Cardy Potassium
K^+ Meter

PRODUCT MANUAL

Item # 2400

Spectrum®
Technologies, Inc.

Contents

This manual will familiarize you with the features and operation of your new Cardy Potassium meter. Please read this manual thoroughly before using your instrument. For customer support, or to place an order, call Spectrum Technologies, Inc. at (800)248-8873 or (815) 436-4440 between 7:30 am and 5:30 p.m. CST
FAX at (815)436-4460,

E-Mail at info@specmeters.com.
www.specmeters.com

Spectrum Technologies, Inc
12360 S. Industrial Dr. East
Plainfield, IL 60544

Specifications

Display:
- LCD two digit display

Display Range:
- 0 - 99 x 100 ppm (9,900 ppm 0)

Battery:
- 2 - CR 2025 (lithium) user replaceable

Battery Life:
- Approximately 500 Hrs continuous use

Resolution:
- 1ppm for 0 - 99 ppm
- 10ppm for 10-99 x 10 ppm
- 100ppm for 10 - 99 x 100 ppm

Calibration:
- 2 - point calibration by STD/SLOPE controls using standard calibration solutions

Weight:
- 1.4 oz. (approximately 40 g)

Repeatability:
- ±20% of indication value

Compensated Sample Temperature:
- At ambient temperature

General Overview

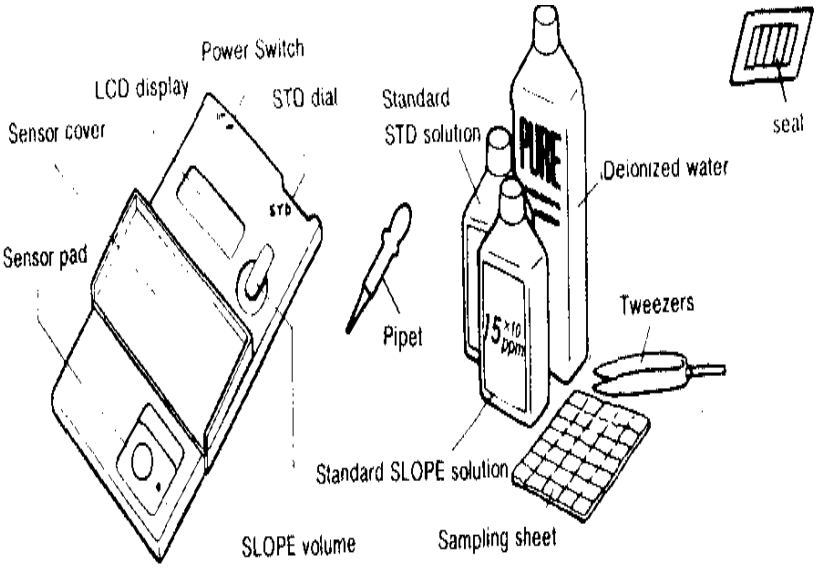
Congratulations on the purchase of your Cardy Potassium meter. This manual describes how to use your Cardy meter and how to keep it working accurately for many years. Read it thoroughly in order to make effective use of your meter.

The Cardy Potassium meter presents a completely new concept in sample measurement. This self contained digital meter delivers high quality answers to potassium level questions in soils, plants, and water based solutions.

The replaceable flat sensor makes the measurement of small samples much more convenient. When replacement of the sensor is required, the sensor cartridge snaps in and out of the meter at a touch.

The readout of the measurement value is an LCD display. It a has a total display range of 0 - 9900 PPM. This is provided by three automatically switched ranges, the X 1 range (0-99 ppm), the X10 range 100-990 ppm), and the X 100 range (1000 - 9900 ppm). To get the final value you simply multiply the reading on the LCD display by the proper number, 1, 10, or 100, as indicated by the small arrow on the right side of the display window.

Meter Components and Accessories



See page 6 for detailed explanation.

