

# Static Field Meter & Ionization Test Kit Operation and Maintenance



Made in the  
United States of America



Figure 1. Desco 19442 Digital Static Field Meter

The Desco 19443 Air Ionization Test Kit includes and utilizes the 19442 Digital Static Field Meter to measure the offset voltage (balance) and charge decay of ionization equipment. The Air Ionization Test Kit also includes a charger used to place a  $\pm 1000V$  charge on the conductive plate, making it possible to also measure the discharge times of air ionization equipment per ANSI/ESD SP3.3 Periodic Verification of Air Ionizers.

Although not as accurate, the Desco Air Ionization Test Kit is designed to make measurements that correspond to those made by using a charged plate monitor and ANSI/ESD STM3.1. The Air Ionization Test Kit provides convenience and portability to test per ANSI/ESD SP3.3 Periodic Verification of Air Ionizers or Compliance Verification ESD TR53. Desco recommends using the 770004 or 770005 Charged Plate Analyzer if precise measurements are required.



Figure 2. Desco 19443 Air Ionization Test Kit

All Digital Static Field Meters and Air Ionization Test Kits are calibrated to NIST standards and include a certificate.

“When any object becomes electrostatically charged, there is an electrostatic field associated with that charge. If an ESDS (ESD sensitive) device is placed in that electrostatic field, a voltage may be induced on the device. If the device is then momentarily grounded, a transfer of charge from the device occurs as a CDM (Charged Device Model) event. If the device is removed from the region of the electrostatic field and grounded again, a second CDM event will occur as charge (of opposite polarity from the first event) is transferred from the device.” (Handbook ESD TR20.20 section 2.7.5 Field Induced Discharges)

The Digital Static Field Meter, Air Ionization Test Kit, and its accessories are available as the following item numbers:

## Description

The Desco 19442 Digital Static Field Meter indicates surface voltage and polarity on objects. The meter has a measurement range of 0 to  $\pm 19.99$  kV at a distance of 1 inch and a measurement accuracy of  $\pm 5\%$ . It utilizes a chopper-stabilized sensor for use in both normal and ionized environments. The meter’s enclosure is dissipative and features a 7 mm snap and ground cord for bonding to equipment ground. A rotary zero knob sets the zero-reference point with finely tuned precision, and a Hold button allows the user to “freeze” a displayed measurement for evaluation. A LED range indicator assists with placing the meter at the correct distance from the object being measured.

Item	Description
<a href="#">19442</a>	Digital Static Field Meter
<a href="#">19443</a>	Air Ionization Test Kit
<a href="#">19440</a>	Conductive Plate and Charger
<a href="#">19441</a>	Conductive Plate

## Packaging

### 19442 Digital Static Field Meter

- 1 Digital Static Field Meter
- 1 Coiled Ground Cord, 12' length
- 1 9V Alkaline Battery
- 1 Certificate of Calibration

### 19443 Air Ionization Test Kit

- 1 Digital Static Field Meter
- 1 Conductive Plate
- 1 Charger
- 1 Coiled Ground Cord, 12' length
- 2 9V Alkaline Battery
- 1 Carrying Case
- 1 Certificate of Calibration

