

EOS/ESD

**ELECTRICAL OVERSTRESS / ELECTROSTATIC DISCHARGE
SOLUTIONS**



CONTROL WITHOUT COMPROMISE

Whether you're monitoring charge accumulation, evaluating surfaces for static dissipation, verifying ionizer performance or evaluating a material's resistance.

Whether you're doing Automated test handling. Photolithography. Semiconductor manufacturing. Wafer loading/unloading. Hard disk drive manufacturing. Wafer testing. LCD manufacturing. Electronic assembly. GMR head manufacturing. Chemical mechanical planarization.

Whatever your application, you should settle for nothing less than the total accuracy and control only Trek EOS/ESD solutions deliver.

With so many options, there's sure to be a cost-effective, precision Trek measurement or detection product right for your application. And if there isn't, simply give us your specifications and we'll custom design a Trek solution just for your application.

The integrity of products and components can be compromised due to Electrical Overstress (EOS) conditions or by Electrostatic Discharge (ESD) events. Trek products measure electrostatic voltage/charge with certainty to identify the presence or absence of EOS conditions, thereby enabling control of EOS and ESD without compromise.

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When it comes to Electrostatic Discharge you can't afford to wait for problems. Be proactive. Take control. Do it right, with Trek measurement instruments and expertise.

It's an invisible killer. Relentless. Unfeeling. Uncaring. And the toll that electrostatic discharge (ESD) takes on your equipment and your production is probably higher than you imagine. Worldwide, ESD causes billions of dollars in damage annually. Whether you look at yield loss or early life failure, the problem is still ESD. The solution is obvious - eliminate it from the workplace - and be sure it is truly gone, every hour of every day.

So you think your ESD is under control?

It does not take much electrostatic charge to cause problems. The Electrostatic Discharge Association reports that many electronic components are susceptible to ESD damage at less than 100 volts, with some below 10 volts*. And the problem is only getting worse as electronic devices get smaller, manufacturing processes run faster, and facilities operate leaner.

Of course, that's why you haven't played around with it. Why you've most likely put an ESD control program into place. Maybe you have dissipative tabletop mats and dissipative flooring, low-charging smocks, wrist straps, and even shoe grounders for the people on the floor. Then there are the air ionizers needed to neutralize charge on insulative materials within the process.

So the problem is under control? *Maybe*. Unless you are measuring and monitoring your workplace environments for ESD with accurate measurement instruments, you can't be sure. Whether you are auditing your workplace or monitoring it on a "real time" basis, be sure with Trek.

You might not even know you (still) have an ESD problem.

Trek offers the products *and expertise* that will help you find out if you (still) have an ESD problem - whether or not you think there is - and we will show you how to fix it. We have decades of experience, a full array of measurement instruments, and an understanding of ESD that goes well beyond the data.

Our experts can assist you in a number of ways and Trek has all the measurement instruments needed to address each step of the process, from survey to solution.

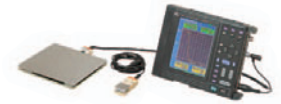
Let Trek help you find and fix your ESD problems, once and for all.

Don't fool around with ESD in your facility. Get it under control - and be sure - once and for all. Use Trek's ESD measurement instruments and you will know for sure. Our measurement instruments not only deliver high accuracy but also high confidence.

Through our involvement in the Electrostatic Discharge Association, we are well versed on the new S20.20 ESD control standards. Trek can guide you in understanding the impact of these standards on your business, and more importantly the future of your business. After all, we are the ESD experts. So let us share our expertise with you.

Don't deal with just anyone when it comes to static charge. Deal with the experts. Deal with Trek and be sure your ESD is under control.

*"Fundamentals of ESD, Part One - An Introduction to ESD", by the ESD Association, Rome, NY (2001)



Whether you need to locate sources of charge generation or to verify the effectiveness of your ESD countermeasures, you can settle for nothing less than total accuracy. Which is why you should settle for nothing less than Trek.

We're a recognized leader in EOS/ESD and high-voltage solutions, certified to ISO 9001 international quality assurance system standards.

