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# The Investigator™ Soil Compaction Meter

Catalog #6105



*Spectrum*  
Technologies, Inc.

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This manual will familiarize you with the features and operation of your new Electronic Soil Compaction 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 pm CST, FAX at (815)436-4460, or E-Mail at [specmeters@aol.com](mailto:specmeters@aol.com).

Spectrum Technologies, Inc.  
12360 S. Industrial Drive East  
Plainfield, IL 60585

## SPECIFICATIONS

### Accuracy:

- $\pm 0.5$  Inch ( $\pm 1.25$  cm)
- $\pm 15$  PSI ( $\pm 103$  kPa)

### Range:

- 0 - 18 Inch Depth (0-45 cm)
- 0 - 1000 PSI (0-7000 kPa)

### Battery:

- 2 AA Batteries (Included)
- 80 Hours continuous use
- 550 Days when unit shut off

### StarLogger (optional):

- 1,364 Soil Profile Measurements
- 862 Soil Profile Measurements with a GPS/DGPS system

## GENERAL OVERVIEW

**The Investigator** is a revolutionary GPS compatible soil compaction meter. Soil compaction prevents moisture penetration, reduces fertilizer and chemical utilization, and hinders plant root growth. In some cases, yield losses can run as high as 30% due to compaction. This new electronic soil compaction meter is the most versatile compaction meter on the market. Soil depth readings are determined by internal shaft sensors and the magnetic collar. Compaction values, measured by a load cell sensor, are displayed in PSI/inch or kPa/cm.

This revolutionary compaction meter can be linked to the StarLogger (Item # 3605) to record multiple measurements. Measurements downloaded to a PC can then be analyzed to make tillage management decisions.

Using StarLogger software with PC cable (Item # 3606) soil compaction profile measurements can be geo-referenced through the StarLogger in the event that a GPS/DGPS receiver is available.

## SPECIAL FEATURES

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**The Investigator** Compaction Meter has unique features which enhance its measuring ability. Features include:

- Automatic calibration feature
- Depth sensing collar senses depth from 0" to 18"
- Switchable digital display in PSI or kPa as inches or centimeters
- Displays battery status at start up
- Alarm when penetrating too fast
- Over force warning at 200 lbs. to protect load cell (250-300 lbs. will damage unit)
- Recall button reviews measurements in 2-inch increments
- Unit shuts off automatically after 10 minutes when not in use
- Replaceable tip
- Designed to ASAE Standard S313.2

## TAKING COMPACTION MEASUREMENTS

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**The Investigator** is a state-of-the-art electronic cone penetrometer for use in soil density, trafficability, and compaction studies. This soil compaction instrument measures cone index data, logs the data, then allows the user to review the compaction data to make soil management decisions.

It is recommended to perform compaction measurements after a rain, or in the spring when the soils have a good moisture content. Measuring soil compaction in dry soil conditions will not yield meaningful data.

**The Investigator** compaction meter should be used before tillage to determine where the compacted areas of a field/plot are. Once the compacted areas, along with the compaction depths have been determined a much more effective tillage system can be utilized.

The unit works as an efficient diagnostic tool as well as a management unit after the tillage operation has been performed. Determine how deep the soil has actually been worked and if the tillage operation has solved the compaction problems.

## AUTO-CALIBRATION FEATURE

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**The Investigator** has an automatic calibration feature to quickly and easily auto-zero the meter. The auto-calibration feature ensures the accuracy of the meter while preparing the meter for use in changing climatical environments.

Put the meter through the calibration sequence each day of use, and/or before doing each field or plot.

### Performing Automatic Calibration:

1. On a firm surface, balance the meter on the tip of the shaft.
2. Press and hold the **Review** button.
3. While holding the **Review** button, press and immediately release the **Start** button.
4. Release the **Review** button.
5. Meter will display **AutoZero** along with a countdown sequence.
6. After releasing the **Review** and **Start** buttons, balance the meter on the shaft tip by lightly holding the shaft. **Make sure not to put any undue pressure on the tip.**
7. After the 5 second countdown, the unit will automatically restart. The reading on the meter should be 10-20psi (70-140kPa).
8. After restart, the meter is ready for use.

# MEASUREMENT PROCEDURE

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Recording the best quality data requires some practice. Your objective is to uniformly push the probe into the ground using an even motion. The programmed rate, specified in the ASAE standards, is approximately 2 seconds per 2 inches. If this rate is exceeded, the meter will show an **Error** display.

Measurements in tall grass may falsely display soil depths. It may be necessary to flatten any grass to ensure that proper soil depths are being recorded.

