



PGA-710 Autoanalysis System

How To Measure Guide

For PGA-710 Autoanalysis System Only
Currently only available in English & Japanese

Last updated: January 2011

CVM-780 Contact Voltmeter Set
Quick Start Guide

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Overview: Body Voltage Generation Analysis

Body voltage generation is directly related to the contact and separation of footwear with flooring surfaces. Charge (Q) is generated on the outer surface of the shoe sole, and the body's voltage (V) is a function of body capacitance (C), which varies while walking versus standing. The following instrument system and procedures measure and analyze body voltage while personnel transport ESD sensitive devices, and estimate voltages when standing at workstations or equipment during device handling operations.

The following analysis is useful in assessing the *probability* of device damage in the manufacturing process based on the device's Human Body Model (HBM) damage threshold. It will estimate the range of probable body voltage of most personnel while wearing the test footwear on the floor surface in question, under specific temperature and relative humidity conditions. In effect, using the following procedure with the PGA-710 Autoanalysis system calculates and reports the probability of personnel equalling, or exceeding levels of body voltage under specific conditions.

I. General

Install the PGA-710 Autoanalysis Applications software on your computer as described in the Quick Start Installation Guideline, and charge the PGA-710 Autoanalyzer's battery for greater than 8 hours. Setup the instrumentation and test area as described, using the following schematic and photographs. Review the PGA-710 Autoanalysis System Operations Manual for detailed system instructions.

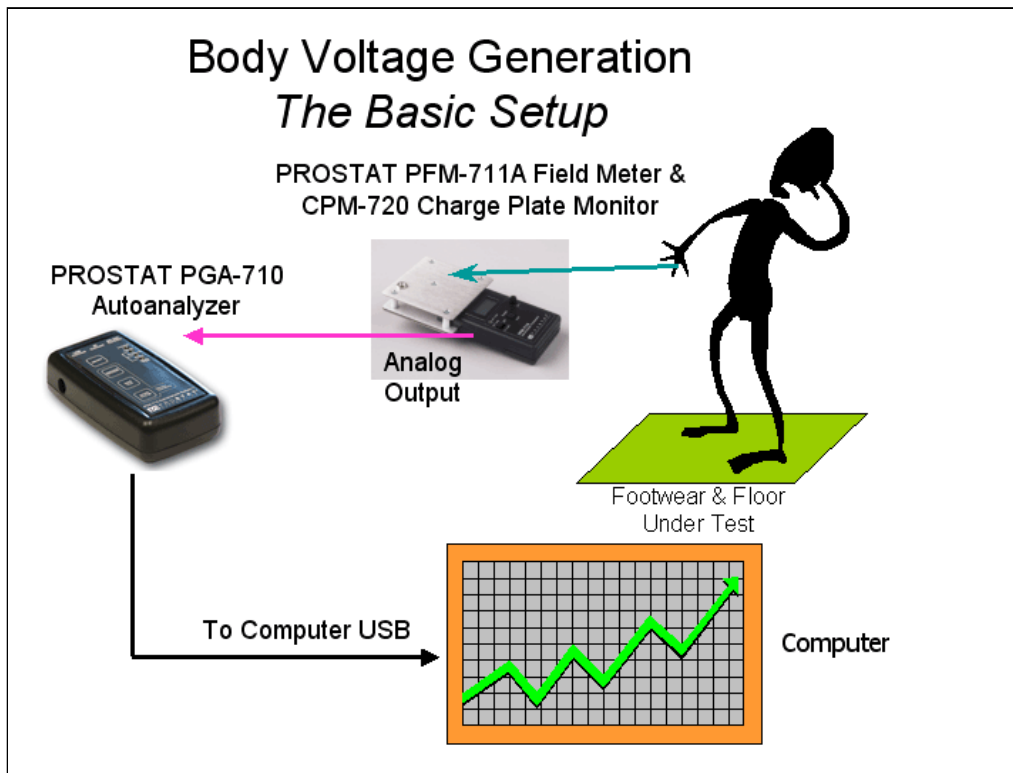
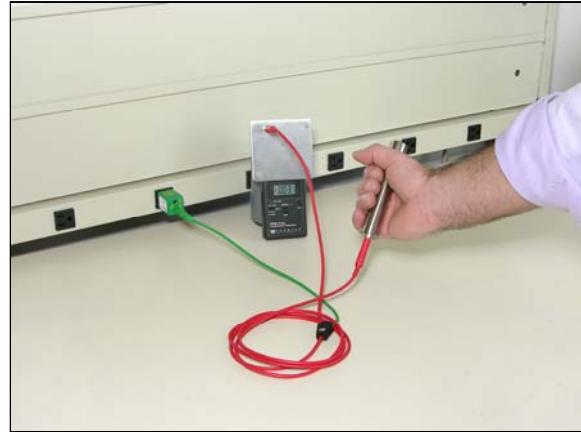
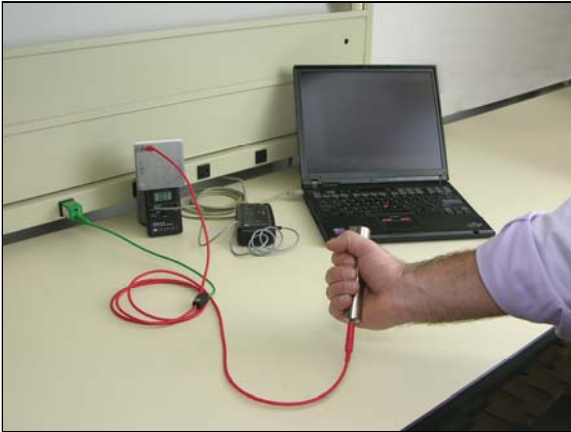


Figure 1: Schematic of Test Setup

The shielded measurement cable is intended for use with the Prostat CPM-720 charge plate monitor for measuring body voltage generation, charge retention, remote equipment and other electrostatic voltage sources. The signal conductor insulation is Red and the shield insulation is Green. Connect the Red lead to the CPM and object being measured. Connect the Green shield to *ground* to reduce the effects of ambient electrical noise and transmitted energy. Do not connect the shield to the ground plate of the CPM.



II. Instrument Setup for Body Voltage

The following outline will help prepare your system for capturing and recording data. To protect your system, please review the following before proceeding further.

NOTE: The PGA-710 was designed to be used in conjunction with PROSTAT instruments, specifically the PFM-711A Field Meter equipped with the CPM-720 Charge Plate Monitor accessory. However, other devices having specified tolerances and output voltages ± 2 volts or less may be used with the PROSTAT PGA-710 Autoanalysis System™. *Confirm that the measurement instrument's maximum output voltage does not exceed 2.0 volts and that connections are compatible before using other instruments with the PGA-710.* If there is any doubt about instrument compatibility, contact PROSTAT **before** connecting the instrument, as damage incurred by using other instruments with the PGA-710 may void your warranty.

CAUTION: To prevent damage to the PGA-710 and voiding your warranty, input to the Autoanalyzer **may not exceed 2.0 volts** without specific adjustments and recommendations from PROSTAT. Confirm proper non-PROSTAT instrument output voltages before connecting to, and energizing the system.

Set up your instrument for capturing data as follows:

1. Attach the PROSTAT CPM-720 Charge Plate to the PFM-711A Field Meter
2. Ground the instrument. Mount a fabric PROSTAT PWS-610M Modified Wrist strap to a 5 pound NFPA electrode, and connect the wrist strap cord to a previously tested ESD ground as shown in Figure 2, below. (See ESD S-6.1 Grounding for details regarding ESD grounds.)