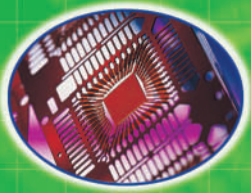
Our unsurpassed reputation for product innovation and engineering excellence is fueled by our unshakable commitment to technology research in response to customer needs.

All of which makes Trek your best resource, your partner of choice, for EOS/ESD solutions to meet your ever-evolving, application-specific needs.

Trek expertise now includes certification from the ESD Association. In fact, a Trek sales engineer was one of the first six individuals to receive Program Manager Certification from the ESDA in early 2006. This designation represents a thorough knowledge of the core competencies for ESD control.



MEASURE WITH CERTAINTY



CHARGED-PLATE MONITORS

Be sure your air ionizers are working correctly with Trek charged-plate monitors.

Model 156A & Model 157 Charged-Plate Monitors

The Model 156A is more than you'd expect in a charged-plate monitor. Because it's a Trek charged-plate monitor. Offering greater accuracy, stability and bandwidth than conventional monitor designs. Its revolutionary, patented, ultrahigh-impedance, high-voltage follower design for monitoring ion collecting plate voltage delivers very high accuracy and virtually infinite impedance loading of the plate, while making measurement capacitance independent of the physical size and shape of the ion collecting plate. Which means that while Trek offers several standard ion collecting plates, we can also customize the size and shape of the ion collecting plate, as well as the plate capacitance, to match a particular ESD-sensitive device within a manufacturing process or any other specifications you need.



The Trek Model 157 goes even further. Designed with 0.1 V resolution and on-board test data storage and retrieval, Model 157 automates data collection for easier, less time-consuming bench-to-bench measuring. Its USB serial interface port connects with a PC, and Trek software enables the operator to program test sequences and save or retrieve test results. Which means that series of quantitative tests can be repeated, analyzed, programmed or retrieved. A barcode reader option is available to enhance functionality.



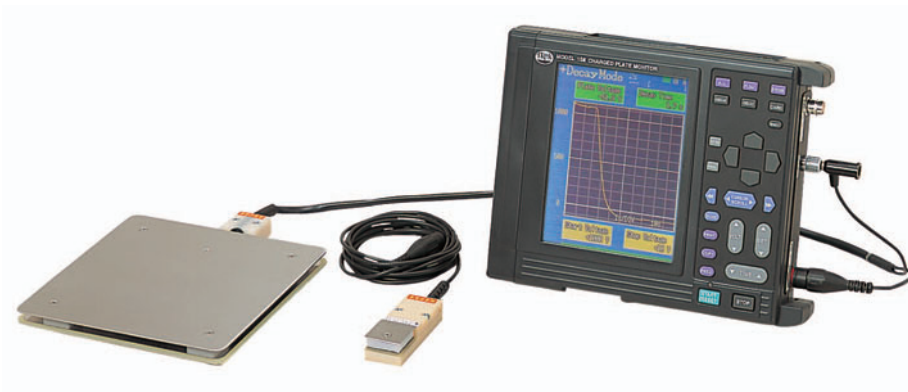
The cost-effective choice for accuracy and flexibility. Model 157 is ideal for:

- Automation of ionizer evaluation
- Decay tests for materials
- Triboelectric tests for materials

Observing plate voltage decay (discharge) in the time domain is especially useful for monitoring pulsed-DC ionizer performance.



**They perform like no other charged-plate monitor
because they're designed like no other charged-plate monitor.
Period.**



Model 158 Charged-Plate Monitor

It's compact. Portable. Displays discharge waveforms and offset voltage in full color. And stores data and waveforms for hundreds of ionizer tests. In short, the Trek Model 158 is everything you need, but could never get, in a charged-plate monitor. All in one easy-to-carry package that lets operators move freely about your facility to evaluate ionizers. And no heavy instrument, laptop computer or tabulation paperwork to lug around.

