



# ELECTROSTAT™

Model ES3

Instruction Manual v1.1

## Features

- Color Touch-screen Display with settings for visibility in a dark room to full sunlight.
- USB-C Port supports charging the internal battery from any USB host device or USB charger.
- Updatable Device Firmware through the PC application (as updates become available).
- Data Transfer into our PC application (available for download Q2 2024).
- Detachable Probe allows easy repair/replacement. The platform will also support new probe designs as they are released. Device support for new probes will be updated through online firmware updates.
- On screen Data Plot with adjustable time-base and range control (or autorange). The data plot can also be configured as a signal strength bar.
- 1/8" Analog output jack calibrated to  $\pm 2.5V = \pm 25kV$ . (The output jack is limited to  $\pm 25kV$  though the ES3 can display up to  $\pm 30kV$ )
- Inactivity Timer for auto power down. Can be set up for 15/30/60 minutes, or disabled. The timer resets anytime the screen or a button is touched.
- 3 Different Alarm Modes:
  - Visual only: Display indicates alarm level exceeded, audio is muted.
  - Variable pitch: Alarm starts at 1/10 of the entered alarm level, and the pitch changes with the input signal up to the alarm level.
  - Constant Tone: The Alarm sounds only when the entered alarm value is exceeded.

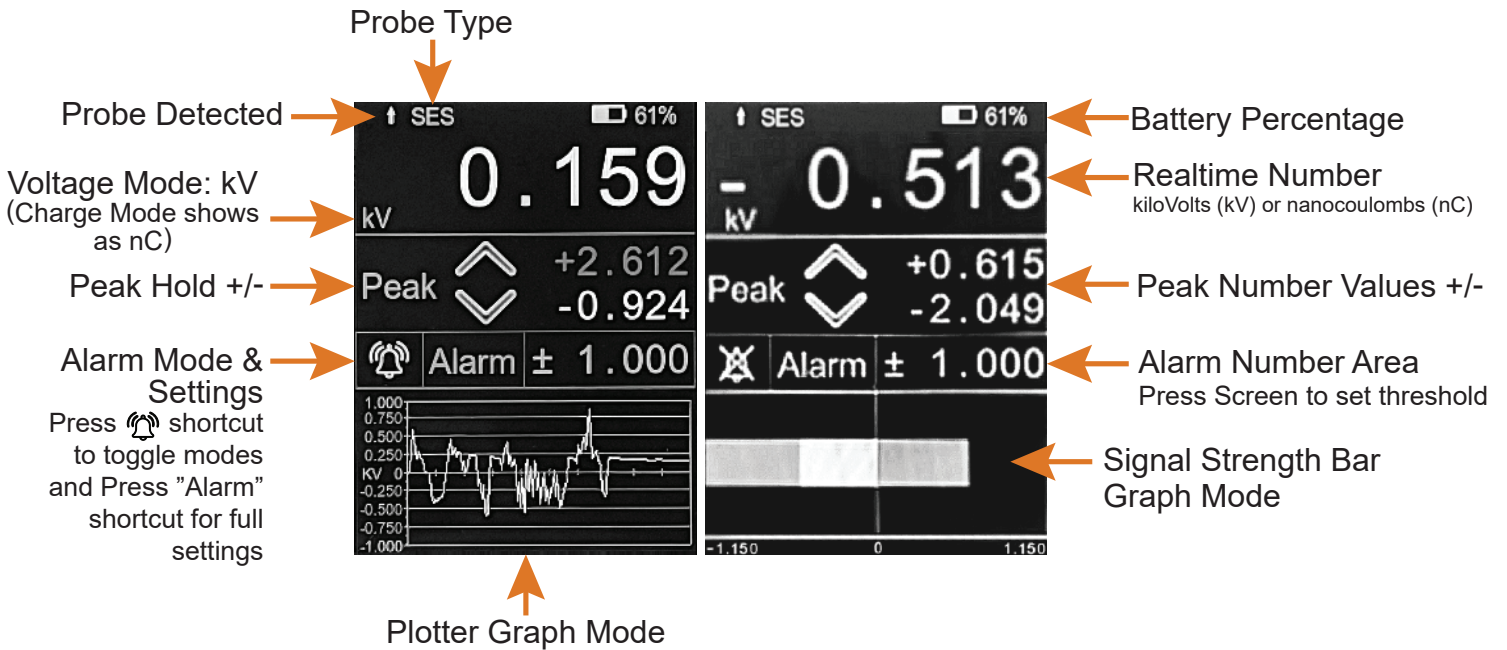
