

# ESD

**Electrostatic Discharge  
Measurement & Control Instruments Catalog**



An Advanced Energy Company

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*\*Note: Trek products are not rated for use in an explosive atmosphere*

# Model 520-1, Model 876 AC Feedback Electrostatic Voltmeters

## Features

- Non-contacting voltage measurement
- No need to maintain fixed spacing; accurate at a wide range of spacings
- Portable (battery operated)
- Good for difficult-to-reach locations (Model 876 has probe-on-cable design)
- Drift-free operation in ionized environments
- Low cost

## Applications

Static charge measurement for LCD, semiconductor devices, MR heads. Monitor electrostatic levels in IC production processes. Surface potential measurement of silicon wafers, films and papers. Materials testing. Standard static charge measurements.

## Specifications

Measurement Range .....	0 to $\pm 2$ kV
Voltage Display .....	0 to $\pm 1999$ V
Voltage Resolution .....	1V
Probe-to-Surface Separation .....	Range of 5 to 25mm
Accuracy .....	$\pm 5\%$ (Full Scale)
Speed of Response .....	400ms
Operating Conditions	
Temperature .....	15 to 35°C
Relative Humidity .....	to 85%RH, noncondensing
Power Supply .....	9V alkaline battery (1)
Dimensions .....	5.9cm W x 3.1cm H x 14.6cm L (without cable sensor)
Weight .....	185g



Model 520-1



Model 876

Model 520-2 (with analog output function)

Output Ratio .....	1/1000 of the measured voltage
Speed of Response .....	25ms
Output Terminal .....	1.3mm jack



(CE compliant)\*

# Model 523-1, Model 884 AC Feedback Electrostatic Voltmeters

## Features

- Non-contacting voltage measurement
- No need to maintain fixed spacing; accurate at a wide range of spacings
- Portable (battery operated)
- Good for difficult-to-reach locations (Model 884 has probe-on-cable design)
- Drift-free operation in ionized environments
- Low cost

## Applications

Static charge measurement for LCD, semiconductor devices. Monitor electrostatic levels in IC production processes. Surface potential measurement of silicon wafers, films and papers. Materials testing. Standard static charge measurements.

## Specifications

Measurement Range .....	0 to $\pm 20$ kV
Voltage Display .....	0 to $\pm 19.99$ kV
Voltage Resolution .....	10V
Probe-to-Surface Separation .....	Range of 30 to 60mm
Accuracy .....	$\pm 5\%$ (Full Scale)
Speed of Response .....	400ms
Operating Conditions	
Temperature .....	15 to 35°C
Relative Humidity .....	to 85%RH, noncondensing



Model 523-1



Model 884

Power Supply .....	9V alkaline battery (1)
Dimensions .....	5.9cm W x 3.1cm H x 14.6cm L (without cable sensor)
Weight .....	200g



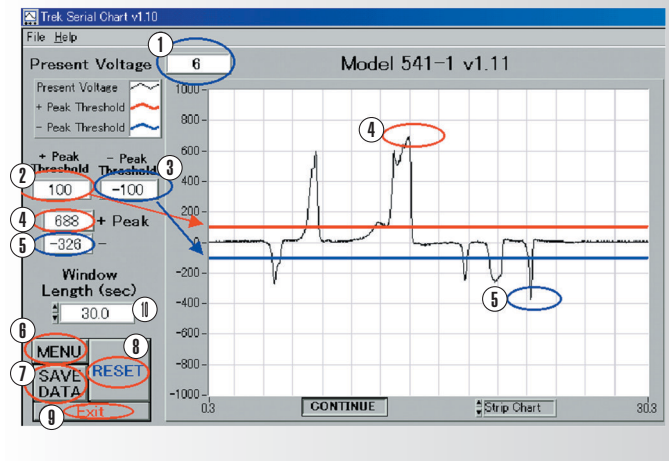
(CE compliant)\*



# Model 541A, 542A Application Software

## Explanation of the Screen

1. Voltage display (V) ..... Display measured voltage
2. Positive (+) threshold (V) ..... Set the level
3. Negative (-) threshold (V) ..... Set the level
4. Positive (+) peak value (V) ..... Display maximum voltage value of positive (+) side
5. Negative (-) peak value (V) ..... Display maximum voltage value of negative (-) side
6. Menu screen ..... Display the screen setting of the measurement
7. Data save ..... Save measurement value
8. Reset ..... Reset the peak value
9. Exit ..... Terminate the software
10. Length of time ..... Select the length of time for displaying the measurement value (storage time)



To enhance the utility of Model 541A and Model 542A, Trek provides application software (available for download at [www.trekinc.com](http://www.trekinc.com)) and a USB or RS-232 serial port on both models for interfacing with a Windows® PC.

Trek's software thereby enables touchscreen setting of threshold values and preservation of data. The data can be viewed graphically (screen shot above), in real time. Other PC-friendly adjustments include threshold setting, alarm ON/OFF, and storage time.