Figure 2: Portable CPM Connections

- Secure the instrument to prevent damage. Attach the PFM-711A Field Meter to the modified wrist strap using its ground snap as shown in Figure 2. This will maintain the PFM-711A & CPM-720's connection to ground, while preventing the system from being pulled from a worksurface during normal measurements.
- Connect the instruments. Plug one end of the analog output cable into the PFM-711A Field Meter, and the other end into the PGA-710 Autoanalyzer. See Figure 3, below.



Figure 3: Connect Field Meter Output to Autoanalyzer input

- Connect the PGA-710 to the Computer. Install the supplied USB output cable between the PGA-710 Autoanalyzer receptacle and your computer's USB port. This allows data flow from the PGA-710 into the Autoanalysis System Application software.
- Energize instruments & computer. Turn ON the field meter, computer and Autoanalyzer.
- Start Software. Open Autoanalysis Applications Software on the computer and select **Start a New Session Wizard** (Figure 4)

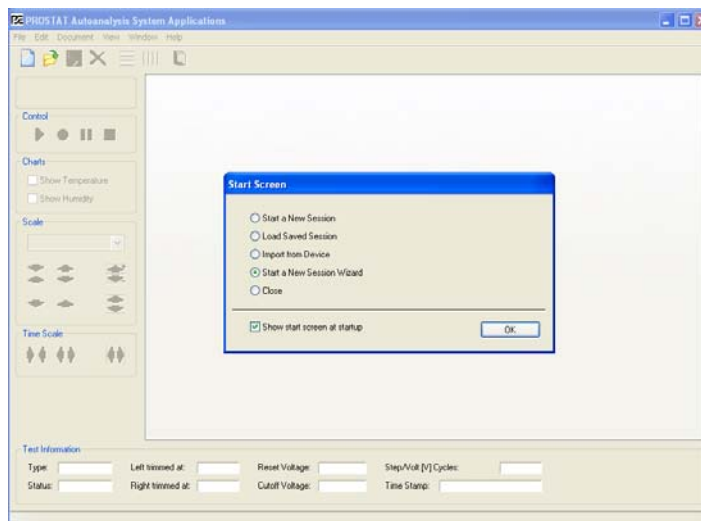


Figure 4: Start a new session

8. Select type of test. When the Session Wizard opens, choose **Voltage Generation Test** as in Figure 5. This opens a series of windows you may use to annotate your charts and provide report information.
9. Enter number of walking steps. In the first window you may enter the number of walking step cycles you plan to conduct, as in Figure 6. Twenty is typical, but you may enter any number suitable to your needs. Press **>>** to continue.

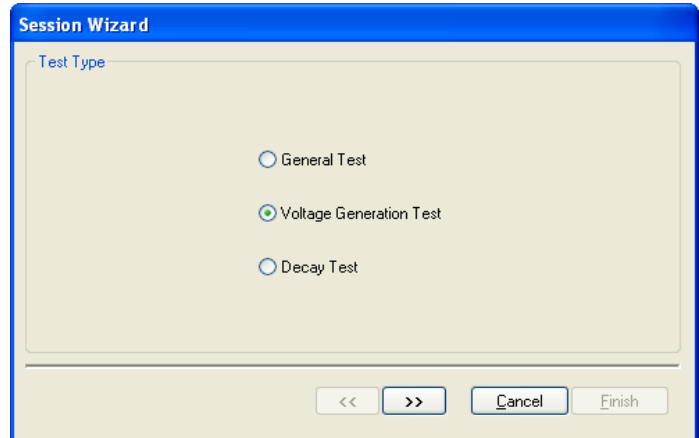


Figure 5: Start a new session

10. Enter Technician, Affiliation and Material information, and press **>>** to continue.

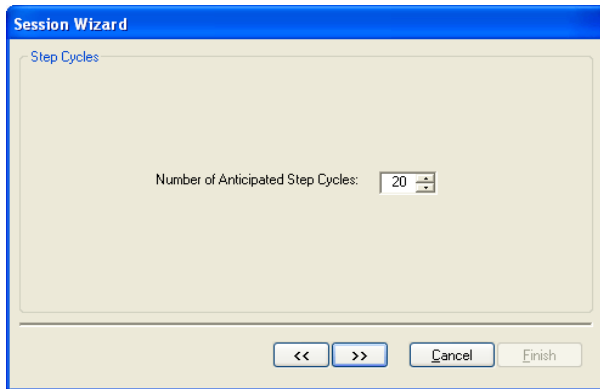


Figure 6: Enter number of Step Cycles

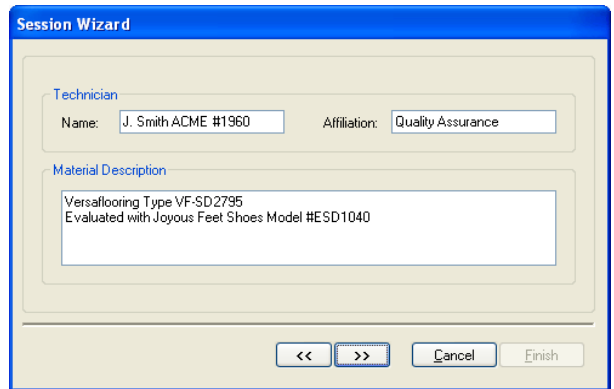


Figure 7: Enter Personnel & Material Information

11. Enter address and test area information and click **Finish** to complete Session Wizard.

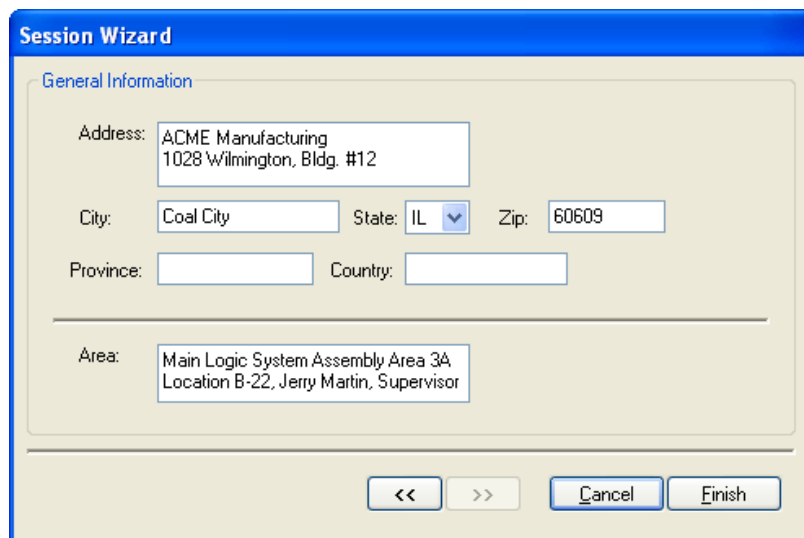


Figure 8: Test Location Information

- A new test screen opens and allows immediate measurements. Note that without data in the system Test Information Status is "Incomplete".