## Safety Warning



Risk of Electrical Shock is present when using the ElectroStat™ model ES3 static electricity meter. Be sure to ground the meter properly and use any necessary safety precautions.

# Operation

## Reading and Using the IPS Touch Screen

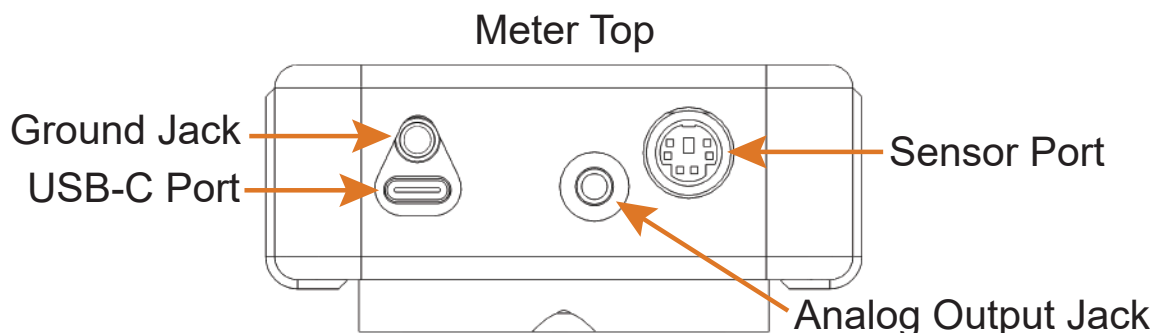


## Charging the Battery

Charging the internal 2000mAh battery is done through the USB-C port and can typically recharge the unit within 2 hours. Battery life ranges from 7 hours to 20 hours depending on screen brightness, with an SES probe attached.

## Ground Connection

The Electrostat™ Meter model ES3, when paired with an SES probe, measures both electric charge and the voltage on surfaces. For the highest accuracy and most stable measurements, the ES3 should be connected to ground (earthed) using the included ground cable. Plug the end of the cable that has the mini banana plug (smaller pin) into the top of the ES3, above the USB port. The larger banana plug (on the other end of the cable) is to be connected to an Earth ground attachment. There are two Earth ground attachments included in the kit. There is an outlet attachment that will accept the banana plug, and then can be plugged into a North American wall outlet (mains) which provides the ground available at the wall outlet. There is also an alligator clip that accepts the banana plug and can then be used to clip onto the loosened screw of an outlet plate, or onto cold water plumbing.