### 19440 Conductive Plate and Charger

- 1 Conductive Plate
- 1 Charger
- 1 9V Alkaline Battery
- 1 Carrying Case

### 19441 Conductive Plate

- 1 Conductive Plate



Figure 3. Air Ionization Test Kit and Carrying Case

## Features and Components

### Digital Static Field Meter

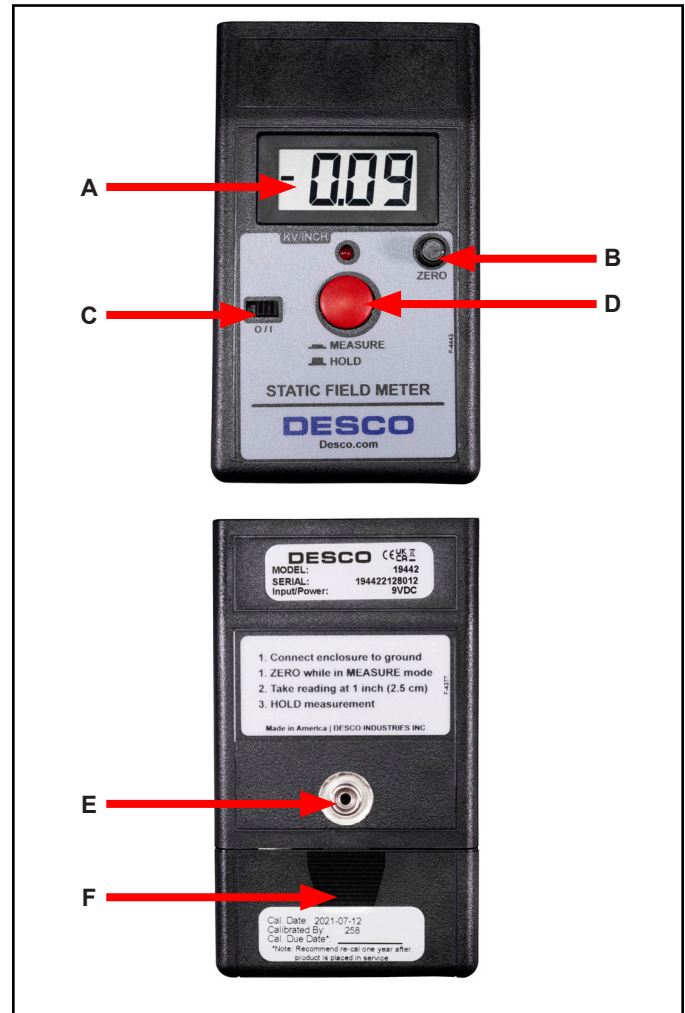


Figure 4. Digital Static Field Meter features and components

**A. Display:** Displays the measured value in kV/inch.

**B. Rotary Zero Knob:** Sets the 0 volt reference point.

**C. Power Switch:** Slide to the left to power the meter off. Slide to the right to power the meter on.

**D. Measure/Hold Pushbutton Switch:** Press the pushbutton to display live measurements. Release the pushbutton to freeze the measurement on the display. The red LED above the pushbutton will illuminate when HOLD is enabled.