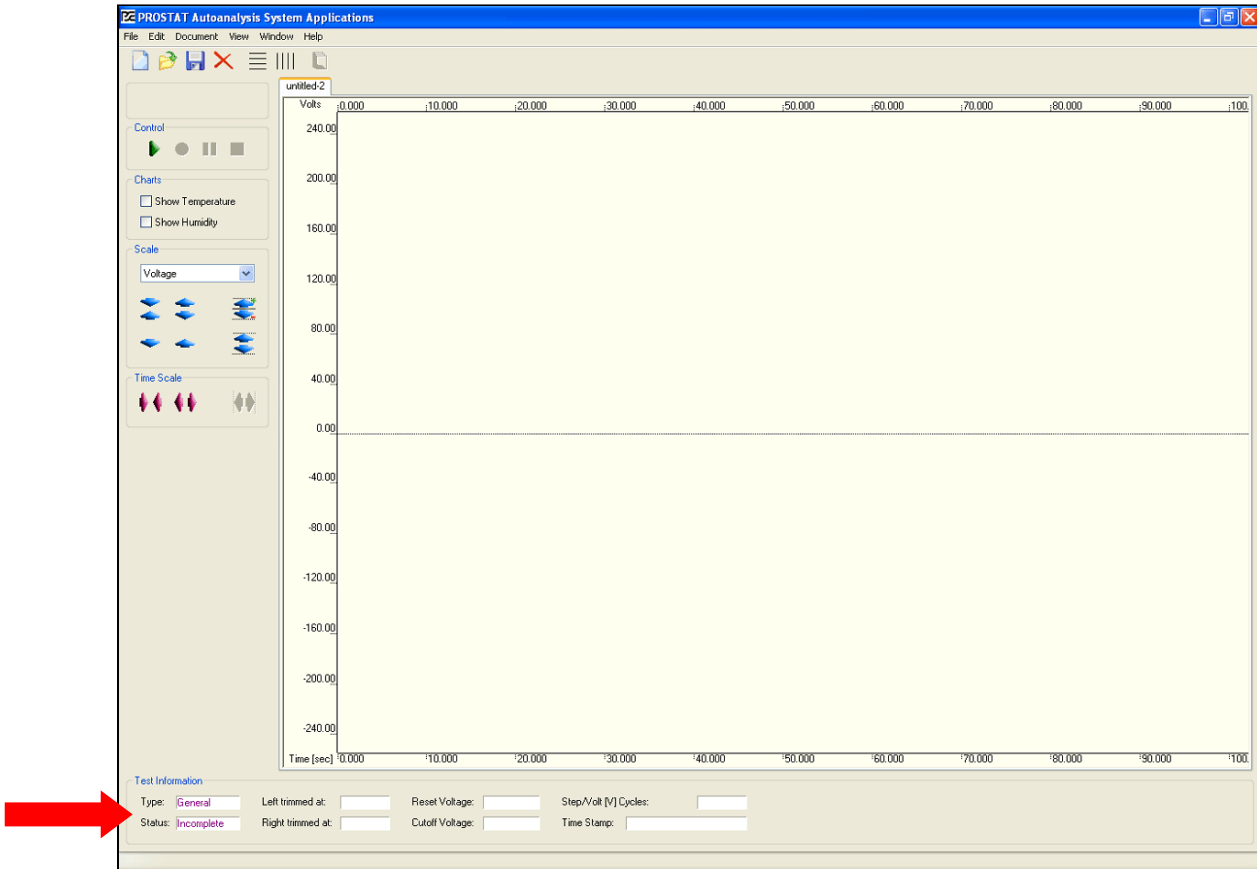


Figure 9: New Test Screen

- Select background, line colors and temperature type ($^{\circ}\text{C}$, $^{\circ}\text{F}$ or both). Change colors or include reference lines using the **Document** drop down, **Appearance Options** menu.

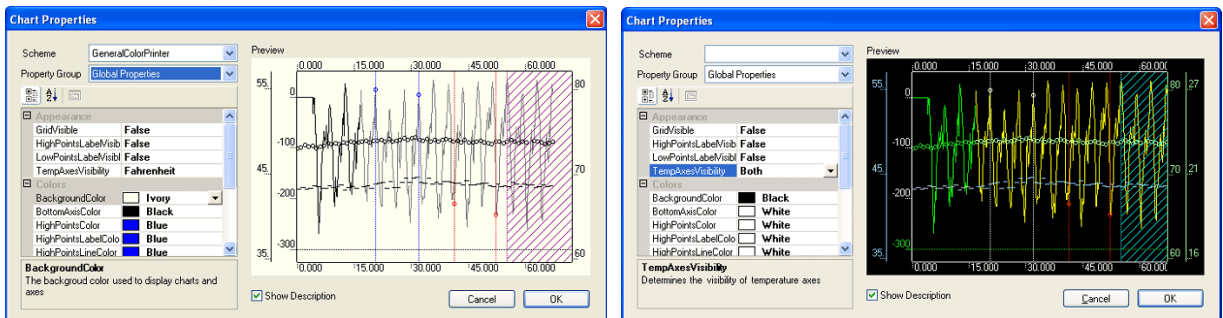


Figure 10: Appearance Window Changes Background and Selected Display Elements

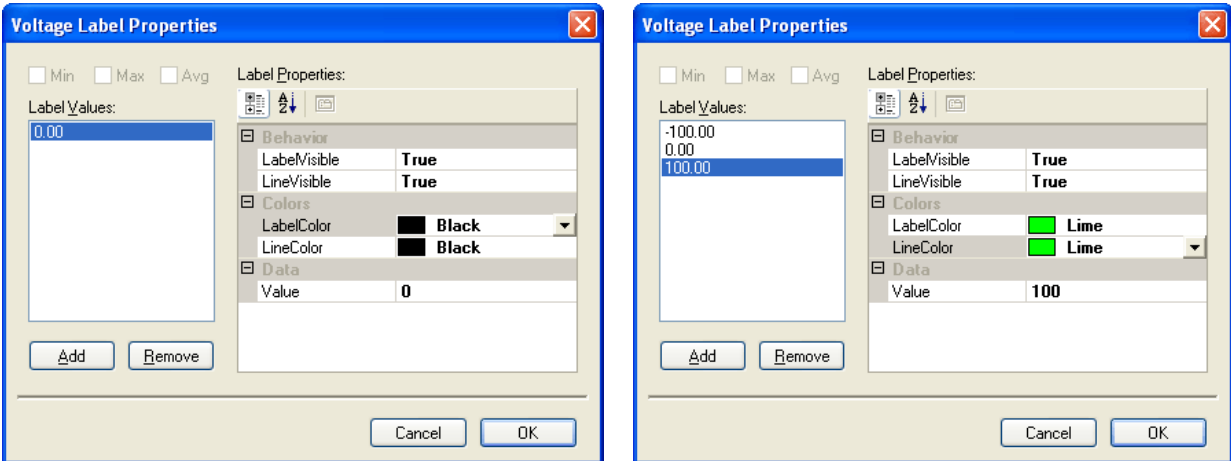



Figure 11: Adding and Modifying Reference Voltage Line, Labels and Colors

14. Add reference lines and labels using the **Document** drop down, **Voltage Custom Labels** menu. Once lines and labels are added and the screen is configured to your needs you may test the system for proper zero, data capture and scaling.
15. To confirm the voltage zero (0) reference for the system, proceed as follows:
 - a. Remove the analog cable from the Autoanalyzer and insert the supplied shorting shunt. Confirm the unit is energized and connected to the computer
 - b. Press Green right arrow  in the Chart Control section or F5 to start the **Preview** data trace.
 - c. If using a black background a Lime Green trace will appear in the screen window at approximately zero