The Model 158 also uses Trek's innovative voltage-follower technique that delivers accuracy, stability, and bandwidth that charged-plate monitors using fieldmeter-based measurement methods simply can't match— resolving 0.1 V plate voltage. As with all Trek charged-plate monitors, you can even tailor the size and shape of the ion collecting plate and the plate's capacitance to your application.

The Model 158 can be either line or battery operated. And its removable PCMCIA flash memory card means test results are easily transported from cleanroom facilities to office areas where they can be downloaded, evaluated, and transferred to reports.

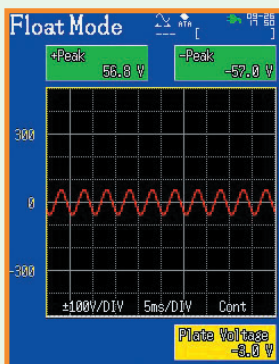
SPECIFICATIONS: MODELS 156A, 157, 158

Monitored Voltage Range
0 to ± 1100 V DC or peak AC

Start Accuracy
Within ± 1 V of programmed start voltage

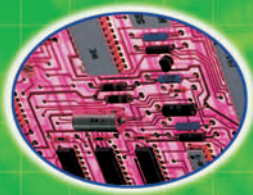
Stop Accuracy
Within ± 1 V of programmed stop voltage or ± 0.2 V if set less than or equal to 90 V

Unparalleled convenience, simplicity & accuracy in one lightweight package. Model 158 is ideal for:



- Automation of ionizer evaluation
- Decay tests for materials
- Triboelectric tests for materials
- ESD training

This screen clearly shows the ripple from AC ionizers, which makes it a great ESD training aid.



ELECTROSTATIC MONITORS

You don't have to pay a high price for 10 times the surface voltage measurement accuracy.

Model 520 Series Hand-Held Electrostatic Voltmeters

Why settle for a hand-held fieldmeter that has an error rate over 50%, when you can get 95% voltage measurement accuracy with the low-cost Trek Model 520 Series Hand-Held Electrostatic Voltmeters? And accuracy is just the beginning of the Model 520's benefits:

- Accurately measures surface voltage at a wide range of spacings
- No need to maintain a fixed spacing
- Inspect small spots for charge accumulation
- Measure charge accumulation in difficult-to-reach locations
- Chopper stabilized for drift-free operation in ionized environments
- Low cost
- CE compliant
- AC feedback technology



SPECIFICATIONS: MODEL 520 SERIES

Measurement Range

Models 520 and P0876A
0 to ± 2 kV DC

Models 523 and P0884A
0 to ± 20 kV DC

Measurement Accuracy

Models 520 and P0876A
Better than $\pm 5\%$ of full scale over the entire recommended probe-to-surface separation range of 5 mm to 25 mm

Models 523 and P0884A
Better than $\pm 5\%$ of full scale over the entire recommended probe-to-surface separation range of 30 mm to 60 mm

Grab the low-cost choice for:

- Tribo/decay characterization of equipment surfaces
- Monitoring electrostatic charges on parts



Model P0876A with probe and 6 foot cable.

This portable electrostatic voltmeter delivers high accuracy in a durable, lightweight package.

Model 706A/1 Portable Electrostatic Voltmeter

The 706A/1 Electrostatic Voltmeter utilizes DC feedback technology and is designed as a tool to perform ESD noncontacting surface voltage measurements. Accurate electrostatic measurements can be performed by insulative mounting of the probe at a distance of 1 mm to 5 mm from a surface.

- Portable
- Excellent resolution of small areas
- Highly accurate



SPECIFICATIONS: MODEL 706A/1

Measurement Range

0 to +1 kV or -1 kV DC
(switch selectable)

Measurement Accuracy

Better than 0.5% of full scale

**When it comes to electrostatic measurement,
no one does it better than Trek.**

Our technology makes the difference.

Proven Technology and More.

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

The **DC Feedback ESVM** uses a well-known technology that Trek has employed for over 35 years. 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, fast speed of response, and 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.

The **AC Feedback ESVM** is 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 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 one specific spacing in order to provide useful measurements. In addition, the AC Feedback ESVM can measure smaller surface areas than fieldmeters because Trek's technology allows the probe to be placed closer to the surface.