# Model 821HH InfiniTron® Hand-Held Contacting Electrostatic Voltmeter

## Features

- Portable, battery-operated, compact design
- Trek contacting technology enables precise surface voltage measurements
- Measure conductive and insulative objects/surfaces with virtually zero charge transfer to the measurement probe
- Save test data to internal memory
- Data graphing capabilities (via connection with PC)

## Specifications

Input Characteristics.....	Resistance >10 <sup>14</sup> , Capacitance <10 <sup>-14</sup> F
Measurement Range.....	0 to ±2kV DC or peak AC
Bandwidth.....	1kHz (-3dB)
Accuracy.....	±1% (Full Scale)
Operating Conditions	
Temperature.....	15 to 35°C
Relative Humidity.....	5 to 75%RH, noncondensing
Power Supply .....	Internal NiMH battery (approx. 8 hours continuous usage from a full charge) or external 15V @ 1A supply/charger for line operation
Dimensions.....	14.0cm W x 24.0cm H x 5.25cm D
Weight .....	1.13kg (includes battery)



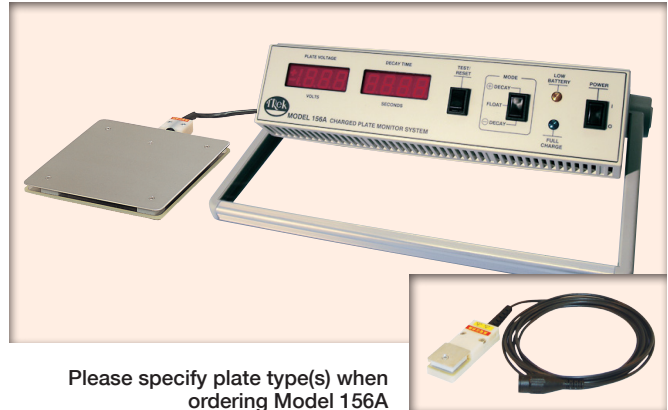
# Model 156A Charged Plate Monitor

## Features

- Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
- Mode of operation is easy to select via three-position toggle switch
- Standard ion collection plate, 6" x 6"

## Specifications

Measurement Range ..... 0 to  $\pm 1100V$  DC or peak AC  
 Small Signal Bandwidth ..... 1kHz (-3dB)  
 Output Monitor ..... 1/200 of the plate voltage  
 Accuracy .....  $\pm 0.1\%$  (Full Scale)  
 Offset Voltage .....  $\pm 10mV$   
 Output Noise ..... 10mV rms  
 Operating Conditions  
 Temperature ..... 5 to 35°C  
 Relative Humidity ..... to 80%RH, noncondensing  
 Power Supply ..... Built-in rechargeable battery (approx. 8 hours of continuous usage from a full charge) or by using a recharge/operating AC adapter. AC power adapter for all global areas is available.



Please specify plate type(s) when ordering Model 156A

Dimensions ..... 31.8cm W x 8.3cm H x 28.0cm D  
 Weight ..... 2.0kg



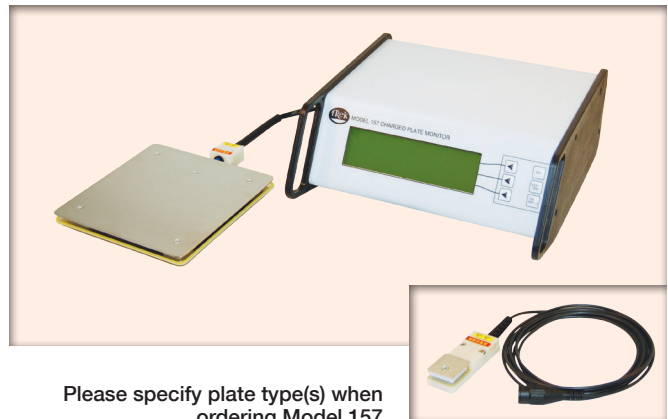
# Model 157 Charged Plate Monitor

## Features

- Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
- Store & retrieve data as data points or graphs; internal memory
- USB connection (to PC) enables real time data
- Connect to the optional Thermohygrometer Kit (Omega Model HH331)
- Bar code wand also available

## Specifications

Measurement Range ..... 0 to  $\pm 1020V$  DC or peak AC  
 Large Signal Bandwidth ..... 80Hz (-3dB)  
 Monitor Output ..... 1/200 of the plate voltage  
 Accuracy .....  $\pm 0.1\%$  (Full Scale)  
 Offset Voltage ..... under  $\pm 10mV$   
 Output Noise ..... 10mV rms  
 Operating Conditions  
 Temperature ..... 5 to 35°C  
 Relative Humidity ..... to 80%RH, noncondensing  
 Power Supply ..... Built-in rechargeable battery (approx. 8 hours of continuous usage from a full charge) or by using a recharge/operating AC adapter. AC power adapter for all global areas is available.



Please specify plate type(s) when ordering Model 157

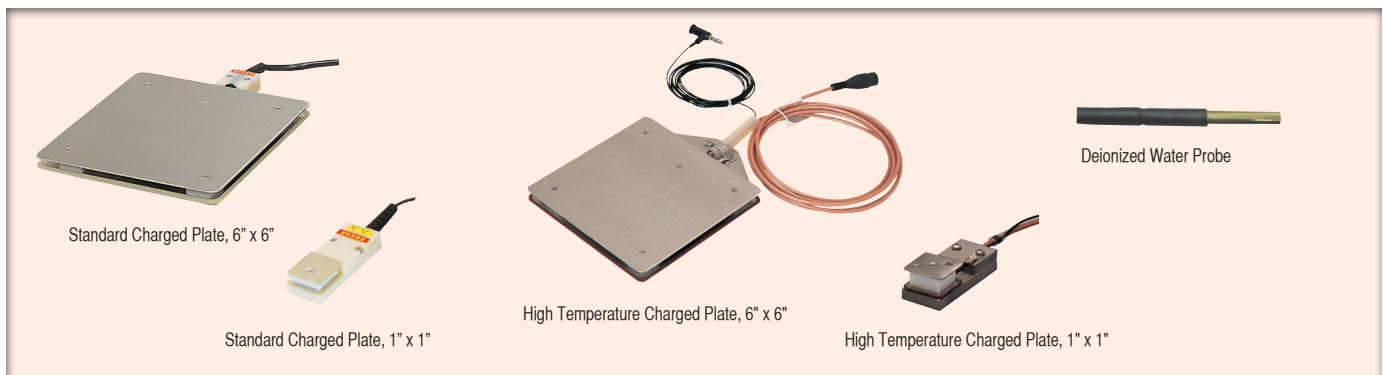
Dimensions ..... 25.4cm W x 10.2cm H x 24.1cm D  
 Weight ..... 2.0kg