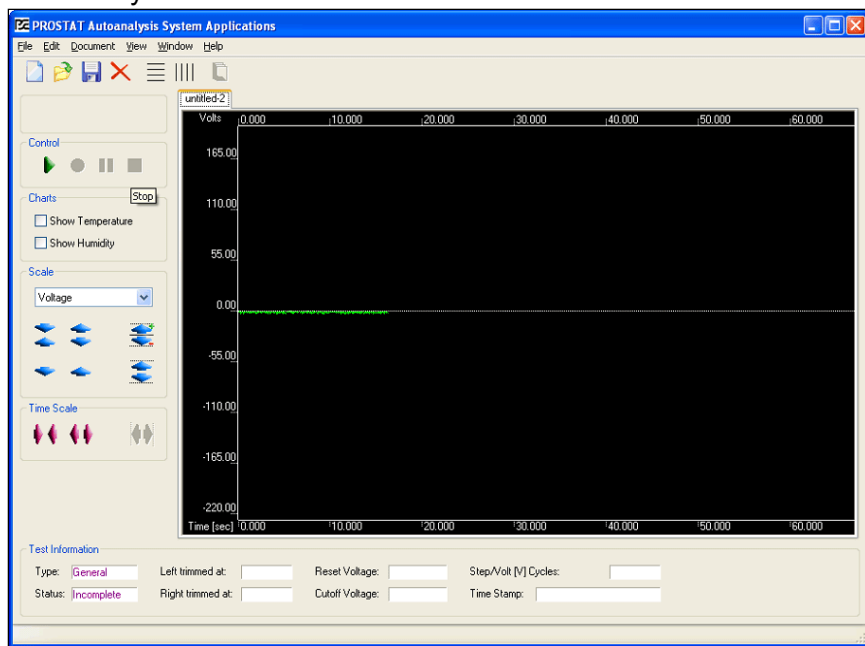



Figure 12: Previewing the zero reference

- d. Press the Black Square  or F8 to stop the preview

16. To fine tune the zero reference, open the **Edit** drop down menu and select **Current Measures** (Figure 13). This will display a small window that provides detailed data regarding specific Voltage, Temperature and Relative Humidity.

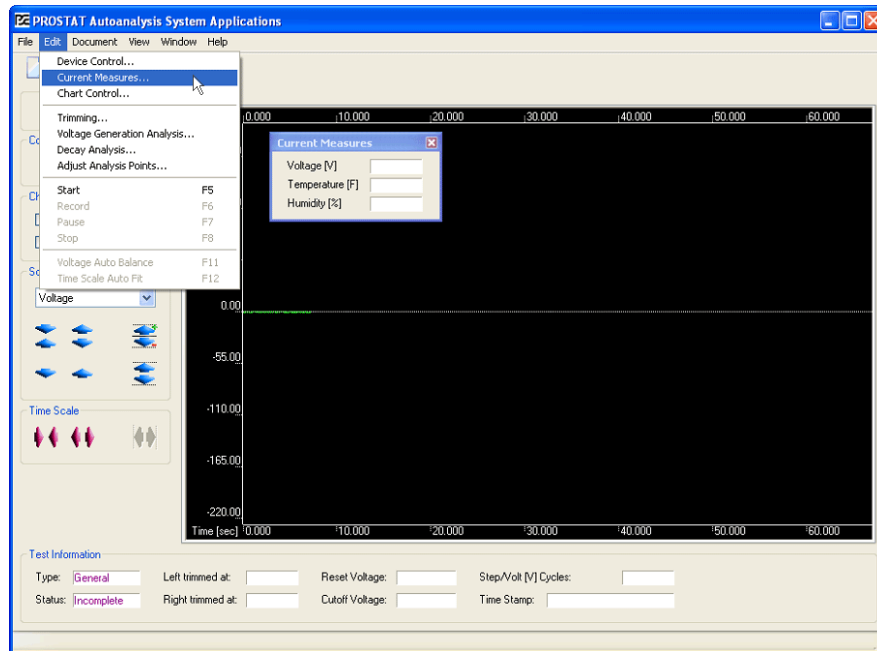


Figure 13: Opening the Current Measures window for detailed data display

- a. Press the Green Preview Arrow (F5) to start the Preview Trace, then Voltage Auto Balance double vertical arrows (F11). This will provide a detailed view of the zero reference.

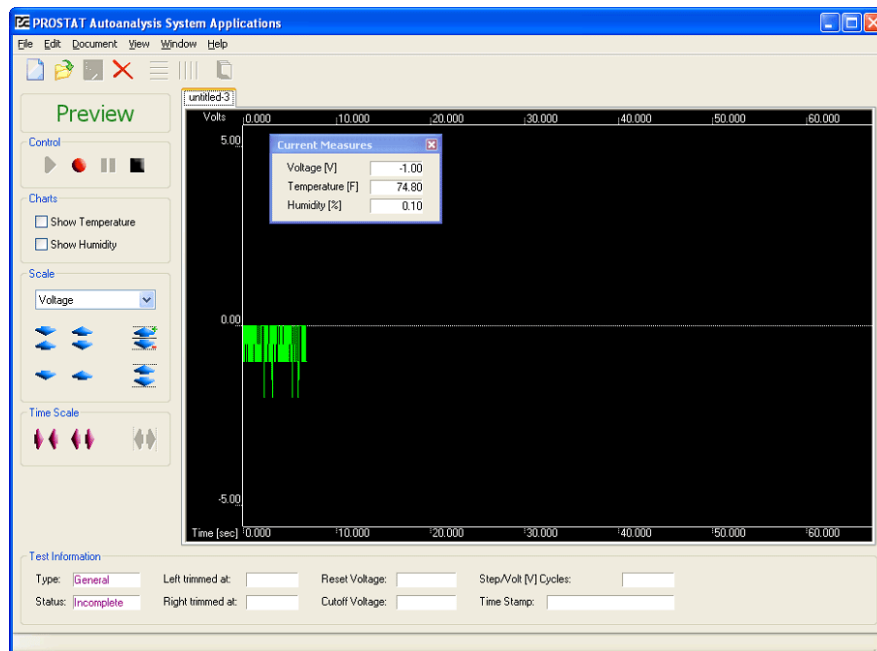


Figure 14: Press Voltage Auto Balance button of F11 to display all data in the screen view

- b. If the zero reference is greater than 0 ± 2 Volts, zero the System as follows:

- i. Select the **Edit** drop down menu and click **Device Control**. The **Device Control** window will open
- ii. Press **Clear Zero**, then **Set Zero**
- iii. To finish, press **Done**. This will reset the Autoanalysis System zero to 0 ± 2 Volts