## Operation (con't)

### Protective Boot



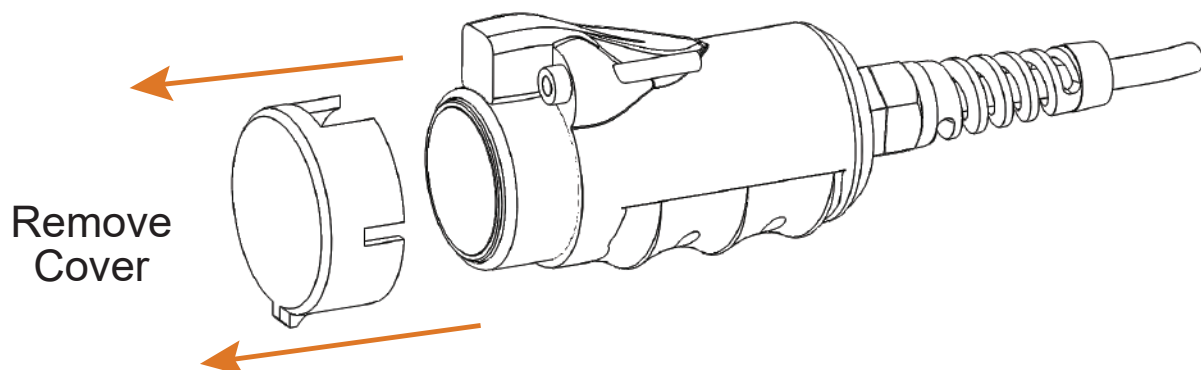
The ES3 comes with an orange, Thermoplastic Polyurethane (TPU) boot to provide a comfortable grip and to protect the unit from damage. This rubber boot also has a fold-out kickstand to enable hands-free use on a desktop. To use it, pull the base of the kickstand out as shown here.

### Connecting the SES (Surface Electricity Sensor)

Plug the SES probe into the ES3 Sensor port, with the arrow indicator on the DIN cable connector facing forward. Once plugged in, you will note the ES3 detects the probe and now reads "SES" in the top left corner, and is already active, taking static measurements.

### Initial Startup

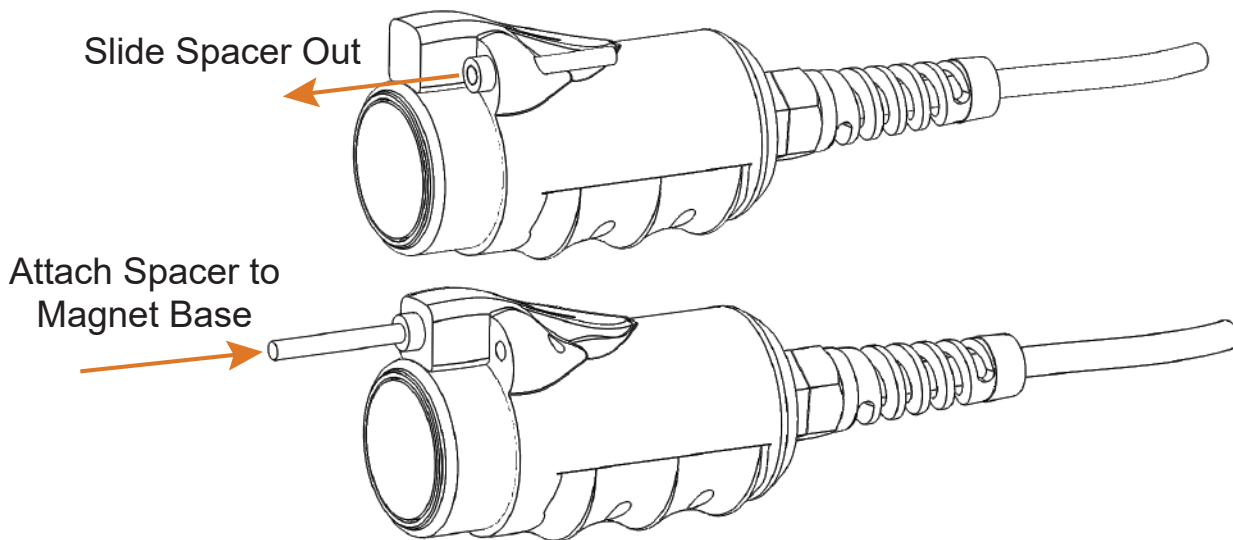
The SES probe has a black, protective cover over the sensor. To measure surface voltage, press and release the power button and wait a few seconds for warm up. Then, remove the sensor cover. On the top left of the display, the letters SES should appear once the probe is plugged in, meaning that the Surface Electricity Sensor is connected. Below that, the letters kV for kilovolts (as opposed to nC for nanocoulombs) should appear. If nC appears, press the menu button, then touch "Mode: Charge (nC)" at the top of the display, so that it changes to "Mode: Voltage (kV)". Then touch "Exit" at the bottom of the display.