## Ion Collecting Plates (can be used with Model 156A and 157)

Standard Charged Plate, 15cm x 15cm (6" x 6") - Model 156AP-C150x150-R3M\*\*;  
 Standard Charged Plate, 25mm x 25mm (1" x 1") - Model 156P-C25x25-S3M;  
 High Temperature Charged Plate, 15cm x 15cm (6" x 6") - Model 156P-HT-150x150-R3M\*\*;  
 High Temperature Charged Plate, 25mm x 25mm (1" x 1") - Model PD04002AP

\*\* Complies with IEC 61340 Standard Note: Other sizes and shapes of charge plates are available. Deionized water probes are also available (PM08035)



Standard Charged Plate, 6" x 6"

Standard Charged Plate, 1" x 1"

High Temperature Charged Plate, 6" x 6"

High Temperature Charged Plate, 1" x 1"

Deionized Water Probe

# Model 158A Charged Plate Monitor

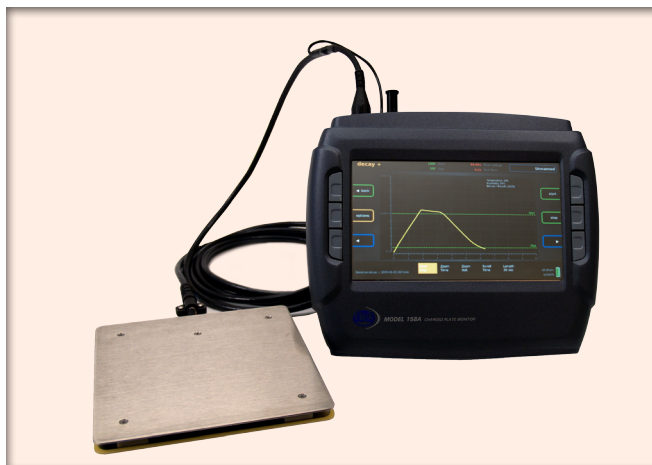
Trek Model 158A Charged Plate Monitor is the premier instrument to evaluate the performance of air ionization systems. Its design includes a color graphics display for viewing of discharge waveforms and offset voltage in the time domain and the ability to store test data and waveforms for hundreds of ionizer tests. This unit employs Trek's patented voltage-follower technique to provide accuracy, stability and bandwidth well beyond the performance capabilities of field meter technology.

## Features

- Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
- User-friendly compact design
- Superior data collection and storage capability
- Large LCD color graphic display
- Navigate via touch screen or function keys
- Standard ion collecting plates available (see below)
- Operate in Float Mode, (+) Decay Mode, or (-) Decay Mode
- Programmable voltage balance and (+) and (-) discharge time
- Performs float voltage and discharge time EOS/ESD measurements
- Allows multiple operational and programing options
- Can be pre-set to perform automated tests
- Can store/retrieve previously defined test parameters
- Test data can be saved for future reference/retrieval
- Long battery life
- USB port enables data transfer
- Optional barcode scanner with bluetooth technology

## Specifications

Measurement Range ..... 0 to  $\pm 1100V$  DC or peak AC  
Large Signal Bandwidth..... 80Hz (-3dB)  
Monitor Output..... 1/200 of the plate voltage  
Accuracy.....  $\pm 0.1\%$  (Full Scale)  
Offset Voltage.....  $\pm 10mV$   
Output Noise..... 10mV rms<sup>2</sup>  
Operating Conditions  
Temperature..... 5 to 35°C  
Relative Humidity..... to 80%RH, non-condensing



Please specify plate type(s) when ordering Model 158A.  
A Model 158A Charged Plate Monitor Kit is also available.  
See details below.

Power Supply ..... Built-in rechargeable battery (approx. 6 hours of continuous usage from a full charge); can also be operated using the supplied AC adapter.  
Dimensions..... 22.6cm W x 5.3cm H x 18.7cm D  
Weight ..... 2.2kg

## Ion Collecting Plates

Standard ion collecting plates are ordered separately; standard 6" x 6" plate and standard 1" x 1" plate are available. Refer to relevant photos on prior page.

## Model 158A Charged Plate Monitor Kit

This kit includes Model 158A charged plate monitor, standard 6" x 6" collecting plate, standard 1" x 1" collecting plate, charged plate handle, walking test adapter assembly, mini-tripod, and custom carrying case.

# Model 511/1501 ESD Audit Kit



Trek's Model 511/1501 ESD Audit Kit includes the Model 511 Ionizer Kit (electrostatic field meter, charger, and charge plate) and Model 1501 (surface resistance meter) in a compact carrying case. Please refer to specifications below. Most items can be ordered individually. Refer to details below.