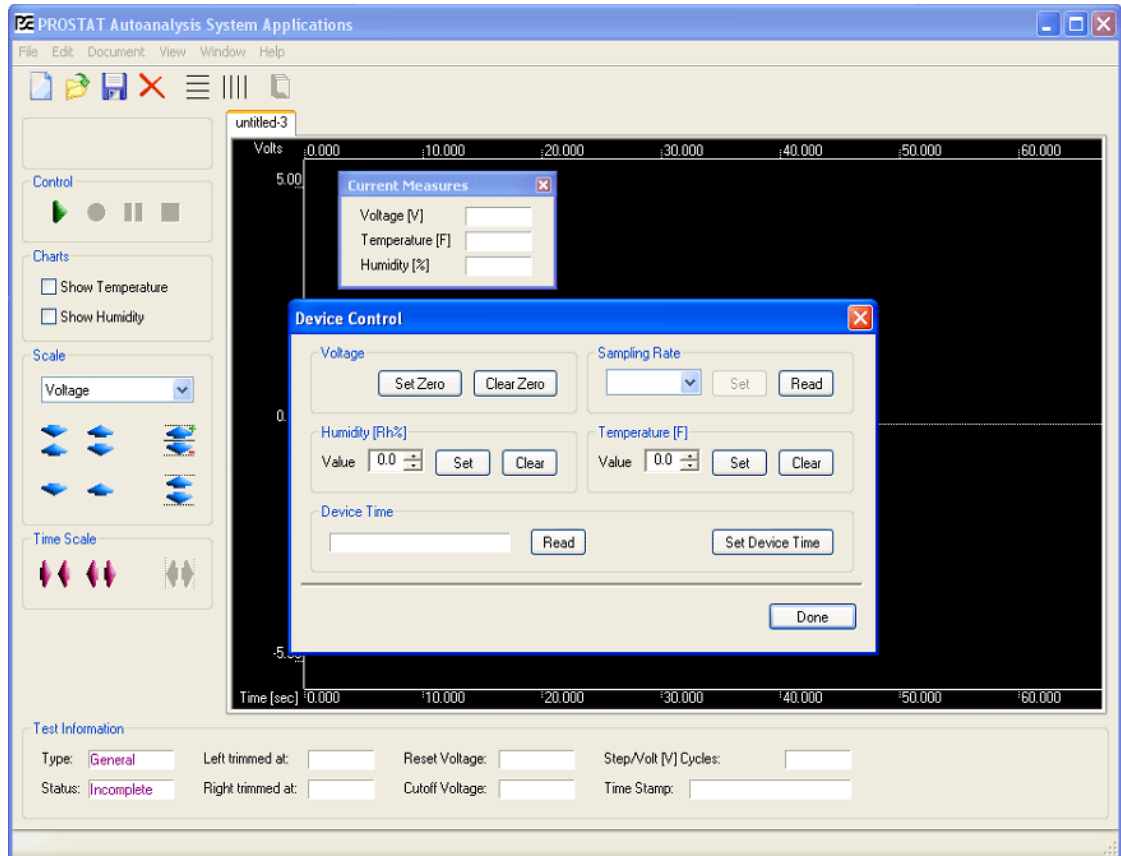


Figure 15: Resetting Autoanalysis System Zero reference

- c. Remove the shorting shunt and reinstall the PFM-711A analog output cable

INFORMATION NOTE

The PGA-710 Autoanalysis System is a precision instrument. Depending on the environment and while rare, the System's zero reference may be affected by high levels of extraneous transmitted energy, or "noise" i.e., EMI/RFI. All units are easily zeroed as described above unless influenced by excessive noise. The noise level will be recorded and displayed by the system unless it is eliminated, or the system is shielded from the transmitted energy in some manner.

- d. Use the Voltage Scaling Buttons to adjust the signal trace to your display needs.

III. Measure Body Voltage Generation

Once the system is setup and zeroed, the actual body voltage generation measurements are quite simple to conduct. Basically, the system records the voltage generated on the operator's body while walking, using a specific six step pattern. The walking pattern is repeated several times, typically about 20 cycles. The system then analyzes the walking data with some input from the operator.

The Walking Step

The operator holds a metal wand in their hand during the walking cycles. The wand is connected to the Charge Plate Monitor accessory installed on the PROSTAT PFM-711A Field Meter.

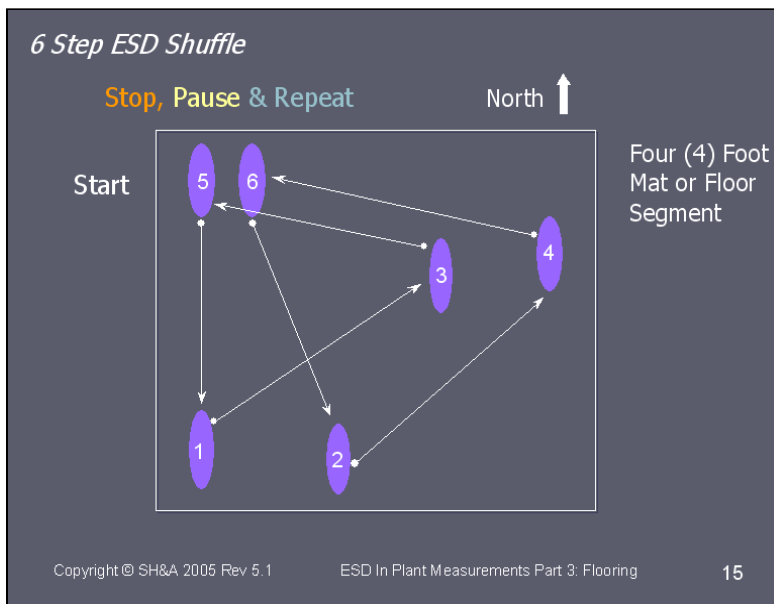





Figure 16: Six-Step Walking Pattern



Figure 17: Operator Conducting Six-Step Walking Pattern

1. Once positioned, press the **Green Right Arrow**  (F5) to start data **Preview**; conduct one or two walking patterns to ascertain body voltage range. The following  demonstrates high voltage generation. Press the **Voltage Auto Balance** button  (F11) to bring the entire trace within the display view.

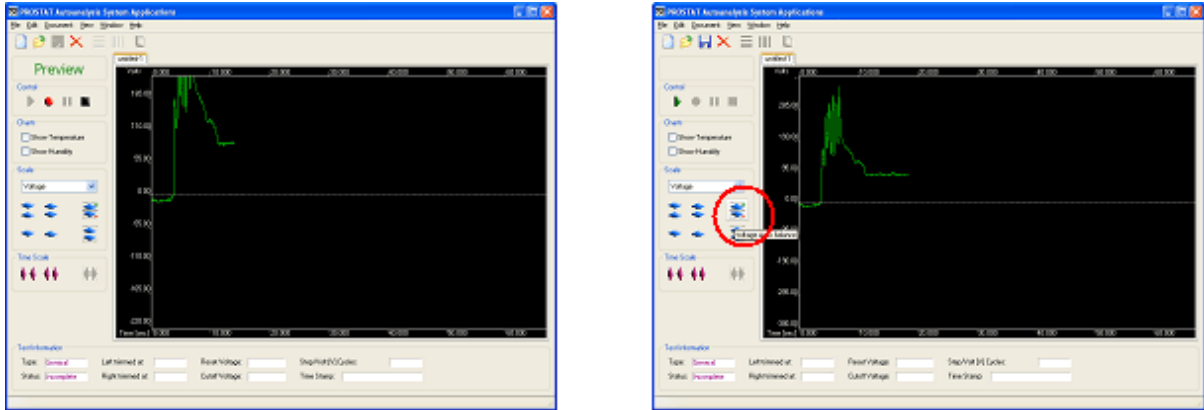





Figure 18: Preview Body Voltage Generation and Adjust Voltage Range by pressing the Voltage Auto Balance button or pressing F11

2. If range is satisfactory, temporarily ground the operator to re-zero the trace then press the **Red Record button**  or F6 to begin collecting recorded data. Note that the trace changes color indicating data is being recorded. Conduct the number of six-step walking cycles you desire. Press the **Black Square**  (F8), to stop recording; the *preview* trace will be erased leaving only the recorded data.

- a. You may press the **Time Scale Auto Fit**  button or F12 to display the entire test series on the screen (Figure 19)
- b. If desired add lines and labels. In the Figure 19 additional voltage lines and labels were added at ± 100 volts using **Document, Voltage Custom Options** menus.