The table below compares Trek's two ESVM technologies with fieldmeter technology. If you want high accuracy in your measurements and operational flexibility at the workplace, no one does it better than Trek.



Electrostatic Measurement Technologies

| | Trek DC Feedback Electrostatic Voltmeter | Trek AC Feedback Electrostatic Voltmeter | Electrostatic Fieldmeter |
|---------------------------------|--|--|----------------------------------|
| Recommended Measurement Surface | Large and Small Surfaces | Large and Small Surfaces | Only Large Surfaces |
| Measured Variable | Voltage | Voltage | Electric Field Intensity |
| Accuracy | Excellent | Good | Poor |
| Speed of Response | Excellent | Good | Poor |
| Voltage Resolution | Excellent | Good | Poor |
| Spatial Resolution | Excellent | Good | Poor |
| Probe Body Potential | Potential of Test Surface (no arcing) | Grounded (possibility of arcing) | Grounded (possibility of arcing) |
| Spacing Independent | Yes | Yes | No |
| Confidence in Data | Very High | High | Low |
| Flexibility in the Workplace | High | High | Low |
| Trek Model Numbers | 706A/1, 541 | 520, 542 | n/a |

The information above is provided as a guide for comparison of the different technologies. For more complete technical information and references please contact TREK, INC.

AND VOLTMETERS

The ultimate diagnostic tools for locating charging sources virtually anywhere in your ESD-sensitive processes.

Model 541 and Model 542 Electrostatic Voltmeters

You can put our miniature electrostatic field chopper probes in many difficult-to-access areas. So it's easy to position them within process equipment, remotely. Wherever static charge accumulation poses a threat to production yields or product quality, or interrupts processes. These probes enable you to utilize all the versatility of either the Trek Model 541 or 542:

- Chopper probe is DC stable with or without incident air ion flow
- Microprocessor based
- LCD screen displays the present voltage, and holds the most positive and the most negative measured values
- Visual and audible alarms
- Voltage output monitor for remote monitoring or control
- RS-232 serial port
- 4-20 mA current output
- 20 X 4 alphanumeric LCD display screen
- DC feedback technology (Model 541)
- AC feedback technology (Model 542)



The easy choice for monitoring charge accumulation in:

- LCD, semiconductor and film manufacturing/converting/conveying
- Electronic assembly

SPECIFICATIONS: MODELS 541, 542

Measurement Range

Model 541-1
0 to ± 1 kV DC or peak AC

Model 541-2
0 to ± 100 V DC or peak AC

Model 542-1
0 to ± 10 kV DC or peak AC

Model 542-2
0 to ± 20 kV DC or peak AC

Measurement Accuracy

Model 541-1
1% of full scale

Model 541-2
1% of full scale

Model 542-1
Better than $\pm 5\%$ of reading, $\pm 0.2\%$ of full scale over a probe-to-surface separation of 15 mm to 30 mm

Model 542-2
Better than $\pm 5\%$ of reading, $\pm 0.2\%$ of full scale over a probe-to-surface separation of 30 mm to 60 mm

Model 706A/1 and Model 541 (Trek DC feedback)

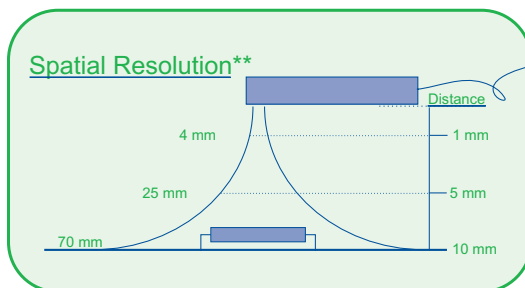


Figure 1

Model 520 and Model 542-1 (Trek AC feedback)