## Operation (con't)

### Voltage Mode

For greatest accuracy, voltage should be measured one inch away from the surface that is being scanned. A one-inch white rod with a magnet at the end is included. It will stick to the front of the gray handle-grip on the probe to make spacing easy. Note that there is a hole in the gray handle-grip to store this white rod. If desired, the gray handle-grip can slide backward off of the probe's aluminum, cylinder housing, in case you want to mount the probe somewhere, such as in a grounded fixture. (When replacing the sensor in the gray handle-grip ensure that it is fully seated so that the sensor plate is 1" from the end of the spacer).



### Zeroing the ES3

The ES3 can now measure the voltage of whatever is 1 inch (25 mm) in front of the probe. The probe may need to be re-zeroed. If so, point the probe in a neutral direction or toward whatever you want to define as zero volts; then press the "Zero" button. This is similar to pressing the "tare" button on a weight scale. The SES protective cover can be used to shield the sensor while zeroing to get a highly stable zero if desired. The user can also cup a hand over the sensor while touching the metal body (but not the sensor plate) as another method to assist in getting a stable zero. After the zero procedure is done (less than 5 seconds), remove your hand (or protective cover) to start measuring again. The largest numerals near the top of the display show the voltage in kilovolts(kV). For example, a reading of 2.054 means 2.054kV or 2054

If you touch the metal sensor disc with your finger, or if a charged object touches it, or if air ions are directed toward it, a charge will be accumulated. As a result, the displayed voltage will not be zero. This charge can be removed by pressing the "Zero" button. Note, of course, that this will also reset the zero-voltage level.

## Operation (con't)

### Charge Mode

In addition to surface voltage measurements, electric charge can also be measured by changing the ES3 measurement mode from kilovolts (kV) to nanocoulombs (nC). This is done by pressing the "Menu" button, then touching "Mode: Voltage (kV)", so that it reads "Mode: Charge (nC)", and then touching "Exit". The maximum charge that can be measured is 10nC ( $10 \times 10^{-9}$  coulombs), both positive and negative polarity. The resolution is one picocoulomb. The alarm function does not work in the charge mode.

In charge mode, you can measure the total charge that is on the one-inch diameter sensor disc. For example, this can be used to measure the amount of charge per area that accumulates on the sensor disc at a given distance from an air ionizer. This technique can also be used to determine if the positive and negative ions are balanced. If balanced (desirable when using ionizers to discharge static electricity), no net charge should accumulate on the metal disc.

The charge mode also allows you to measure the charge per area on an insulator. However, on *metal or conductive* surfaces, charges can easily move around in response to nearby grounded objects such as the probe sensor. Therefore, charge per area is not well-defined, and when measuring metal surfaces, use the voltage mode (kV), not charge mode (nC). (Voltage is well-defined on conductive surfaces, whereas charge per area is not.) Hold the probe close to the charged insulator (usually closer than one inch) to measure the total charge on an area equivalent to a one-inch circle (about 4 cm<sup>2</sup> of area). In addition, when holding the probe upright, small charged objects or powders can be placed directly on the metal sensor disk to measure their total charge. Maximum range is 10.000nC.



When using either the voltage or the charge mode, it is possible that ions floating in the air may alter the total charge on the disc, slowly building up an error in the zero-voltage (or zero-charge) level. When measuring voltages, periodically check to see if the reading goes back to zero when the probe is placed back in what should be zero voltage environment. If this level has drifted, simply press the "Zero" button again. When measuring charge, always press the zero button first (with the probe away from any charged surface) before making a measurement.

### Rapid Scanning and Peak Function

You can rapidly scan an object surface, if required, with this meter. In the "Peak" area of the screen, the highest positive and highest negative voltages will be displayed. The capture time for these peak values is 5 milliseconds, so even a rapid scan will find voltage hotspots. You can reset the peak values at any time by pressing the "Peak Reset" button. This will not alter the zero-voltage level. However, if you press the "Zero" button, it will reset both the peak values and the zero-voltage level simultaneously.