The carrying case and all of its contents are shown (far left). The kit as packaged for delivery is also shown (near left). Orders in the USA include ground plug adaptor, AC receptacle tester, and 2.75W charger/USB adaptor. (below).

 (CE compliant)\*



USA only

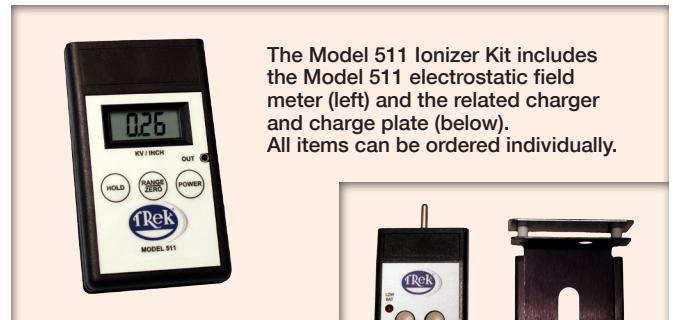
## Model 511 Electrostatic Field Meter

### Features

- Switch selectable measurement range
- Hand-held, portable, non-contacting
- Chopper-stabilized technology
- Reliable in ionized or non-ionized environments
- Complies with ANSI/ESD SP3.3

### Specifications

Measurement Range (per inch).....0 to  $\pm 2kV$ ...OR... 0 to  $\pm 20kV$   
 Measurement Accuracy  
 Voltage Monitor Output.....better than  $\pm 5\%$  of reading,  $\pm 10mV$   
 Voltage Display.....better than  $\pm 5\%$  of reading,  $\pm 2$  counts  
 Operating Conditions  
 Temperature.....10 to  $30^{\circ}C$   
 Relative Humidity.....to 80%RH, non-condensing  
 Power Supply .....9V alkaline battery (1), included



The Model 511 Ionizer Kit includes the Model 511 electrostatic field meter (left) and the related charger and charge plate (below). All items can be ordered individually.

 (CE compliant)\*

Dimensions.....2.4cm H x 7.0cm W x 12.6cm L  
 Weight .....140g (with battery)

## Model 1501 Surface Resistance Meter

### Features

- Auto-ranging
- Lightweight, hand-held
- Displayed values can be stored in internal memory
- Records temperature and relative humidity
- Built-in electrodes with conductive rubber
- Appropriate electrodes can be externally connected for tests (IEC 61340: -4-1, -2-3, -4-5; ANSI/ESD: S4.1-2006; ANSI/ESD STM: 11.11-2006, 11.12-2007, 11.13-2004, 12.1-2006, 97.1-2006)

### Specifications

Measuring Range .....  $10^3$  to  $10^{12}$   
 Display Range .....  $1 \times 10^z$  to  $9 \times 10^z$  where z = measuring range exponent  
 Accuracy .....10% to 25% of reading (depends on measuring range)  
 Operating Conditions  
 Temperature..... -5 to  $40^{\circ}C$   
 Relative Humidity.....to 75%RH, non-condensing



 (CE compliant)\*

Power Supply ..... Rechargeable lithium battery, 3.6V 900mAh  
 Dimensions..... 14.5cm H x 8.0cm W x 3.5cm D  
 Weight .....290g



# Model 152-1 Surface Resistance / Volume Resistance Meter

## Features

- Accuracy, stability and repeatability in a lightweight, portable design
- Complies with IEC 61340-5-1 for Surface Resistance Measurements
- Complies with IEC 61340-2-3 for Volume Resistance Measurements
- Technique used to measure surface resistance and volume resistance conforms to ANSI/ESD Association standards (STM2.1, 4.1, 7.1, 9.1, 11.11, 11.12, 12.1, 11.13, 97.1)
- Wide measurement ranges of  $10^3$  to  $10^{13}$
- Variety of probes available (see photo at right)
  - Model 152P-CR-1 ..... Surface resistance/volume resistance (center top)
  - Model 152P-2P ..... Two-point surface resistance (center bottom)
  - Model 152BP-5P ..... Point-to-point surface resistance (lower right)
  - Model 152AP-3mm x 25.4mm ..... Miniature resistance probe (pair)
  - Part CN 1K039 ..... Walking test adapter kit (lower left)



## Specifications

Measurement Range .....  $10^3$  to  $10^{13}$   
 (using probe 152BP-5P, 152P-2P, or 152P-CR-1)  
 Test Voltage ..... Select 10V or 100V ( $\pm 2\%$ ) using the selection switch  
 Power Supply ..... Two 9V alkaline batteries provide approx. 6 hours of power for portable operation. AC line adapter available for all global areas.

Operating Conditions  
 Temperature ..... 15 to 35°C  
 Relative Humidity ..... 5 to 80%RH, noncondensing  
 Dimensions ..... 10.0cm W x 18.0cm H x 4.4cm D  
 Weight ..... 500g (includes battery)



# Model 901HS High-Sensitivity ESD Event Detector

## Features

- Sensitive to ESD voltage levels as low as 10V at 50mm
- Well-suited for Charge Device Model (CDM) and discharge between metallic electrodes
- ESD event detection conveyed through visual and audible alert systems
- Good for difficult-to-reach locations (antenna-on-cable design)
- Compact, lightweight design and highly accurate data
- Operates on four AA batteries; AC power adapter for continuous
- Alternate antenna for less sensitive detection (50V @ 90mm)

## Specifications

Indicators ..... Audible alarm and 5 color-coded LEDs to visually indicate intensity  
 Alarm ..... Automatic or manual reset control  
 Dimensions ..... 8.0cm W x 11.0cm H x 4.5cm D  
 Weight ..... 500g (includes battery)



# Model 950 Nozzle Ionizer

The Model 950 is a nozzle type air ionizer which removes dust contamination and eliminates static electricity by use of high pressure ionized air flow. The compact nozzle body contains a built-in high-voltage power supply and an abnormal operation detection/warning output circuit. Model 950 is operated by connecting a compressed air supply and a 24V power supply to the unit.

