





# INTRODUCTION

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Congratulations on the purchase of your FieldScout Direct Soil EC Meter. This instrument has been specifically designed for direct measurement of salts in soil media as well as water or nutrient solutions. This manual describes how to use your meter and keep it working accurately for many years. Please read it thoroughly to get effective performance from your meter.

The salinity of the soil solution, irrigation water or fertilizer solution is an important parameter affecting the root zone environment. Any of these factors can have a significant effect on plant growth and physiology. The easiest way to monitor salinity is by measuring the electrical conductivity (EC). EC is strongly correlated to the salinity of the soil solution. EC measurement is also affected by temperature and, to a lesser degree, by soil moisture content.

Use this portable EC meter and probe to measure salinity in greenhouse soil media right on the spot without tedious soil sampling and preparation. Greenhouse production managers can compare readings from plant to plant and fine-tune their fertility program because measurements can be made directly in a plug tray cell without cannibalizing the seedlings. Turf managers can monitor for high salt levels on golf course greens and determine when to flush (leach) salts before turf quality declines.

The meter comes with the Field Scout Soil/Water EC probe. This single, stainless steel probe has a specially designed conical tip. It can measure liquid EC (water or nutrient solutions) or in-situ soil salinity. The probe automatically compensates for temperature.













# TAKING MEASUREMENTS

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The procedure below illustrates the general process for taking pH readings. When taking measurements in liquids, ensure that the tip is fully immersed and not touching the side of the container. Stir and let the reading stabilize. Information on measuring other media are given in subsequent sections.

1. If necessary, power on the tester.
2. The timer icon will blink during this time. Once the reading is stabilized, the timer stops blinking and will appear to indicate the stability of the reading.
3. Note the value or press HOLD to freeze the reading. To release the reading, press HOLD again.
4. Press and hold the power button for 5 seconds to turn off tester. If key is not pressed for 8.5 minutes, the tester will automatically shut off to conserve batteries.



# SME MEASUREMENT

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## **Saturated Media Extract (SME) Measurements**

Growth media used in most greenhouse operations is high in organic material and processed materials and low in mineral soil. These materials are easier to handle, are well aerated and have good moisture-holding properties, but have limited ability to retain nutrients. Therefore, tests developed for field soils do not always yield meaningful results. Saturated Media Extract (SME) analysis has been shown to eliminate these problems. The samples should not be dried, sieved or pulverized as this will affect the growth medium properties and alter the results. Traditionally, the soil solution from the saturated medium is extracted by a vacuum pump. However, the Field Scout Soil & Water EC Meter allows the saturated sample to be tested directly.

### Procedure

- Moisten the media sample with distilled water to reach a consistent “saturated” moisture level. When saturated, the media should glisten and slide from the mixing spatula with little or no free water.
- Wait 15 minutes and add more water if needed. The sample should have the consistency of a paste with slightly more water than if the media was in a pot and fully irrigated.
- Power up the meter.
- Insert the probe tip into the media and read the results.



6. Press HOLD to accept the auto conductivity standard and finish the calibration.

7. Display returns to Measurement window.

### **Manual Calibration**

When the conductivity reading is outside the calibration range of the automatic conductivity standards or when TDS or salinity is used, the tester will require manual adjustment.

1. Repeat steps 1 to 4 from “Automatic Calibration”.

2. Wait until the display settles on a measured value. Press MENU/▼ to manually adjust the value to the desired reading.

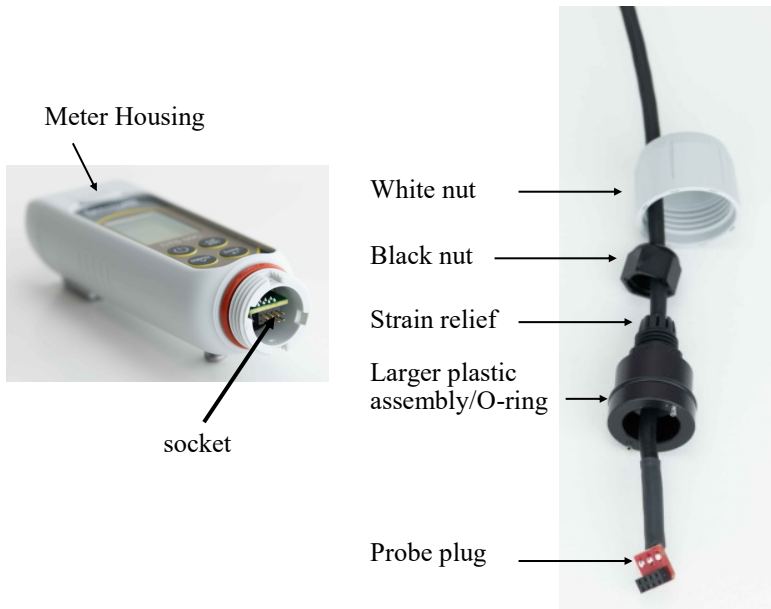
**Note:** The adjustment will decrease only, however the adjustment will eventually cycle to the highest available value after decreasing by 40% of the initial value.

3. Press HOLD to accept and finish the calibration when the desired value is selected.

**Note:** To abort calibration, press CAL/ESC to escape.

4. Once the calibration is finished and user has accepted the changes, the Measurement window will show the calibrated reading.