### Streaming and Recording Data

Data recording and streaming via USB-C will also be supported by a new version of AlphaApp coming Q2 2024. This, along with all upcoming new features, will be possible to download free of charge onto existing ES3 units via the internet.

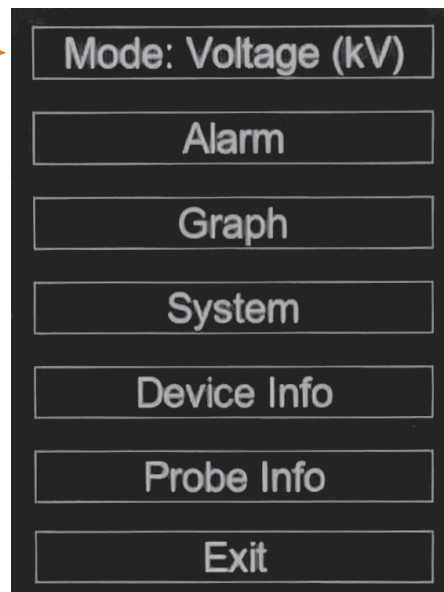
# System Settings

## Main Menu

Pressing Mode toggles between Voltage in kiloVolts (kV) and Charge in nanocoulombs (nC).

Use Voltage (kV) for non-contact measurement of static fields.

Use nanoCoulombs (nC) for measurement of the static charge of small objects, and powders placed directly on the sensor disk. Also measures total charge on the surface of insulators and output of ionizers.



- ← Press for Alarm Settings
- ← Press for Graph Settings
- ← Press for System Settings
- ← ES3 Specific Information
- ← Attached Probe Specific Information
- ← Return to the Main Screen

The ES3 can sound an alarm if the voltage exceeds an alarm level that you set. The alarm response time is a very fast 5 milliseconds, so large surfaces can be scanned quickly, if required. The alarm will sound whether the voltage is negative or positive. The alarm function can be accessed by pressing the "Menu" button (must be in kV mode), then by touching "Alarm" on the screen. By touching the "Value" box, the alarm level can be set anywhere from one volt to 20 kilovolts. Enter the number using the displayed keypad, then press the box with a check mark. There are three settings for the alarm: "Disabled" means the alarm will not sound, "Standard" means the alarm sounds only while the voltage exceeds the amount you set, either positive or negative, and "Variable" means the alarm begins to sound at a low frequency, which becomes higher as the reading nears the level you set. To return to the menu, touch "Exit", Then touch "Exit" on the menu screen.

### Select Tone Type

Standard:

Tone activates only when reading exceeds Set Alarm Level

Variable:

Alarm Tone starts at 10% of Level, with the pitch reaching maximum at 100% of Set Level

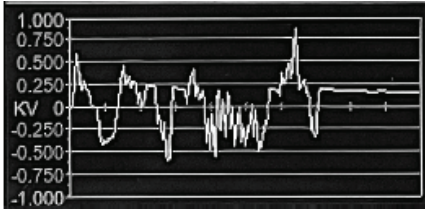


Audio On/Off  
In Audio 'Off' Mode, Alarm Indicates on the Screen Only

Alarm Set Level

The Alarm configuration can also be adjusted from the main screen, by touching zones in the alarm area. The alarm icon adjusts the audio mode, and touching the alarm number will allow you to change it.

## System Settings (con't)

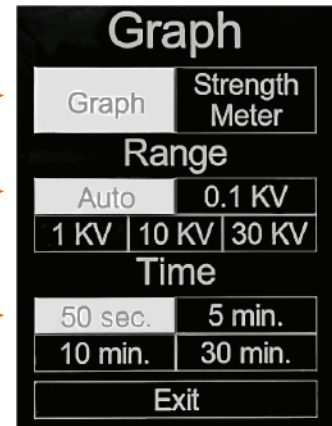


A rolling graph displays the voltages recorded over the previous 50 seconds to 30 minutes (selectable). It is auto or manual scaling. Press the "Menu" button then touch "Graph" to adjust.