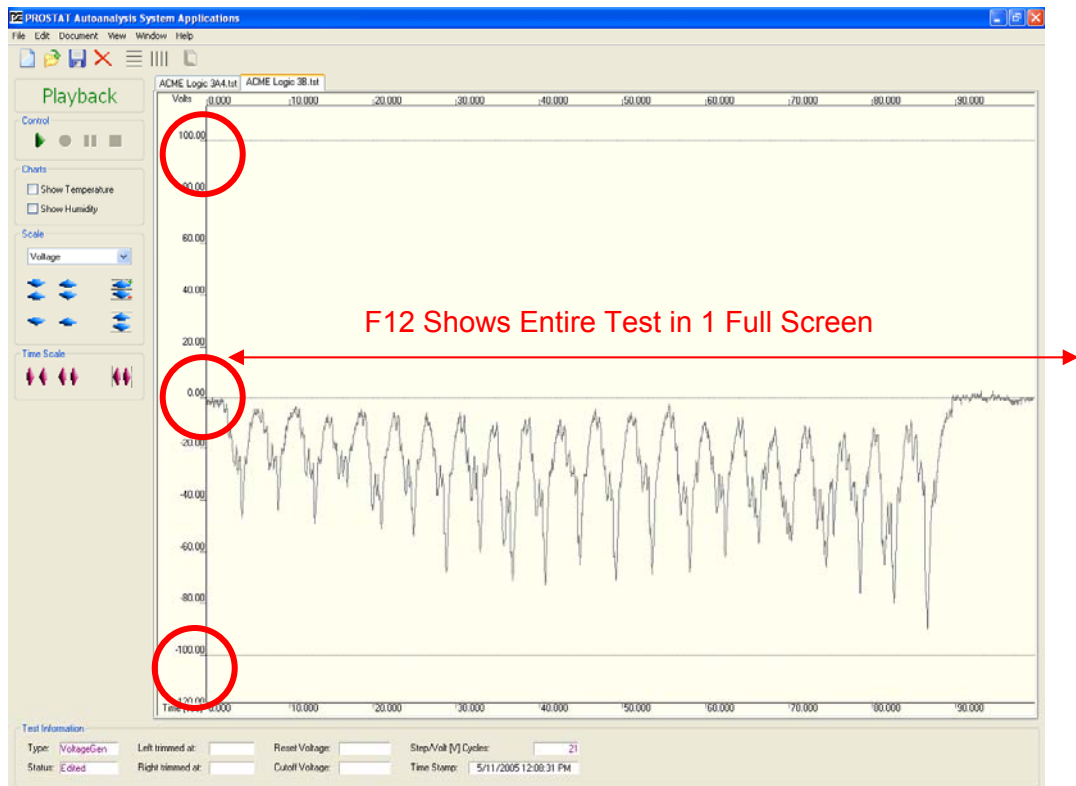


Figure 19: To fit all data on the display horizontally press Time Scale Auto Fit Button (F12)

c. Notice that the Test Information section displays the Type of test and its status
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- i. Test Type reflects the selection you made in the Session Wizard. It could be General Test, Voltage Generation Test or Decay Test
 - ii. Status indicates your progress in the testing and analysis sequence Edited indicates that data was obtained the recording is stopped.
3. Trim the trace of data to be ignored by the analysis process. Select the Edit drop down menu, and click **Trimming**.... The drop down menu will close and the Editing Control window will open. The Editing
- a. Select **Trim Left**. Position the cursor on the trace. Everything LEFT of the cursor will not be used in the analysis.
 - b. Select **Trim Right**. Position the cursor on the trace. Everything RIGHT of the cursor will not be used in the analysis.

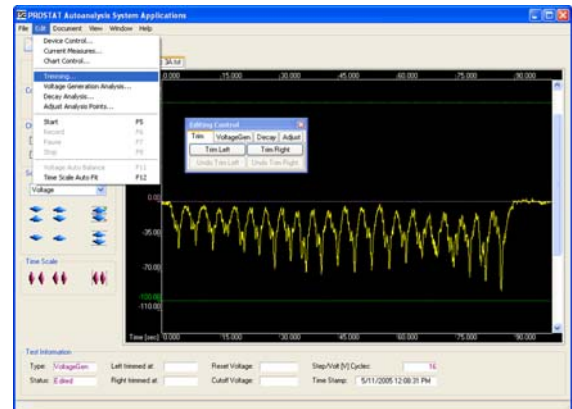


Figure 20: Trim the trace of data to be ignored

NOTE

Trimming will exclude data from the analysis process. Trimming will not remove data from the file. Be sure of your positioning to reflect the data you wish to incorporate in the final analysis.

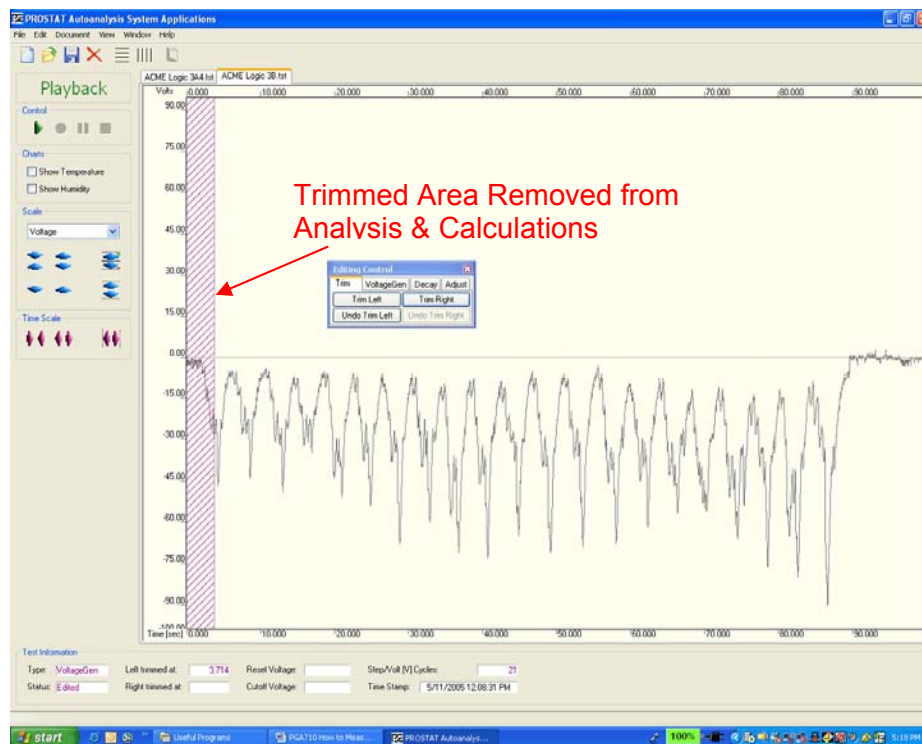


Figure 21: Trimmed data is not used for the analysis, but is not eliminated from the data file. Use Undo Trim to remove Trim Areas

4. To analyze the data, select **VoltageGen** in the **Editing Control** window, and enter the total number of six-step walking cycles in the recorded trace.

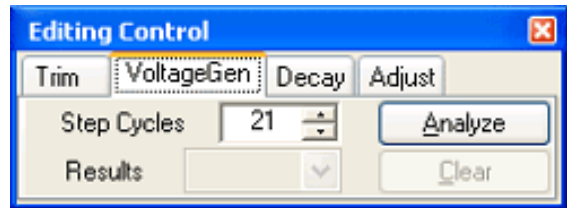


Figure 22: Enter Number of Walking Steps to analyze

5. Click the **Analyze** button to start the analysis. There are *two peaks for each Step Cycle*, a Walking (maximum) peak and a Standing (minimum) peak. Thus, if the system “sees” 40 peaks, it is analyzing 20 step cycles. If it sees 42 peaks, it is analyzing 21 steps
 - a. If the system analysis agrees with your entry, vertical colored lines indicating negative or minimum values and other lines indicating positive or maximum values will appear. In this case, click **Adjust** and **Release** to complete the analysis.

- b. If the system does not agree, the number of possible voltage peaks found may appear in the Results window

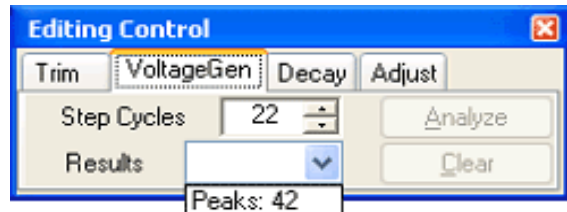


Figure 23: Analysis Offers Different Number of Peaks

- c. You may click on a proposed **Results** option, if there is more than one, to initiate the analysis. Or, you may enter a different number of Step Cycles, press Enter, and then Analyze to restart the analytical process.

- d. If the system cannot resolve the number of peaks that were entered a **No Peaks Found!** (Figure 24) Message appears. Click **OK** and enter a new number of walking cycles. Repeat the process as necessary until the system recognizes the number of step cycles.