Meter Component Functions

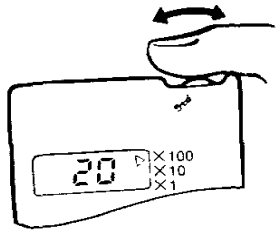
1. Power Switch - Turns the power ON or OFF

2. STD dial - calibrates the Cardy with Standard

3. SLOPE volume - Calibrates the Cardy to the SLOPE calibration solution.

4. LCD display - Expressed as ppm K^+. Displayed by one of three automatically switched ranges.

X 1 (0 - 99 ppm)
X 10 (100 - 990 ppm)
X 100 (1000 - 9900 ppm)



Example

5. Sensor pad - Ion-specific electrode principle: replaceable.

6. Sensor cover - protects the sensor during storage

7. Battery box - contains two CR - 2025 lithium cells. A "B" shows up in the display if the batteries are low.

Meter Components and Functions Continued:

8. Tweezers - Use for handling sample sheet. Use the head of the tweezers for adjusting the SLOPE volume screw.

9. Sampling sheet - Use for measuring samples and calibrating meter. Assures that the solution bridges across the sensor pad properly.

10. Pipette - Use for depositing solutions on the sensor for measurement.

11. Standard Solutions - Use for calibrating the meter.

12 Yellow Seal - Use to cover the sensor (reference junction) when meter is idle for more than 30 days.

Care For Your Cardy Meter

1. If the sensor is new or has been inactive for over a month, drip 3 to 4 drops of either one of the standardizing solutions onto the sensor pad using a sampling sheet to "warm-up" the sensor for 20 to 30 minutes. The meter can be off. This improves sensor response time and reduces the drift of the readings.

2. A stable meter reading occurs when the value on the LCD display has not changed for a period of three (3) seconds.

3. Wait 30 to 45 seconds after the solution has been placed on the sensor pad when calibrating or making a reading. A functional sensor should reach a "stable" reading during that time.

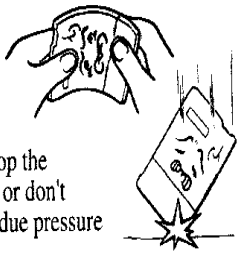
4. When measuring a sample, make sure that the sample is covering the two black round sensors in the sensor pad. The ion concentration cannot be measured if the electrodes are not covered by the sample.

5. Use clean tweezers to handle the sampling sheet.

6. In order to obtain measurement values of high repeatability, maintain identical conditions as much as possible.

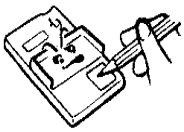
7. Any kind of soft wiping tissue may be used to blot the sensor pad dry after rinsing. Sometimes there will appear to be some liquid on a spot of the small electrode. It is normal, simply rinse and blot dry.

NOTES FOR PROLONGED USE

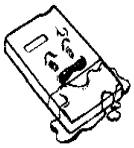


• Don't drop the CARDY or don't apply undue pressure

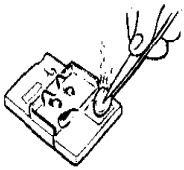
• Don't press the sensor pad with undue pressure



• Don't scratch the sensor pad



• Don't allow the CARDY to become wet



• Don't measure hot samples over 40 degrees

• Don't place the CARDY in direct sunlight, or in hot or humid places

• Don't put the CARDY directly into the solution in a beaker etc.

CALIBRATION

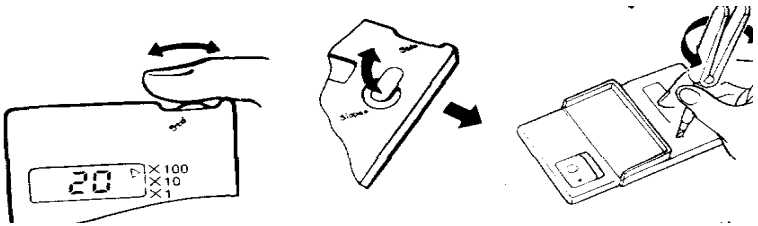
2 - Point Calibration (Perform at least once a month)

1. Turn the power ON.

2. Open the sensor cover, and wipe the sensor pad clean with a piece of sampling sheet or tissue, etc. Rinse with deionized water then wipe dry with a piece of sampling sheet or tissue, etc. Repeat rinsing and blot dry.