Select Graph Mode  
Toggles between Rolling Plotter  
or Strength Bar displayed on  
Main Screen

Select Graph Range to Auto  
Scale or Lock to a Voltage  
Range

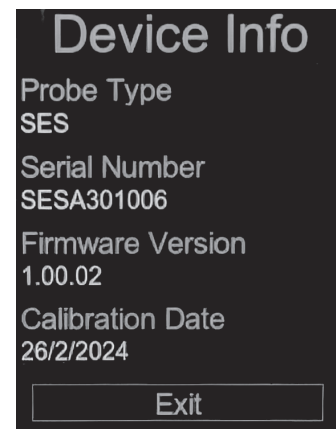
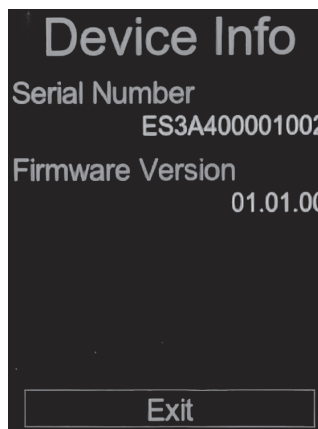
Select Data Time - Amount of  
data on the screen



From the main menu screen, "System" is used to select one of the three preset themes and to set the brightness level. "Timeout" settings for when the meter will power down due to inactivity are also available. Touching the screen or pressing a button will reset this timer.

Pressing "Device Info" will display the serial number and firmware version for the meter. Device firmware updates will appear on the ES3 product page under support along with installation instructions as they become available: <https://www.alphalabinc.com/products/es3/>.

"Probe Info" (must have a probe attached) will display data from the probe including probe type, serial #, preset firmware, and calibration date.



## Warranty

All AlphaLab, Inc. meters come with a one-year limited warranty from the date of purchase under normal use and service. This warranty is valid to the original purchaser only and is non-transferable. The consumer forfeits the benefits of this warranty if the product's main assembly is opened or tampered with by anyone other than an authorized AlphaLab, Inc. technician.

Please visit <https://www.alphalabinc.com/terms-and-conditions/#return> or email [trifield@trifield.com](mailto:trifield@trifield.com) for more information.



# Specifications

<b>Range at 1":</b>	0 to ±29.999 kV (29999 Volts)
<b>Resolution at 1":</b>	0.001 kV (1 Volt)
<b>Accuracy:</b>	±2% of reading
<b>Capacitance (to ground) of Sensor:</b>	3 nF
<b>Drift: (if air ions are not present, RH&lt;90%)</b>	< 0.001 kV/ 10 seconds
<b>Leakage Half Life: (if air ions are not present, RH&lt;85%)</b>	> 10 hours
<b>Peak Capture Speed:</b>	0.005 sec.; > 98% response for > 0.015 sec. pulse
<b>High-Voltage Alarm:</b>	Sounds Automatically > 20 kV
<b>Adjustable Alarm Range:</b>	.010 kV - 20 kV
<b>Output (1/8" Jack):</b>	Real-time waveform fast response; 1 volt per 10kV signal
<b>Battery:</b>	Internal 2000mAh LiPo
<b>Runtime per charge:</b>	6 hours (Max screen brightness), 20 hours (Min screen brightness)
<b>Recharge:</b>	Charge over USBC. Empty to full in 2.5 hours with USB 3.0/3.1; or 4 hours with USB 2.0/2.1
<b>Environmental:</b>	-1 °C to 43 °C (30°F to 110°F) 0-85% RH
<b>Size:</b>	4.5 X 3 X 1.2 inches; 115 X 72 X 30 mm
<b>Weight:</b>	160 g; 5.5 oz



The ElectroStat™ Surface Electricity Meter Model ES3 is Made in the USA by:

**ALPHALAB INC.**

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