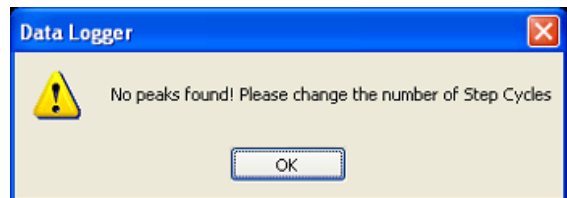


Figure 24: No Peaks Found message indicates system cannot resolve number of entered walking steps

- e. In the next **Adjust** function, you will have an opportunity to accept, add or delete displayed peaks.

6. Should you find that there is an extra peak, or one missing, either minimum or maximum; you may correct the situation using the **Adjust** function in the **Edit Control** window. Use the **Add** or **Remove** buttons to include or eliminate various peaks from the analysis.

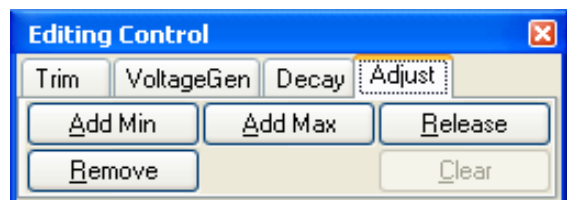


Figure 25: Edit Control Window

- a. To remove any peak (**Min** or **Max**) from the analysis, click **Remove**, place the cursor over the peak line you wish to eliminate, and click the Left mouse button. (Figure 25)
 - b. To add a Minimum or Maximum peak to the analysis select the appropriate button (**Add Min** or **Add Max**) and position the cursor on the peak you wish to add.
7. Once you are generally satisfied with the number peaks click **Release** in the **Edit Control** window (Figure 25) to initiate detailed analysis of the data.

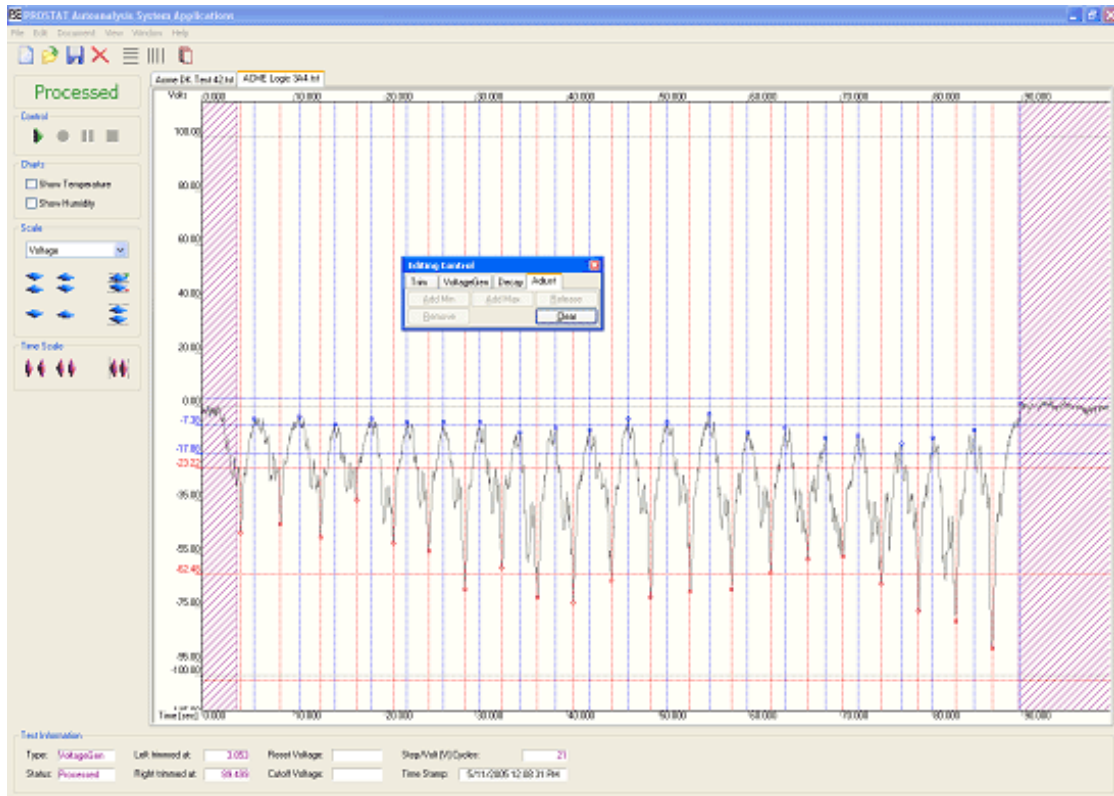


Figure 26: Clicking “Release” initiates detailed data analysis. 3 Sigma range will be identified for Walking and Standing data, and the Average for each range will be

Once the data is “released” the program will automatically calculate (Figure 27):

- a. 3 Sigma range (Average plus and minus 3 times the standard deviation) for Walking body voltage range
- b. 3 Sigma range (Average plus and minus 3 times the standard deviation) for Standing body voltage range
- c. The Average for each Walking and Standing body voltage ranges

In this illustration, the Blue Lines Indicate Standing Body Voltage Average ± 3 Standard Deviations

In this illustration, Red Lines Indicate Walking Body Voltage Average ± 3 Standard Deviations

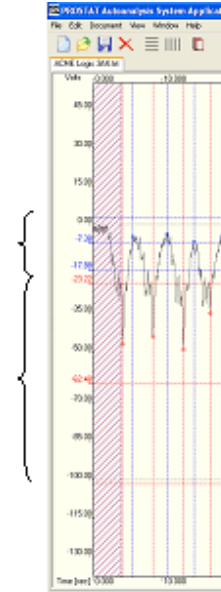


Figure 27: Automatically Calculated Standing & Walking Voltage Ranges

8. Once the basic calculations are completed a detailed report may be generated. From the **Document** drop down menu (Figure 28) select **Report View**
 - a. This opens the Report window where type and format may be selected.

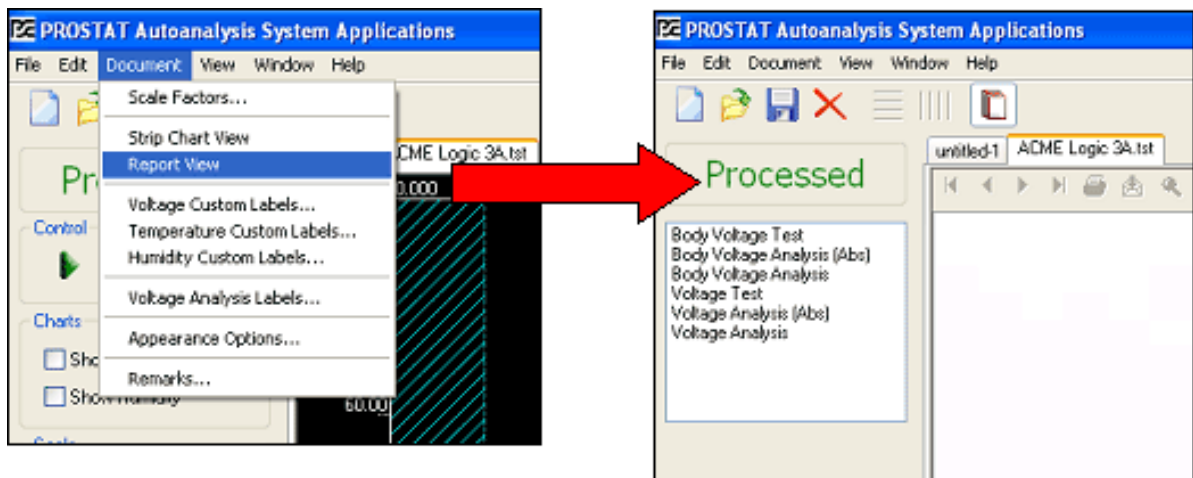


Figure 28: Generating Reports using Document Drop Down Menu

- b. If the **Body Voltage Test** is selected, a full size 8.5 x 11.0 inch landscape chart will be generated for printing, or export (Figure 29). Any information entered in the Session Wizard will be included on the chart.