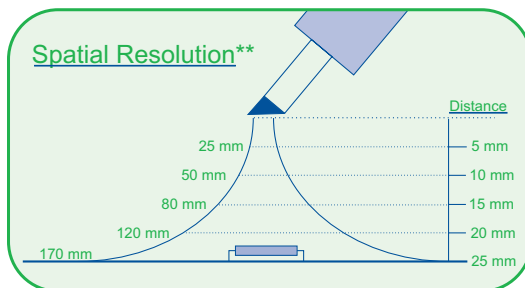


Figure 2

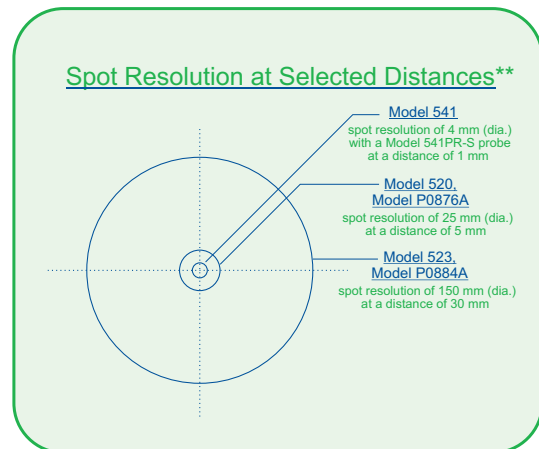


Figure 3

Trek's DC feedback technology allows very small probe-to-surface distances while maintaining excellent spot resolution and accuracy. (Figures 1 and 3)

Trek's novel AC feedback technology provides a good mid-range combination of probe-to-surface distance and spot resolution and accuracy. (Figures 2 and 3)

Typical fieldmeter technology is limited to a fixed probe-to-surface distance, large spot resolution and compromised accuracy.

** Please refer to Trek's product data sheets, or contact Trek directly, for more information. The data shown here represent only a portion of Trek's complete data set.

The single choice that gives three precision choices for surface resistance & resistivity measurement.

Model 152 Surface Resistance/Resistivity Meter

Delivering precision surface resistance measurement on virtually any conductive, dissipative, and insulative material you can think of. Garments. Work surface. Flooring. Three probe configurations offer complete flexibility. Along with these exceptional features:

- Exceptional accuracy, stability and repeatability
- Concentric ring probe preamplifier eliminates interference and enables reliable operation at high resistance values
- Complies with ESD Association standards concerning surface resistance, including STM2.1, STM4.1, STM7.1, STM11.11 and STM11.13
- Elastomer electrodes for excellent surface contact
- Battery or AC line operated with automatic shutoff
- Lightweight and portable
- CE compliant



SPECIFICATIONS: MODEL 152

Resistance/Resistivity Measurement Range

Model 152P-CR
Concentric Ring Probe
10⁴ to 10¹⁴ ohms/square

Model 152AP-5P
Point-to-Point Probes
10³ to 10¹² ohms

Model 152P-2P
Two-Point Resistance Probe
10³ to 10¹² ohms

Measurement Accuracy at 25°C ±5°C, 50% ±10% Relative Humidity:

Model 152P-CR
Concentric Ring Probe
10⁴ to 10¹³ ohms/square, ±2.5% of LCD reading,
10¹⁴ ohms/square, ±5% of LCD reading

Model 152AP-5P
Point-to-Point Probes
10³ to 10¹¹ ohm range, ±2.5% of LCD reading,
10¹¹ to 10¹² ohm range, ±5% of LCD reading

Model 152P-2P
Two-Point Resistance Probe
10³ to 10¹¹ ohm range, ±2.5% of LCD reading,
10¹¹ to 10¹² ohm range, ±10% of LCD reading

Extreme precision makes it the ideal choice for testing:

- Dissipative materials
- Floor coating effectiveness
- Floor, mat, bag and other material resistance

3 probe choices:

- Concentric ring
- Point-to-point, resistance to ground
- Two-point resistance

Its ultrasensitivity makes it the only choice for ultralow voltage applications.

