°F to 80°F. Make a correction of approximately 1.0% for every 20° F. The meter will read higher than the actual moisture content as cotton temperature increases, and will read lower as cotton temperature decreases.

Example:

At 70°F, a reading of 7% indicates actual %MC of 7%. At varied temperatures, meter readings will vary as follows:

Cotton Temperature	Meter Reading	Actual %MC
110°F	9.0%	7%
50°F	6.0%	7%

CARE OF YOUR METER

To keep your meter in good working order:

- ▶ Store your meter in a clean, dry place. The protective carrying case provided is an ideal storage place when the meter is not in use.
- ▶ Change the 9-Volt battery as needed. Continued use with a low battery may cause the meter to go out of calibration.
- ▶ Clean the meter, contact pins, and probes with any biodegradable cleaner. Use the cleaner sparingly and on external parts only. Keep the cleaner out of the external connector. **DO NOT IMMERSE THE METER OR ANY ELECTRODE IN WATER.**
- ▶ Remove the battery if the meter will not be used for one month or longer.

WARRANTY

Delmhorst Instrument Co., referred to hereafter as Delmhorst, guarantees its C-2000 meter for one year from date of purchase and any optional electrodes against defects in material or workmanship for 90 days. If, within the warranty period of the C-2000, you find any defect in material or workmanship return the meter following the instructions in the "Service for Your Meter" section. This limited warranty does not cover abuse, alteration, misuse, damage during shipment, improper service, unauthorized or unreasonable use of the meter or electrodes. This warranty does not cover batteries, pin assemblies, or pins. If the meter or any optional electrodes have been tampered with, the warranty shall be void. At our option we may replace or repair the meter.

Delmhorst shall not be liable for incidental or consequential damages for the breach of any express or implied warranty with respect to this product or its calibration. With proper care and maintenance the meter should stay in calibration; follow the instructions in the "Care of Your Meter" section.

UNDER NO CIRCUMSTANCES SHALL DELMHORST BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES OF ANY TYPE WHATSOEVER, INCLUDING, BUT NOT LIMITED TO, LOST PROFITS OR DOWNTIME ARISING OUT OF OR RELATED IN ANY RESPECT TO ITS METERS OR ELECTRODES AND NO OTHER WARRANTY, WRITTEN, ORAL OR IMPLIED APPLIES. DELMHORST SHALL IN NO EVENT BE LIABLE FOR ANY BREACH OF WARRANTY OR DEFECT IN THIS PRODUCT THAT EXCEEDS THE AMOUNT OF PURCHASE OF THIS PRODUCT.

The express warranty set forth above constitutes the entire warranty with respect to Delmhorst meters and electrodes and no other warranty, written, oral, or implied applies. This warranty is personal to the customer purchasing the product and is not transferable.

NOTES



NOTES



For 65 years Delmhorst Instrument has been the leading manufacturer of high quality, US-made moisture meters and thermo-hygrometers. Today we offer a wide range of meters for applications including water damage restoration, construction, flooring, lumber/woodworking, paper, and agriculture.



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