Using a high-frequency corona discharge, Model 950 enables the efficient elimination of static electricity. Selection of specific nozzles (from a variety of options, as shown on p.7) to transfer ionized air provides utility for Model 950 in a wide range of applications. The Model 950 uses an LED display and contact output to indicate abnormal conditions. The high voltage supply and ionizing electrode can be replaced easily through the back of the unit. These features facilitate easy cleaning and maintenance at the production line site, thereby reducing downtime.



Please specify nozzle type(s) when ordering Model 950

## Features

- Ultra-small compact body
- High voltage failure and emitter needle contamination detector function
- Outputs a relay signal when abnormal operating conditions occur
- Optional tubes allow transfer of ionized air to remote or difficult-to-reach locations
- Easy maintenance – built-in power supply with a replaceable emitter unit makes for easy cleaning and replacement
- Excellent ion balance
- A wide range of optional nozzles and tubes for various applications

How to replace or clean the discharge needle



LED Display (displays the information shown in the chart below)



Rear of the unit showing the discharge needle access and the connector for power input, output signal, and failure alarm output relay signal

## Operating Conditions – LED Indicators

Condition	“Power” Green LED	“H. V.” Green LED	“C. C.” Yellow LED	“Alarm” Red LED
Normal Operation	•	•		
H.V. Malfunction	•			•
Maintenance Needed (clean the needle)	•	•	•	
H.V. Output Off	•			
Power Off				

# Specifications

Discharge Method .....High-frequency AC corona discharge method  
 Input Power Supply Voltage .....24V DC±10%  
 Power .....2.4VA  
 Air Purge-Operation Pressure ..... 0.05 to 0.6MPa  
 Dimensions.....8.65cm D x 1.8cm W x 5.0cm H (main unit only)  
 Weight .....Approx. 80g (main unit only)  
 Operating Conditions  
 Temperature.....0 to 40°C  
 Relative Humidity..... 15 to 65%RH, noncondensing

Ozone Density..... 0.05ppm or less (at a distance of 300mm from air outlet)  
 Ion Balance.....±15V or less (0.05 to 0.5MPa)  
 Material .....Enclosure: ABS  
 Cover: stainless steel  
 Discharge needle: tungsten  
 Air Piping Dimension ..... 6mm O.D.



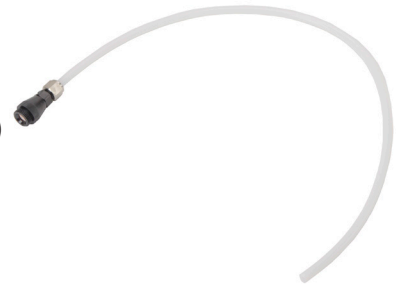
## Model 950 Optional Parts (length, material type and part numbers as noted)



Seamless carrier pipe nozzle  
 (950-C200 in photo)  
 100mm 950-C100  
 200mm 950-C200  
 300mm 950-C300  
 400mm 950-C400  
 500mm 950-C500



Bar nozzle  
 (950-200B in photo)  
 100mm 950-100B  
 200mm 950-200B  
 300mm 950-300B



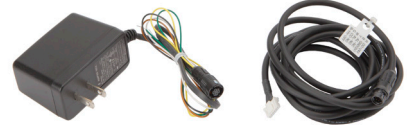
Carrier tube nozzle  
 (950-TT in photo)  
 Teflon carrier tube nozzle 950-TT  
 Silicon carrier tube nozzle 950-ST