Model 540 Electrostatic Monitor

It's used in the most critical applications. In semiconductor. LCD. Electronic assembly. Hard disk drive manufacturing. Where static charge accumulations pose a threat to production yields and/or product quality. Where high accuracy ion balance measurement to less than one volt is required. Where you need everything the Model 540 offers:

- Virtually infinite input resistance design
- Less than 0.1 picoampere ion current required for full accuracy and stability
- More than 2000 times more sensitive than competing designs
- 3^{1/2} Digit DPM displays present voltage readings with 0.1 V resolution
- LED bar graph displays present voltage and holds most positive (+) and most negative (-) voltage values
- Programmable audio/visual alarms
- DC stable in ion fields
- Bandwidth greater than 2.5 kHz
- Measurement range ±100 V DC or peak AC

SPECIFICATIONS: MODEL 540

Monitored Voltage Range
0 to ±100 V DC or peak AC

Measurement Accuracy
0.2% of full scale



The ultrasensitive choice for accurate air ionizer monitoring in:

- Hard disk drive production
- LCD manufacturing
- Electronic assembly
- Automated test handling

About Trek.

**A successful company with
acknowledged leadership qualities.**

Founded on Technology

TREK, INC. was established in 1968 to serve the needs of the electrophotographic industry for highly accurate, stable, cost-effective measurement instrumentation and devices. Novel probe design technology provided the foundation for the company's first electrostatic voltmeter, which quickly became the industry standard. Trek's design ensures highly accurate measurements under extreme conditions, unlike other electrostatic measurement products.

Growth through Innovation

In the decades that followed, Trek established itself as a designer and manufacturer of high quality instrumentation. Innovative designs and unique solutions have fueled product development over the years. Trek developed the world's first all-solid-state, high-voltage, high-speed, DC-stable amplifier, which is now the product of choice for medium-current ion implantation systems in semiconductor fabrication facilities around the world. As a result of Trek's close working relationship with its customers, new designs are constantly being created to answer the needs of industries as they evolve and grow.

Established Technical Expertise and Application Knowledge

Our scientifically based measurement expertise, coupled with our application knowledge, has enabled us to establish an enviable position in the markets we serve. We are the experts when it comes to highly accurate measurement instruments and high-voltage amplifiers, and the technology that drives them. The technical expertise of the individuals at Trek is equally matched by their application knowledge. Customers have come to depend on Trek to understand both the technical aspects and practical realities of an application, often viewing Trek as a virtual member of their product development team.

Dedicated to Excellence

Trek has a well-respected reputation for excellence. We are the premier resource for electrostatic measurement and high-voltage solutions due to our product leadership and engineering excellence. If we don't have a product on the shelf that suits your application, we can design the right solution for you. That's how serious we are about serving your needs, and why excellence is associated with the Trek brand.

Committed to the Global Marketplace

Early on, Trek saw the importance of a global presence. In 1987 Trek Japan KK, a subsidiary of TREK, INC., was founded in Tokyo, Japan for the purpose of providing sales, application engineering support and service to customers in Japan and elsewhere in the Pacific Rim region. A global sales and service network now exists to serve the needs of customers throughout the world.

**Leading the way in
electrostatic measurement
for EOS/ESD applications.**



Electrostatic measurement represents a core technology for TREK, INC. The expanded utilization of this technology, beyond its initial use in electrophotography, is exemplified by our products for the measurement of electrostatics in a wide range of EOS/ESD applications. As the problems caused by ESD continue to take a toll across many industries, Trek is committed to providing new and unique methods to assist our customers with the measurement and control of ESD. Our Charged-Plate Monitors are unparalleled in performance and accuracy. Trek's AC Feedback Electrostatic Voltmeters have provided the world with a desirable alternative to fieldmeters. Both of these developments are the result of technology advancements patented by Trek. Our DC Feedback Electrostatic Voltmeters provide the ultimate in measurement accuracy and flexibility. Watch for more developments from Trek, the leader in electrostatic measurement applications.

***Contact Trek the next time you have a challenge.
Our Application Engineers are ready with answers
for your toughest questions.***

Due to our continuous product quality improvement and customer satisfaction programs, TREK, INC. reserves the right to change specifications in this brochure without notice.

CE compliant for most products



CONTROL WITHOUT COMPROMISE

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