3. Place a piece of sampling sheet onto the sensor pad, and drip 2 to 5 drops of the standard STD solution on it (or drip the solution directly onto the sensor pad).

4. After the readout has stabilized, adjust the STD dial so that the display reads 20 X 100.



5. After cleaning the sensor according to step (2), apply the standard 15 X 10 SLOPE solution as in step (3). After the readout has stabilized, pull the rubber plug and use the driver end of the tweezers to adjust the SLOPE until the display reads 15 X 10.

6. After cleaning several times with distilled water, measure the standard STD solution again. Recalibrate if the reading is not (20±2) X 100.

Measurement of Tissue Sap

Sample Collection:
When conducting a test on plant materials, the biggest source of error is due to sampling. This error results when a sample is not representative of the source. Follow these steps to gather and care for your sample:

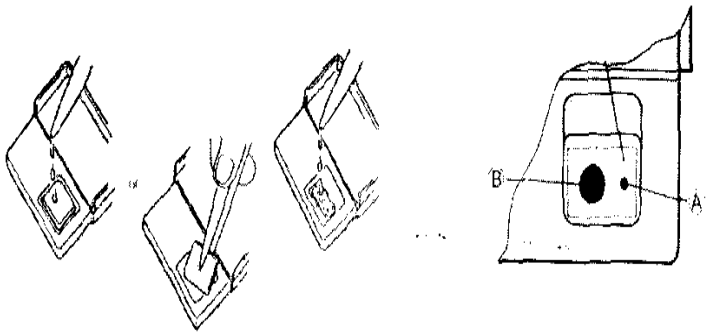
1.) Do not sample plants which show obvious signs of nutrient deficiency or damage from disease, insects, or chemicals unless these plants are the subject of a study. Plants which have been under stress for a period of time may not give a true picture of the nutrient status of the field.

2.) The leaves or parts of leaves selected should be of the same age and relative position on the plant. The most recently matured leaves should be used. These are the leaves that have stopped expanding in size. The petiole or leaf stem of the leaf or appropriated plant material should be used for the test.

3.) A minimum of 25 petioles or leaves should be collected. This is enough to represent a five to ten acre field if the field is judged to be uniform. Chop up the petioles and mix and sub-sample these pieces for testing. Crops with small, dry petioles, such as strawberries require much larger samples to get enough sap compared to fleshy crops such as tomatoes. Store whole petioles, not leaves, at room temperature for up to 1½ hours or on ice for up to eight hours. Cold petioles should be warmed to room temperature before taking a measurement.

Measurement procedure

1. Measurement can be aided by placing the sample onto a piece of sampling sheet. Using the pipette included in the case, transfer 3 to 5 drops of the pressed plant liquid onto the sensor pad. A sampling paper may also be placed on the sensor and saturated with the liquid.
Note: the plant sap press may be ordered from Spectrum Technologies, Inc., or your distributor.



2. After the value has stabilized (30 to 45 seconds), read the results from the display.

3. Rinse the sensor pad with the distilled water and blot it dry with tissue or a paper towel. Repeat rinse and blot dry.

Important: Do not make measurements with the meter (sensor) in direct sunlight.

Soil Test Instructions

Soil testing of mineral soil requires the Soil Test Kit. A starter kit is included with the Cardy K^+ meter #2400. Additional supplies can be ordered through a distributor or by calling Spectrum Tech. directly.

Measurement Procedure:

1. Measure 1 level measuring spoon (11cc) full of dry soil into the soil sample cup. The soil should be pulverized and sifted through a flour sifter.

2. Add "2" (50cc) measuring spoons of aluminum sulfate extractant to the soil.

3. Mix the soil and the solution by stirring with the spoon for at least 2 minutes, making sure the soil sample is thoroughly mixed with the distilled water. Let stand for 5 minutes

4. Fold a circular filter in half 'twice' and open it up to form a cone. Place it in the soil suspension as far as possible. The filtration will take place from the outside of the filter to the inside.