Shower nozzle  
 950-60S



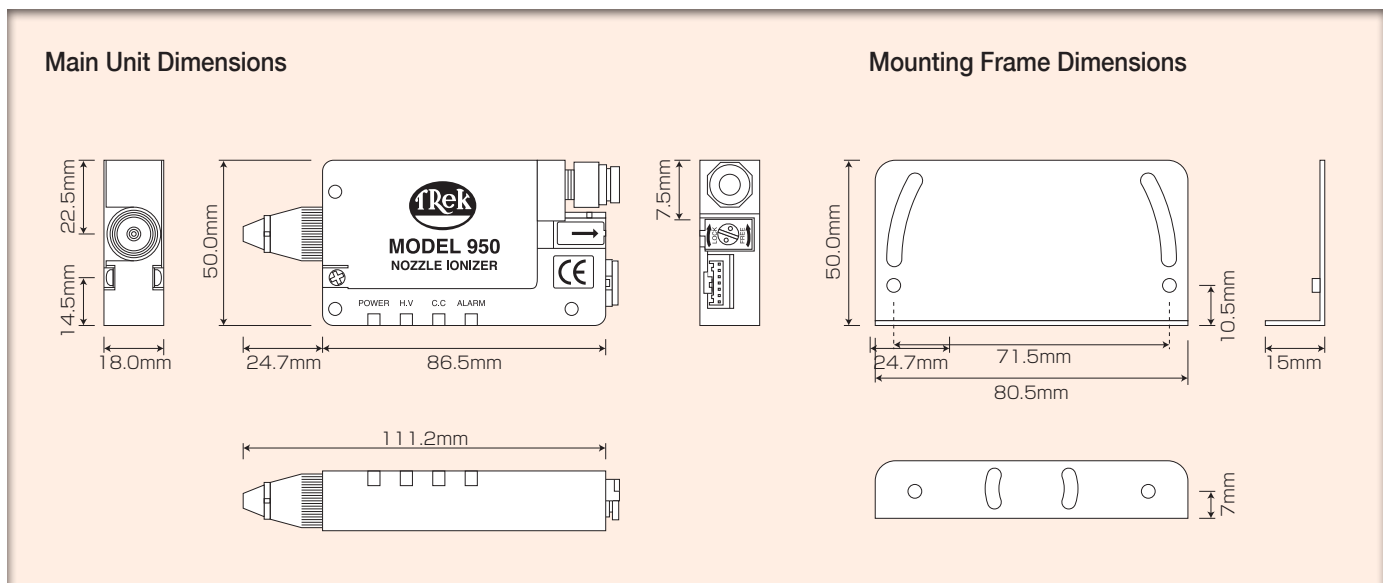
Flat nozzle  
 950-F



AC Adapter (950-24VA in photo)  
 950-24VA AC Adapter  
 (power supply + signal cable + grounding wire)  
 950-24V AC Adapter  
 (power supply only)

## Model 950 Other Optional Parts (part numbers as noted)

Bar nozzle L-type 950-100BL 950-200BL	Pipe nozzle 950-120PSP	Mounting Frame 950-FM
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# Electrostatic Voltmeters: Measurement Distance & Measurement Area

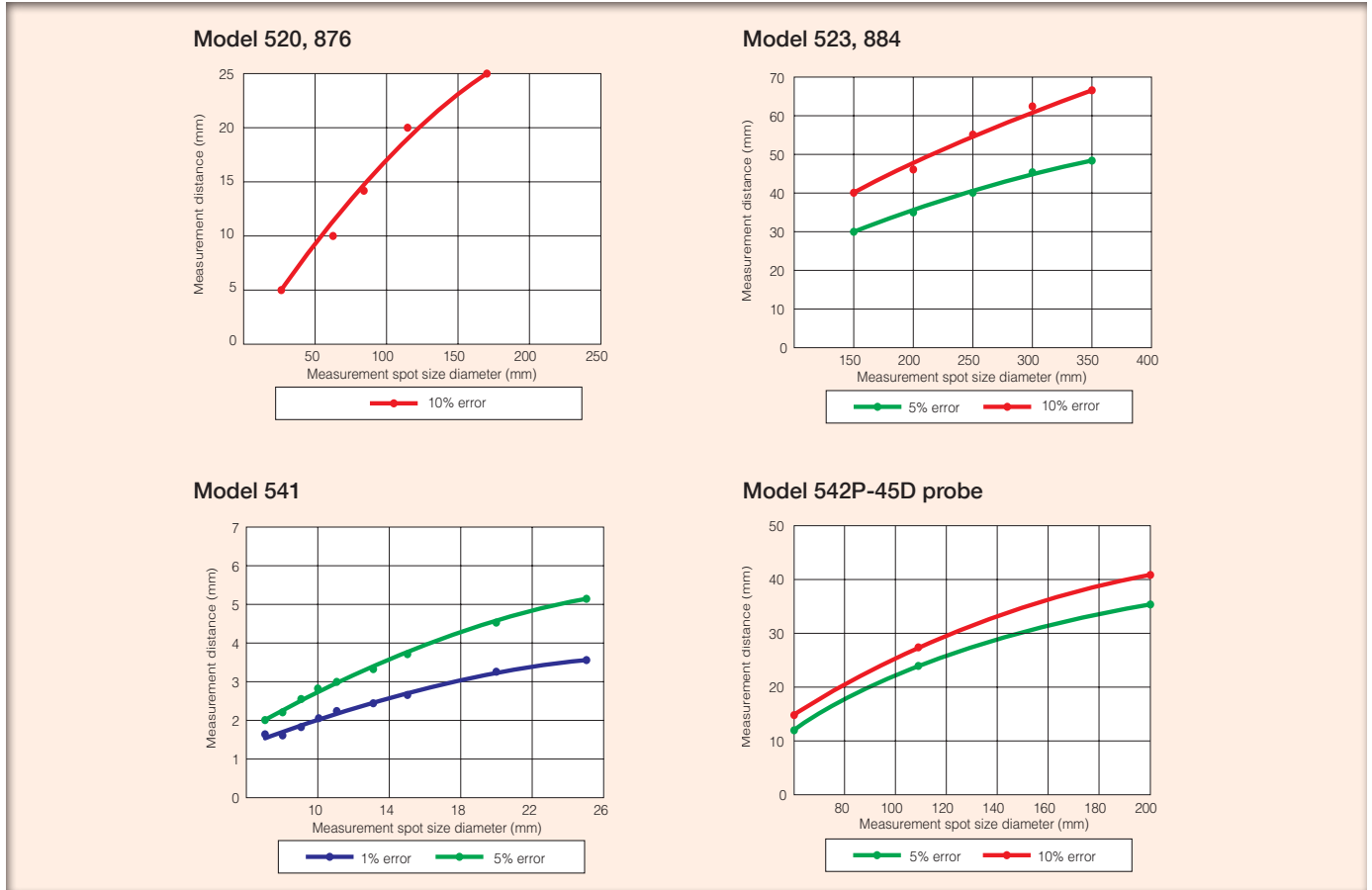


Figure 1. Spatial Resolution, Trek AC Feedback Electrostatic Voltmeter (i.e. Model 520)