## Single Measurement:

1. Push and release **Start** button.
2. Wait for LCD to display "0" for depth and load.
3. Push probe into ground slowly and evenly so that there is not any side stress on the shaft.
  - If an error is produced from pushing too fast, start over by removing probe and pushing **Start**.
4. Remove probe gently.
5. Display will beep when magnetic collar is descending.
6. Once collar is at 0, you can **Review** compaction measurements at 2-inch depth increments by pushing the **Review** button.
7. Press **Start** to ready the probe for the next measurement (Previous data is deleted).
8. Push the **OFF** button. Meter will automatically turn off after 10 minutes of inactivity.

## Data Logging Compaction Measurements:

1. The StarLogger (Item #3605) is required.
2. Before entering the field, connect the StarLogger to the RS232 port below the control panel of **The Investigator**.

3. Attach StarLogger to your arm and turn on the StarLogger by pressing **Start**. Wait for the ready signal.
4. Take measurements as described above.
5. Download data from StarLogger to your PC using the StarLogger software (item #3606).

## Geo - Referencing Compaction Measurements:

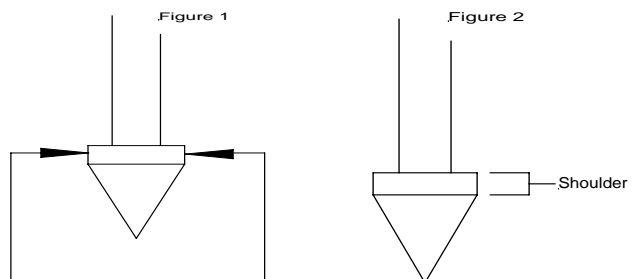
To Geo - Reference, you will need to connect the GPS/DGPS unit to StarLogger and proceed as described above. The GPS format should be NMEA 0183.

# DETERMINING WHEN TO REPLACE CONE

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Repeated soil sampling will wear down the metal cone. Periodically measure the diameter of the cone using a dial caliper or micrometer that allows you 0.001-inch measurements.

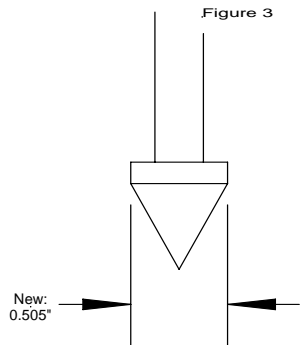
Place the caliper/micrometer on the shoulder of the cone. Figure 1 shows the proper placement and Figure 2 the layout of the shoulder.



The determination as to when to replace the cone will depend on how the user is applying the meter.

If you are using the meter to get **absolute** compaction readings, replace the cone when there is a "wear factor" of 3%. Three percent wear affects the cone index measurements by 5%. A new cone has a diameter of 0.505", see Figure 3. When the cone diameter reaches 0.490" (3% wear), replace the cone.

When you are doing **comparative** analysis of the readings in a field or a plot, the measurements will be consecutive. The amount of wear of the cone will not be a factor. In this case, it is recommended that the cone be replaced when the shoulder is not easily recognizable as a shoulder anymore.



Replace the cone as follows:

1. Lay meter on its side
2. Pull sliding collar to top of the shaft
3. Unscrew worn cone by hand or with a pair of pliers
4. Attach new cone into meter shaft
5. Tighten to a snug fit with hands or pliers. Be careful not to imprint the cone with pliers.

Replacement cones can be ordered from Spectrum Technologies or a Spectrum Authorized Dealer. Ask for **The Investigator** Replacement Cone, Item #6106.

## **SERVICE AND SUPPORT**

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**The Investigator** is easy to use and reliable. Should you have a problem, please read the following:

### **Who do I contact?**

**Contact the company that you bought the meter from: Spectrum Technologies, Inc. or a Spectrum Authorized Dealer.**

### **When Contacting Spectrum Technologies, Inc.:**

Please indicate that you need Technical Support. Be prepared to:

1. Provide details on the hardware and software configuration of your components including: manufacturer, model number, peripherals, and versions of the operating system.
2. Completely describe the problem. The more information you provide, the faster and more accurately we will be able to respond.

## **WARRANTY**

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This product is warranted to be free from defects in material or workmanship for 1 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 is void if the Spectrum products have been damaged by customer error or negligence, or if there has been an unauthorized modification.

### **Returning Products to Spectrum**

Before returning a failed unit, you must obtain a Returned Goods Authorization

(RGA) number from Spectrum. You must ship the product(s), properly packaged against further damage, back to Spectrum at your expense. Clearly mark the RGA number on the **outside of the package**. Spectrum is not responsible for any package that is returned without a valid RGA number or for the loss of the package by any shipping company.

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