5. As soon as sufficient filtrate accumulates in the filter, use the small pipette to transfer the soil extract onto the sensor of the Cardy Meter.

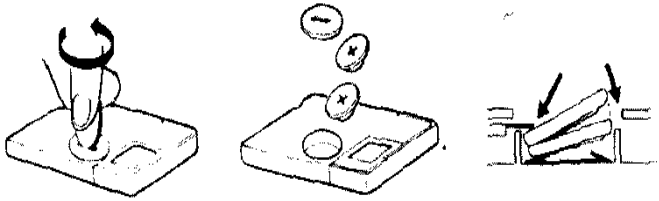
6. After the value has stabilized (30 - 45 sec.), read the value from the digital display. Multiply the display value by 10 to correct for the dilution. For lbs/acre, multiply by 2.

7. Rinse sensor and blot dry. Display should read "0" with distilled water on it. If it doesn't, rinse again.

Maintenance and Service

Battery:

When the meter LCD display shows the battery symbol "B", batteries need replacing. To replace batteries, turn the meter over and remove the circular battery cover. Release the cover by placing a coin in the slot and turning it in the direction shown to open. Place new batteries (CR2025) with the positive terminal up and under the metal tab. Replace the battery cover.



Replace both batteries at the same time. Do not throw old batteries into a fire. Do not leave old batteries in reach of children. If a child does accidentally swallow a battery cell, call a doctor immediately.

Sensor:

The field replaceable sensor has a life of approximately 200 - 400 measurements depending on the sensor age, frequency of use and maintenance. The sensor is worn out when a) the sensor will not calibrate to the “slope” standard (there is no more adjustment in the slope screw) or b) the meter drifts from its calibration standards when rechecking the two (2) point calibration. Repeat the calibration and check for drift.

Samples likely to damage the sensor pad include organic solvents, surface activators, cement, alcohol, strong acid, strong alkali, etc. The sensor pad is a thin, soft film. Do not handle in such a way that will scratch or damage the sensor.

If samples have a small amount of oil, it may be necessary to clean the sensor with a mild detergent solution.

To replace the sensor, turn the meter over and take the sensor off both hooks with the tweezers or a similar tool. Attach the new sensor to the meter properly until it makes a clear click sound.

Replacement sensors can be ordered from your distributor or Spectrum Technologies, Inc.

Petiole Potassium Sufficiency Levels
(Source: University of Florida)

Crop	Growth Stage	K (ppm)
Tomato (field)	First Buds	3500-4000
	First Open Flowers	3500-4000
	First 1-inch Diameter	3000-3500
	First 2-inch Diameter	3000-3500
	First Harvest	2500-3000
	Second Harvest	2000-2500
Tomato (Greenhouse)	Transplant to second fruit cluster	4500-5000
	Second cluster to fifth fruit cluster	4000-5000
	Harvest Season (Dec. -June)	3500-4000
Bell Pepper	First Flower Buds	3200-3500
	First Open Flowers	3000-3200
	Fruits Half-Growth	3000-3200
	First Harvest	2400-3000
	Second Harvest	2000-2400
Eggplant	First Fruit (2-inches long)	4500-5000
	First Harvest	4000-4500
	Mid Harvest	3500-4000
Potatoes	Plants 8-inches Tall	4500-5000
	First Open Flowers	4500-5000
	50% of Flowers Open	4000-4500
	100% of Flowers Open	3500-4000
	Tops Falling Over	2500-3000

Sufficiency Levels Continued:

Crop	Growth Stage	K (ppm)
Annual Hill Strawberries	November	3000-3500
	December	3000-3500
	January	2500-3000
	February	2000-2500
	March	1800-2000
	April	1500-2000
Watermelon	Vines 6-inches Long	4000-5000
	Fruit 2-inches Long	4000-5000
	Fruit One-Half Mature	3500-4000
	At First Harvest	3000-3500

Warranty

This product is warranted to be free from defects in material or workmanship for one year from the date of purchase. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.

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