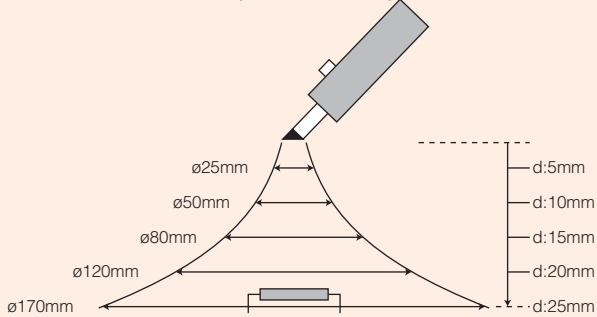


Figure 2. Spatial Resolution, Trek DC Feedback Electrostatic Voltmeter (i.e. Model 541)

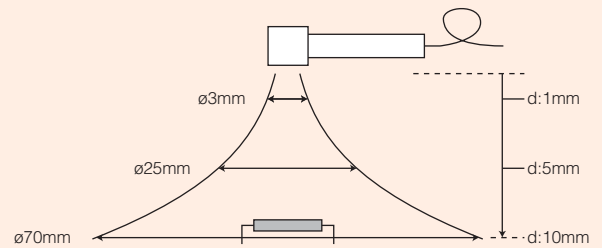


Figure 3. Measurement Accuracy vs. Measurement Distance

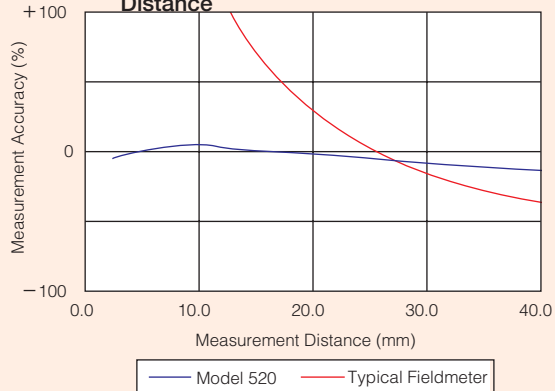
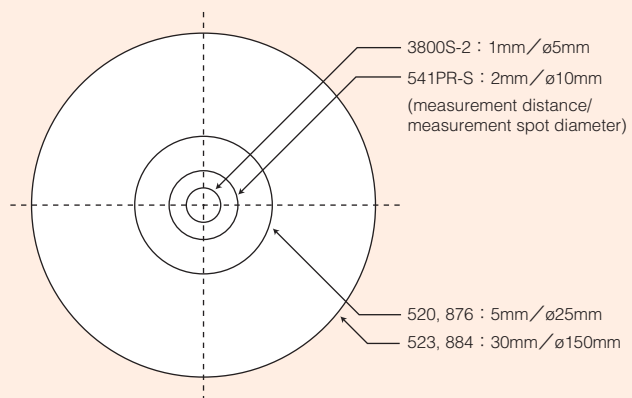


Figure 4. Spot Resolution at Selected Distances

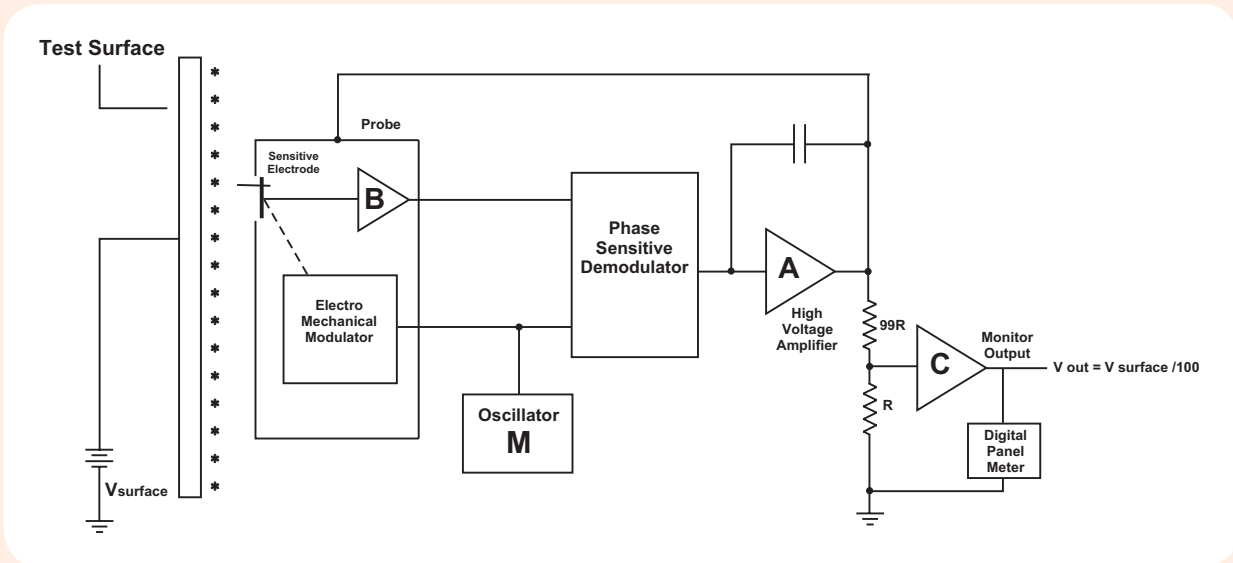


# Theory of Operation – DC Feedback Electrostatic Voltmeter

Trek offers two types of technology in the company's Electrostatic Voltmeters. One product line utilizes DC feedback technology while the other product line is based on Trek's novel approach to electrostatic measurement via patented AC feedback technology.

