

# **Spectrum<sup>®</sup>** **Technologies, Inc.**

## Soil Test Kit Instructions for Cardy Nitrate Meter

The soil test kit (item #2330) contains the following:

<u>Quantity</u>	<u>Item</u>
3	Sample cups
1	30ml measuring spoon
30	Filter papers
2	1-Liter extractant solutions (item 2334L)
1	Mixing spoon
1	450 ppm NO <sub>3</sub> <sup>-</sup> -N solution (item 2336)

### SAMPLE COLLECTION

Collect at least 15 to 20 core samples from an area not exceeding ten acres by using a Z pattern. Areas having different soil types or management histories should be sampled separately. Sample the top 12 inches of soil. Some universities recommend sampling the top 24 inches in 12-inch increments. Contact your county extension agent for recommendations. Care should be taken to ensure that the soil samples are not biased by the presence of rows or bands of fertilizer.

### SOIL PREPARATION

Samples should be dried within 24 hours after collection to minimize changes in NO<sub>3</sub><sup>-</sup>-N concentrations. Before drying, crumble the soil to avoid large clods that will be difficult to crush when dry. The samples should then be dried by spreading on a thin layer of newspaper at least 3 pages thick and placing over night in a warm spot ideally with air movement. Soil will dry in a few hours if placed in a sunny location exposed to the wind. If dried indoors, 24 to 48 hours may be required. Indoor drying time can be reduced if a fan is used. For oven drying spread a thin layer of soil on a cookie sheet or pie plate. Place it in an oven set to no more the 250° F with the door slightly ajar. Soil samples can be dried rapidly in a microwave by spreading soil thinly on a dish and microwaving at full power for 5 to 8 minutes. Consider the soil dry when it crumbles rather than compacts under pressure. After drying, crush the soil by using a block of wood or other suitable device. Crush until the soil particles are the size of BB's or smaller. If possible, sift with a flour sifter or other 10 mesh-screening device. Mix the soil thoroughly.

## METER CALIBRATION

The calibration procedure is the same as outlined in the meter's User's Manual. When doing soil testing, calibration should be done with the solutions included in the soil test kit (items 2336 and 2334L) because they both include aluminum sulfate. The latter solution is the same solution used to do the soil extraction.

Note: The meter's calibration can be checked when desired with the 34ppm solution. Recalibrate if the value does not read 34ppm  $\pm 2$  (32-36ppm).

## SAMPLE PREPARATION

1. Measure 2 level measuring spoons (30 ml) full of dry soil into the soil sample cup.
2. Add 2 (30ml) measuring spoons of the 34ppm  $\text{NO}_3^-$ -N soil extractant (item #2334L) to the soil.
3. Mix the soil and the extractant solution by stirring with the spoon for at least 2 minutes, making sure the soil sample is thoroughly mixed with the extractant. Let stand for 5 minutes.
4. Fold a circular filter in half twice and open it up to form a cone. Place the cone 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 pipet to transfer the soil extract onto the sensor of the Cardy meter.
6. After the value has stabilized (30-45 seconds), read the value from the digital display. Subtract 34 from the display value. This accounts for the aluminum sulfate in the 34ppm extractant solution. To convert to lbs./acre, multiply by "4" for a soil sampling depth of 12 inches.
7. Rinse the sensor pad clean with distilled water and blot dry. The display should read close to "0" with distilled water on it. If not repeat the rinse.

## SOIL TEST INTERPRETATION

### University of Tennessee

< 17ppm NO <sub>3</sub> <sup>-</sup> -N	Low
17 - 25ppm NO <sub>3</sub> <sup>-</sup> -N	Medium
> 25ppm NO <sub>3</sub> <sup>-</sup> -N	High

### Rutgers Cooperative Extension

PSNT Soil Test Level (ppm NO <sub>3</sub> <sup>-</sup> -N)
1 to 5
16 to 20
21 to 25
26 to 30
30+

Sidedress N Recommendation (lbs/A)
160
120
80
40
0

### University of Wisconsin

#### PSNT Result

ppm N
> 21
20 - 18
17 - 15
14 - 13
12 - 11
< 10

#### Soil Potential\*

Very High/High	Medium/Low
N/application Rate, lbs/A	
0	0
60	40
100	40
125	80
150	80
160	120

### Pennsylvania Nitrogen Soil Test Recommendation

Developed by Penn. State University Sidedress N Recommendations (lb. N per acre)

#### Corn Yield Goal

#### Soil Level Test

ppm NO <sub>3</sub> <sup>-</sup> -N	100	125	150	175	200
0 - 10	100	130	160	190	220
11 - 15	75	100	125	150	150
16 - 20	50	75	100	125	125
21 - 25	25	50	75	100	100
25+	0	0	0	0	0

## CORRECTION FOR MOIST SOIL

In order to make accurate soil nitrate measurements, the soil must be dry. Nitrate is extracted by mixing a precise amount of dry soil with a measured amount of extracting solution. If the soil is moist, the dissolution varies and the result is an understated nitrate test concentration.

When soil nitrate is used for **diagnostic** purposes it may be useful to perform in-field testing using **moist** soil. When performing the rapid test, the content of water in the soil should be taken into account.

As the aqueous phase becomes larger with an increasing proportion of water, the results obtained in practice tend to be **low**. Precise work requires that the measured nitrate content be multiplied by a correction factor. To this end, the soil sample is dried under normal atmospheric conditions to determine the moisture content, for which the correction factor is given in Table 1. Where tests are carried out on the farm, the simpler estimation procedure can be used. Table 1 gives the correction factor to be added in percent for each type of soil in the estimated moisture in the soil. With sandy soils it may be necessary to add 16% and with clay soils, up to 63%.

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Table 1: Estimated percentages to be added, according to the type and water content of the soil to take into account the soil water content

Add to the measured nitrate content for

Soil Moisture Content	Water Capacity	Sand	Clay Sand	Sandy Clay	Clay, Loess
Very Dry	40%	+8%	+15%	+17%	+23%
Dry	55%	+10%	+20%	+24%	+33%
Med. Moist	70%	+12%	+25%	+31%	+43%
Moist	85%	+14%	+30%	+38%	+53%
Very Moist	100%	+16%	+35%	+45%	+63%

**As a rough guide it is sufficient to multiply the nitrate value read off the scale by 1.1 for dry soils, 1.3 for normal soils, and 1.5 for wet soils.**

### Example:

If the soil ppm  $\text{NO}_3^-$ -N concentration from the Cardy meter (after subtracting 34 ppm) is 18 ppm, the corrected value for "normal" soils is then  $18 \times 1.3 = 23.4$  ppm  $\times 4 = 94$  lb./a ppm  $\text{NO}_3^-$ -N (12 inch soil depth).

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