**E. 7 mm Ground Snap:** Connect the included 7 mm coiled ground cord here to ground the meter.

**F. Battery Cover:** Slide the cover down to open the 9V battery compartment.

## Charger

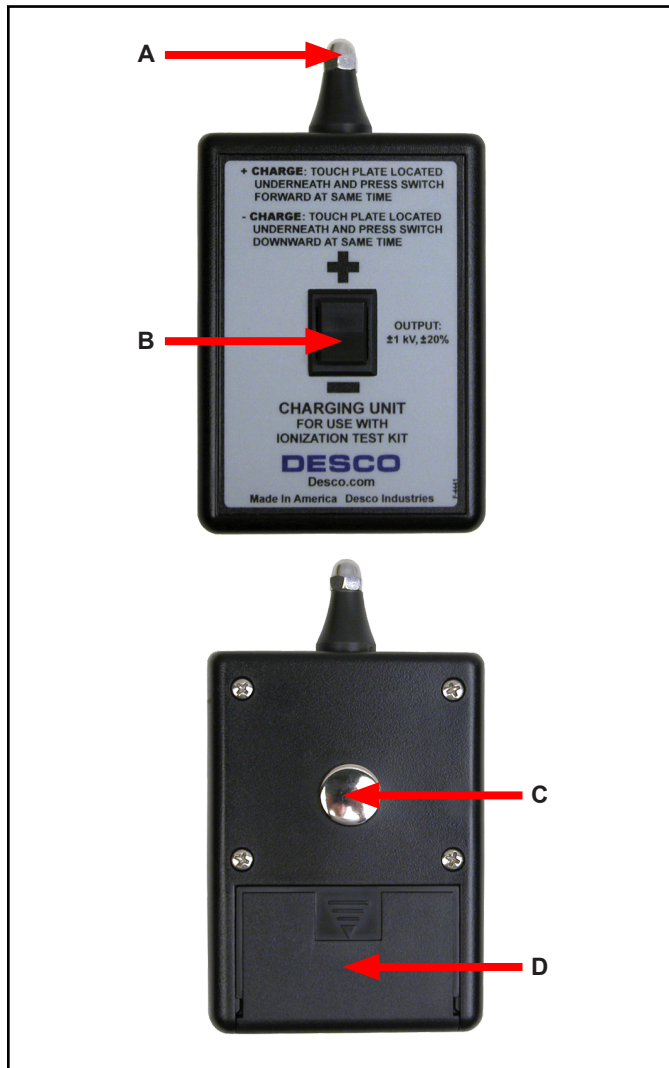


Figure 5. Charger features and components

**A. Output Contact:** The output contact is connected to an internal power source. When the touch plate located underneath the unit is connected to ground, the output contact will provide a charge of the indicated polarity. The charger is designed so that an operator can press the rocker switch and touch the plate simultaneously with the fingers of the same hand.

**B. Rocker Switch:** Press and hold to select the polarity that will be provided at the Output Contact.

**C. Touch Plate:** Make contact with the touch plate while pressing down the rocker switch to provide voltage to the Output Contact. The operator must be properly grounded during use.

**D. Battery Compartment:** Slide the cover down to open the 9V battery compartment.

## Operation

### Digital Static Field Meter

NOTE: The Digital Static Field Meter's enclosure is conductive. The instrument senses the difference in potential between the enclosure and the tested surface. The meter must be grounded by either the hand of a grounded operator or the included coiled ground cord to achieve accurate measurements.

#### Zeroing the Digital Static Field Meter

Slide the power switch to the right to power the Digital Static Field Meter. Point the top of the Digital Static Field Meter approximately 1 inch (2.5 cm) away from a grounded metal surface. Proper spacing is indicated when the two red bullseyes emitted LED range indicator become centered on top of each other. Turn the rotary zero knob until the Digital Static Field Meter's display reads 0.00.



Figure 6. Pointing the Digital Static Field Meter to a grounded surface



Figure 7. Aligning the two bullseyes emitted by the LED range indicator

### Performing a Measurement

Use the LED range indicator to position the top of the Digital Static Field Meter 1 inch (2.5 cm) from the object to be measured. The Digital Static Field Meter will display a reading (from 0 to  $\pm 19.99$ ) of the electrostatic field in kilovolts per inch.

NOTE: The display will indicate "1" or "-1" when the Digital Static Field Meter is over-ranged. Change the range of the unit if necessary. If the measurement exceeds 20 kV, move the Digital Static Field Meter farther away from the object and multiply the reading by the distance (in inches) away from the object being measured. The measurement accuracy is dependent on a stable ground reference and the 1 inch measuring distance. It is also dependent on the "aspect ratio", relating the size of the object to be measured to the measurement distance.

NOTE: This aspect ratio should be at least 3 for best accuracy. In other words, the object should be at least a 3 inch square when measuring at a 1 inch distance. Accurate measurements may be made at other measurement distances by scaling the Digital Static Field Meter range and observing the proper aspect ratio. For example, at a measurement distance of 3 inches, multiply the Digital Static Field Meter reading by 3 to give a range of 0 to 60 kilovolts. For accuracy, the object being measured at this distance should be at least a 9 inch square.

### Holding the Last Reading

With the Digital Static Field Meter positioned 1 inch (2.5 cm) from the object being measured, press the red pushbutton switch into the HOLD position. This will freeze the measurement on the display and illuminate the red LED located above the pushbutton switch. This feature allows the operator to move the Digital Static Field Meter where it may be more easily read or saved for later reference.

NOTE: The LED range indicator will disable while the Digital Static Field Meter is in HOLD mode. Use the HOLD feature between measurements to prolong the battery's life.

### Air Ionization Test Kit

#### Performing Offset Voltage (Balance) Measurements

The Air Ionization Test Kit has been designed to match the compact size and hand held convenience of the Digital Static Field Meter. Use the following procedure to verify the offset voltage (balance) of air ionization equipment. This quick and easy procedure will help determine if the piece of ionization equipment is working within the manufacturer's specifications or user requirements. It is extremely important that ionizers be checked regularly for offset voltage (balance) and discharge times. An ionizer operating in an out-of-balance state can place a charge on sensitive electronic components or assemblies.

NOTE: The Digital Static Field Meter's enclosure is conductive. The instrument senses the difference in potential between the enclosure and the tested surface. The meter must be grounded by either the hand of a grounded operator or the included coiled ground cord to achieve accurate measurements.