The DC Feedback Electrostatic Voltmeters use a well-known technology that Trek has employed for over 45 years (diagram below). The design utilizes a field-nulling method where the body of the probe is driven to the voltage being measured. This provides very high accuracy and fast speed of response. Since the probe is spaced relatively close to the surface being measured (1-2 mm typical) it is capable of measuring very small surface areas, with no arc over.

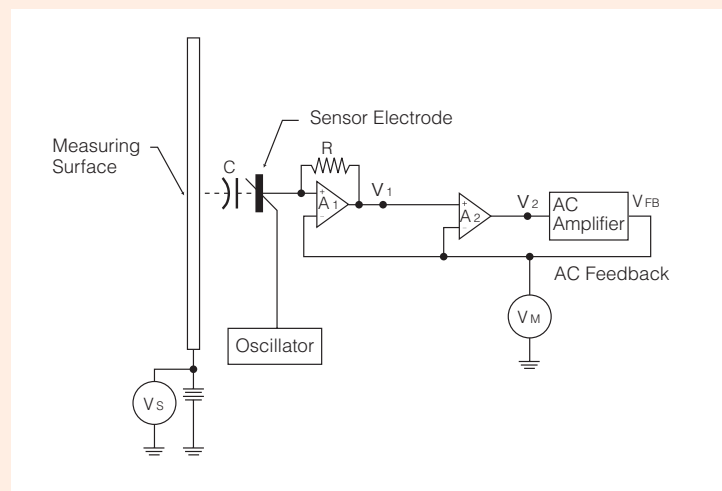
Figure 5. Theory of Operation – DC Feedback Electrostatic Voltmeter



# Theory of Operation – AC Feedback Electrostatic Voltmeter

The AC Feedback Electrostatic Voltmeters are based on a unique design developed and patented by TREK, INC. to address some of the problems associated with electrostatic fieldmeter technology. The AC feedback technology (diagram at right) delivers accurate measurements over a wide range of probe-to-surface spacings without the need to generate high voltage. Compare this to fieldmeter technology which requires a specific fixed spacing in order to provide useful measurements. In addition, the AC feedback electrostatic voltmeter can measure smaller surface areas than fieldmeters because Trek's technology allows the probe to be placed closer to the surface.

Figure 6. Theory of Operation – AC Feedback Electrostatic Voltmeter



For a complete technical description of the DC Feedback Technology and AC Feedback Technology please contact Trek.

# Notes

# Notes

# Trek Sales & Service

## Warranty

A ONE (1) YEAR Warranty applies to Trek's products. TREK, INC. agrees to correct, either by repair, or in the company's sole discretion, by replacement, any defect of material or workmanship which develops within one year from date of original purchase by the customer (user), provided that investigation and factory inspection by the company discloses that such defect developed under normal and proper use.

## Calibration & Repair

TREK, INC. provides calibration and repair services for all Trek products. We have Authorized Service Organizations located around the world. Please contact Trek's Customer Service Department for assistance or go to [www.trekinc.com](http://www.trekinc.com) to locate a service facility.

## Rental Service

Trek's rental program provides cost-effective access to equipment for short-term projects or emergencies. For more information, please contact Trek's Sales Department.

## Pricing & Specifications

Product pricing and specifications are subject to change. Please contact Trek's Sales Department for the most up-to-date information before placing an order.

## Custom Solutions & OEM Applications

Trek can provide custom solutions for applications needing more than an "off-the-shelf" product. Trek utilizes its decades of experience and technical expertise to design, develop and manufacture custom products which address the specific needs of an OEM application. Please contact Trek's Sales Department about custom design services

## Demonstration Units

Trek has a variety of demonstration instruments available to introduce products to customers interested in verifying operation for specific applications. To learn more about demo equipment please contact Trek's Sales Department.

### For Assistance

Sales Department: [HV-Sales@aei.com](mailto:HV-Sales@aei.com)  
Customer Service Department: [HV-Sales@aei.com](mailto:HV-Sales@aei.com)

In early 2018 Advanced Energy Industries, Inc. acquired Trek. Later in 2018, AE acquired Monroe Electronics' Electrostatic & ESD product line and relocated production and sales to AE's Trek facilities in Lockport, NY.

[www.trekinc.com](http://www.trekinc.com)

[www.trekinc.com/monroe/](http://www.trekinc.com/monroe/)

[www.advancedenergy.com](http://www.advancedenergy.com)



Has Joined



## EDACPOWER ELECTRONICS PTE LTD

6 Tagore Drive, #01-02 Tagore Building, Singapore 787623

Tel: +65 6454 7877 | Fax: +65 6453 7977

Email: [sales@edac.com.sg](mailto:sales@edac.com.sg) | Website: [www.ep-power.com](http://www.ep-power.com)

*Trek products generate high voltage. Please read the instruction manual and notes carefully before using the instruments.*