## II. Attaching a direct-insert probe

1. If you are connecting an 8" probe, slide the white nut over the probe and down the black cable. Skip to step 4.
2. If you are connecting a 24" probe, remove the strain relief from the larger plastic assembly.
3. Feed the cable and strain relief through white nut and re-connect the strain relief and the assembly.
4. Attach the probe plug to the socket in the meter housing.
5. Push the assembly onto the meter housing so the metal pegs on the assembly line up with the notches on the inner diameter of the meter opening. Be sure that the small o-ring sits at the base of the large plastic assembly.
6. While holding the assembly in place hand-tighten the nut to the strain relief
7. Connect and tighten the white nut to the meter housing.





# SPECIFICATIONS

## Conductivity

Range	0.0 to 200.0 $\mu$ S, 200 to 2000 $\mu$ S, 2.00 to 20.00 mS
Resolution	0.1 $\mu$ S, 1 $\mu$ S, 0.01 mS
Relative accuracy	$\pm$ 1% full scale
Normalization temp.	25.0°C (77°F)
Temperature co-efficient	0.0% to 10.0%
Calibration points	Up to 3 points

## TDS

Range	0.0 to 100.0 ppm, 100 to 1000 ppm, 0.10 to 10.00 ppt (TDS Factor 0.5)
Resolution	0.1 ppm, 1 ppm, 0.01 ppt
Relative accuracy	$\pm$ 1% full scale
Calibration points	Up to 3 points
TDS factor	0.40 to 1.00 (selectable)

## Salinity

Range	0.00 to 10.00 ppt
Resolution	0.10 ppt
Relative accuracy	$\pm$ 1% full scale
Calibration points	1

## Temperature

Range	0 to 60°C (32.0 to 140.0°F)
Temperature resolution	0.1°C / 0.1°F
Temperature accuracy	From 0 to 50°C ( $\pm$ 0.5°C / $\pm$ 0.9°F + 1 LSD); from 50 to 60°C ( $\pm$ 1.0°C / $\pm$ 1.8°F + 1 LSD)

## General

Display Graphics	Dot matrix 80 x 100 pixel
Auto off	8.5 minutes (from last key press)
Power requirement	Four AAA 1.5 V batteries
Battery life	>150 hours
Water proofing	IP67

## Environmental operating conditions

Ambient temperature	5 to 45°C / 41 to 113°F
Relative humidity	5% to 85% noncondensing
Storage temperature	-20 to 60°C / -4 to 140°F
Storage humidity	5% to 85% noncondensing

## Probe Dimensions

2266FS
Length 7.7 in (19.5 cm)
Diameter 0.30 in (0.8 cm)
2266FSTP
Length 24 in (61 cm)
Diameter 0.35 in (0.9 cm)



	Recommended EC Value (mS/cm)		
	SME <sup>a</sup>	1 to 2 <sup>b</sup>	Pour thru
Poinsettia during weeks 2-12.	2.0 - 3.0	0.85 - 1.25	2.8 - 4.1
Pansies during active growth.	0.25 - 1.5	0.1 - 0.6	0.35 - 2.1
Geraniumus during active growth.	1.6 - 2.4	0.65 - 1.0	2.2 - 3.3

Comparison of substrate tests for various EC sampling methods. (Calvins, Whipker, and Fonteno, North Carolina State University).

<sup>a</sup> saturated media extract

<sup>b</sup> 1 part soil to 2 parts water

## APPENDIX 2

### CLASSIFICATION OF IRRIGATION WATER

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<b>Excellent</b>	EC < 0.25 mS/cm
<b>Good</b>	0.25 mS/cm < EC < 0.75 mS/cm
<b>Permissible</b>	0.75 mS/cm < EC < 2.0 mS/cm
<b>Doubtful</b>	2.0 mS/cm < EC < 3.0 mS/cm
<b>Unsuitable</b>	EC > 3.0 mS/cm

Categories of irrigation water quality based on electrical conductivity. [Wilcox L.V. (1948) The Quality of Water for Irrigation Use, USDA Technical Bulletin 962]



<b>Sensitive &lt; 3 mS/cm</b>	<b>Moderately Sensitive 3 - 6 mS/cm</b>	<b>Moderately Tolerant 6 - 10 mS/cm</b>	<b>Tolerant &gt;10 mS/cm</b>
Annual Bluegrass	Annual Ryegrass	Bent cv. Seaside	Alkaligrass
Colonial Bluegrass	Chewings Fescue	Perennial Ryegrass	Bermudagrass
Kentucky Bluegrass	Creeping Bentgrass	Tall Fescue	Seashore Paspalum
Rough Bluegrass	Hard Fescue	Buffalograss	St. Au- gustinegrass
Centipedegrass	Bahiagrass	Zoysiagrass	

Table 2. Relative tolerance of turfgrasses to soil salinity measured by the SME Method (“Salinity in Turfgrass”, Harivandi M.A, Butler J.D., Lin W. 1992).

Note: The values on this table refer to measurement of a saturated media extract (SME) . Use table 1 to convert from direct-insert readings to SME.



## **Interpreting EC Readings from Soilless Media**

The FieldScout EC meter allows for quick and easy readings of salinity in a greenhouse container. The following equations give an approximation of how a direct-insert reading relates to more conventional soil sampling techniques. The FieldScout reading is designated by the variable FS.

### **Pour-through Method (PT)**

$$PT = 1.637 * FS + 0.556$$

### **1:2 Dilution (OTT)**

$$OTT = 0.448 * FS - 0.13$$

### **Saturated Media Extract (SME)**

$$SME = 1.178 * FS - 0.294$$

Source:

Scoggins, H. L., Vanlersal, M.W. 2006. *In Situ* Probes for Measurement of Electrical Conductivity of Soilless Substrates: Effects of Temperature and Substrate Moisture Content. HortScience. 41:210-214