#### Installing the Conductive Plate

The Digital Static Field Meter's case has two slots along its sides. The top slot is closest to the face of the instrument. Slide down the tabs of the Conductive Plate plate into the top slot of the Digital Static Field Meter's case as far as they go.



Figure 8. Sliding the Conductive Plate onto the Digital Static Field Meter

### Zeroing the Digital Static Field Meter

Slide the power switch to the right to power the Digital Static Field Meter. Make contact between the top of the Conductive Plate and a grounded surface. Turn the rotary zero knob until the Digital Static Field Meter's display reads 0.00.

### Performing a Measurement

Locate the Test Kit in an ionized environment at the appropriate distance from the device under test. The static field displayed is the actual balance of the ionizer or voltage offset. The display will indicate "1" or "-1" when the Digital Static Field Meter is over-ranged. Change the range of the unit if necessary.

NOTE: When testing pulsed ionizer systems, the voltage displayed is constantly changing. This pulse rate may be faster than the display update rate of the Digital Static Field Meter, therefore the displayed voltage is an average of the actual voltage. The output of the Digital Static Field Meter is useful in this situation for more accurate measurements.



Figure 9. Using the Digital Static Field Meter with Conductive Plate to measure the offset voltage of a benchtop ionizer

### Holding the Last Reading

Press the red pushbutton switch into the HOLD position. This will freeze the measurement on the display and illuminate the red LED located above the pushbutton switch. This feature allows the operator to move the Digital Static Field Meter where it may be more easily read or saved for later reference.

### Performing Discharge Time Measurements

In order to verify that an ionizer is operating properly it is also important that its ability to neutralize or discharge static electricity is measured. The following procedure will measure an ionizer's discharge time:

### Operating the Charger

The Charger has a momentary rocker switch that powers the unit. Holding the switch forward / backward supplies power to the output terminals.

### Polarity Selection

The top of the rocker switch is labeled "+", and the bottom is labeled "-". To provide a POSITIVE voltage output, touch the plate located underneath the charger, and press the switch forward at the same time. To provide a NEGATIVE voltage output, touch the plate located underneath the charger, and press the switch downward at the same time.

NOTE: For the Charger to work correctly, the operator and Digital Static Field Meter must be properly grounded. A ground path to the touch plate must exist.

### Ionizer Discharge Time

Use the Digital Static Field Meter with the Conductive Plate in the appropriate location for measurements.

### Positive Discharge Time Measurements

To provide a POSITIVE voltage output, touch the plate located underneath the Charger, and press the switch forward at the same time. Momentarily touch the Charger's output terminal to the conductive plate attached to the Digital Static Field Meter. The Digital Static Field Meter reads approximately +1.10 kV. By using a stop watch or other timing device, determine the time needed for the voltages to decrease from +1.10 kV to +0.10 kV. This is the positive discharge time.

### Negative Discharge Time Measurements

To provide a NEGATIVE voltage output, touch the plate located underneath the Charger, and press the switch downward at the same time. Momentarily touch the Charger's output terminal to the conductive plate attached to the Digital Static Field Meter. The Digital Static Field Meter reads approximately -1.10 kV. By using a stop watch or other timing device, determine the time needed for the voltages to decrease from -1.10 kV to -0.10 kV. This is the negative discharge time.

NOTE: A ground path must be provided between the touch plate of the Charger and the ground reference of the Digital Static Field Meter. This is normally provided by holding the Charger in one hand and the Digital Static Field Meter with Conductive Plate in the other.



Figure 10. Using the Charger to apply a charge onto the Conductive Plate

## Maintenance

The Digital Static Field Meter and Charger are factory calibrated and no maintenance is required. Contact Desco Customer Service should the products behave abnormally. Any unauthorized service will void the warranty and result in additional repair charges.

NOTE: This Digital Static Field Meter is a precision instrument and should not be subjected to dropping as that would void the warranty.

### Replacing the Battery

The Digital Static Field Meter's battery should be replaced when a battery symbol appears on the display. The battery in the Charger should be replaced annually or when it is unable to provide approximately  $\pm 1100V$ . Always replace the batteries with a 9V alkaline or equivalent battery.

### Cleaning

The area around the aperture of the Digital Static Field Meter must be kept clean to ensure accurate, drift-free readings. Never touch the aperture. Use low-pressure instrument-grade air to remove dust or other debris. To remove more severe contamination, spray or flush with the smallest practical amount of clean technical-grade of isopropyl alcohol. Allow the instrument to air dry for several hours afterward.

Keep the insulators on the Aluminum Conductive Plate clean and free of contaminants that may cause surface leakage. To test the performance of the Conductive Plate, charge the plate and note the discharge rate in a non-ionized area. The self discharge rate to 10% of original voltage should be greater than five minutes.

## Calibration

### Digital Static Field Meter

Frequency of recalibration should be based on the critical nature of those ESD sensitive items handled and the risk of failure for the ESD protective equipment and materials. In general, Desco recommends that calibration be performed annually.

#### Equipment Needed

- 1 High Voltage Power Supply (10,000 V)
- 1 Voltmeter (with > 50 kilohms input impedance)
- 1 Cable with a 2.5 mm mono plug and secondary connector to interface with voltmeter.

#### Test Fixture

- 1 Metal Plate with 19.625 in<sup>2</sup> area or greater
- 1 Metal Stand for supporting the Digital Static Field Meter and holding its top face 1 inch away from the metal plate
- 2 Connectors on the metal plate with which it can interface with the high voltage power supply
- 1 Connector on the metal stand with which it can be connected to electrical ground

#### Procedure

1. Place the Digital Static Field Meter on the metal stand, and verify that its top face is placed exactly one inch away from the center of the metal plate.
2. Connect the stand to equipment ground.
3. Power the Digital Static Field Meter and set it to the low range.
4. Ground the metal plate, and zero the Digital Static Field Meter's display.
5. Disconnect the metal plate from equipment ground, and connect it to the high voltage power supply.
6. Apply a +1,000 V charge to the plate.
7. The Digital Static Field Meter should now display 1.000.
8. If the Digital Static Field Meter does not display 1.000, remove the battery door and use a screwdriver to turn the small trimpot located inside the battery compartment. Turn the trimpot until the display reads 1.000. This will calibrate the low range of the Digital Static Field Meter.
9. Repeat steps 6-8 for the high range on the Digital Static Field Meter and use a test voltage of 5,000 V.

## Specifications

### Digital Static Field Meter

#### Performance

Measurement Range	0 to ±19.99 kV / inch
Measurement Accuracy	Better than ±5% of reading, ±2 counts
Measurement Stability	±10 counts

#### Front Panel Meter

Voltage Display	3-1/2 digit LED display
Sampling Rate	3 readings per second

#### Features

Ranging System	LED distance indicator; aligned targets indicate 1"
Range	LED distance indicator
Rotary Zero Knob	Sets the zero-reference point
Low Battery Indicator	An LCD icon indicates when the battery is low
Hold Switch	Retains the LCD display reading when depressed

#### General

Dimensions	0.9" H x 2.8" W x 4.9"L (24 mm x 70 mm x 126 mm)
Weight	4.9 oz. (140 g) with battery
Operating Conditions	
<i>Temperature</i>	50 to 86°F (10 to 30°C)
<i>Relative Humidity</i>	To 80%, non-condensing
<i>Altitude</i>	To 2000 m
Certifications	CE

#### Power Requirements

Power	One (1) 9-volt alkaline battery
Operating Time	Greater than 50 hours, with a new battery at 21°C continuous

## Air Ionization Test Kit

Conductive plate Assembly	Aluminum bracket, bare aluminum plate and teflon spacers isolate plate from bracket
Voltage Output	1/1,000 of measured voltage @ low range 1/10,000 of measured voltage @ high range
Conductive plate Area	2.95" W x 1.18" L (7.5 x 3.0 cm)
Conductive plate Assembly Weight	2.4 oz. (68 g)
Charger Dimensions	1.1" H x 2.6" W x 4.5" L (2.8 x 6.6 x 11.4 cm)
Charger Weight	5 oz. (140 g) with battery
Charger Power Requirements	One 9-volt alkaline battery
Charger Output (using Digital Static Field Meter with conductive plate)	1.1 kV minimum for $\pm$ voltage
Certifications	CE