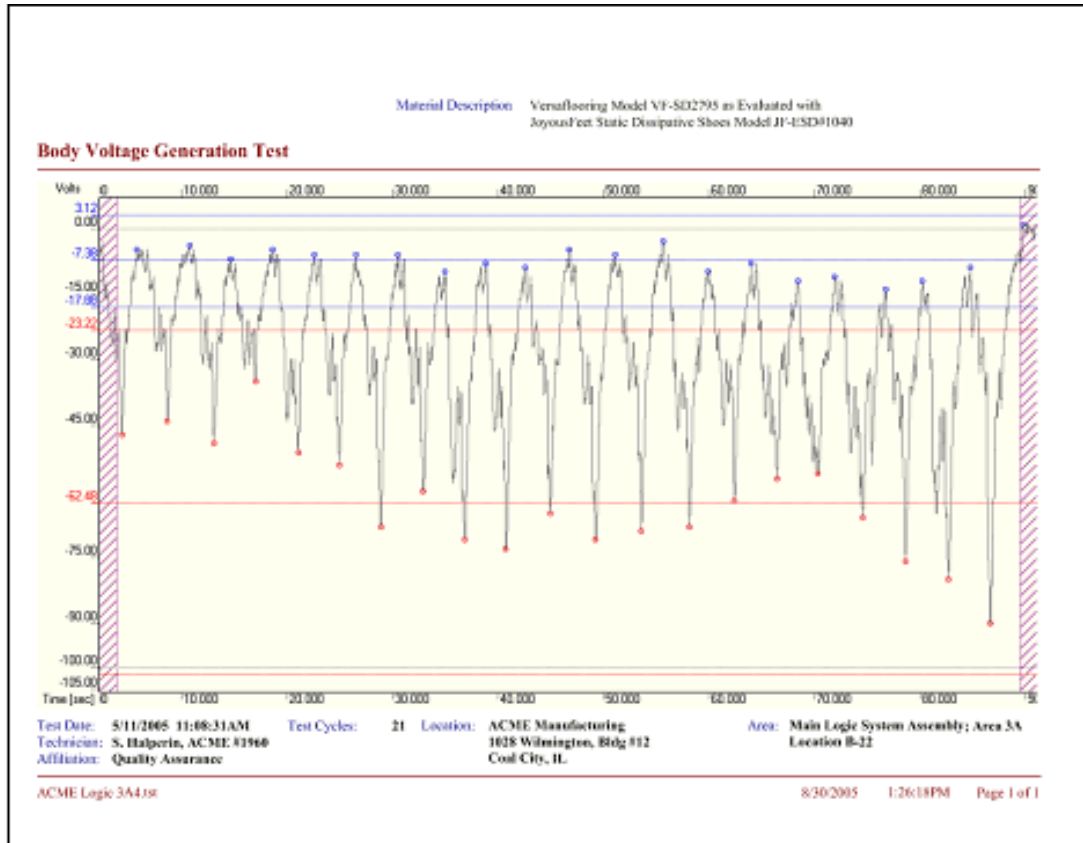


Figure 29: Full Size Chart with Session Wizard Information

- c. Selecting the Body **Voltage Analysis (Abs)** report will generate graphs where their slopes will be calculated using absolute values of the data. (Figure 30)

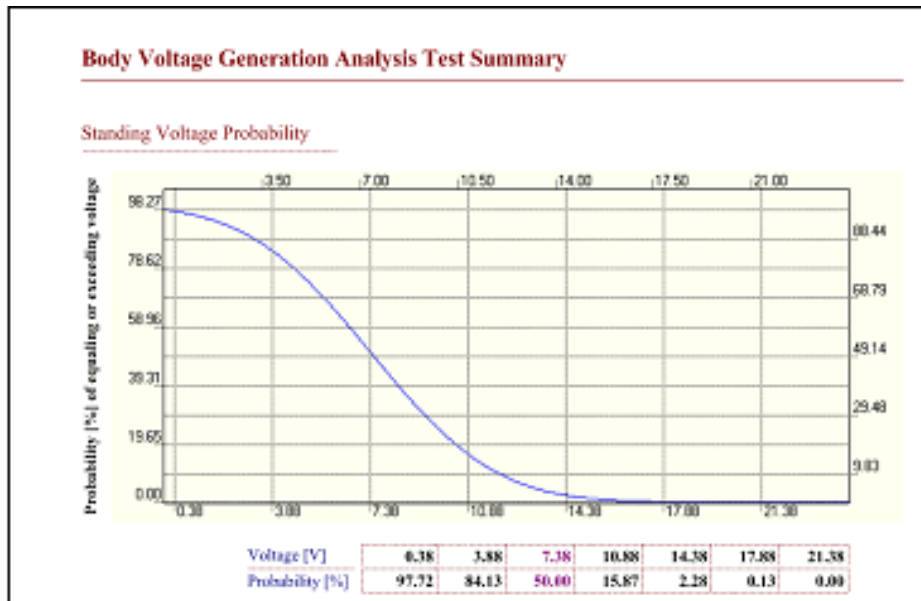


Figure 30: Full Size Chart with Session Wizard Information

- d. Selecting the **Body Voltage Analysis** report will generate graphs where slopes will be calculated using values and *polarities* of the recorded data. (Figure 31)

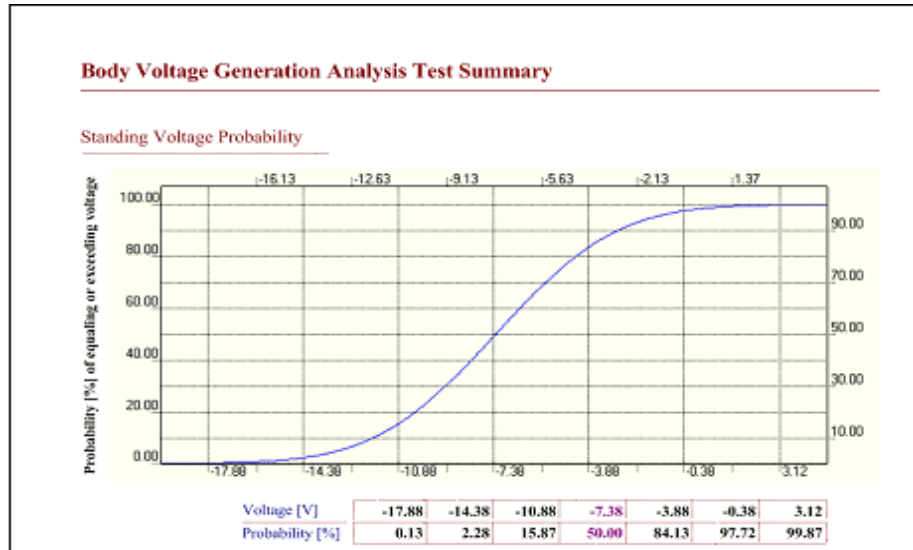


Figure 31: Body Voltage Generation Probability Curve using Recorded Negative (-) data. The slope is from Right (High magnitude) to Left (Lowest magnitude)

- e. The first page of the report includes the graphic recording of the data, session information and general calculations.

Graph of Recorded Data
±3 Sigma Ranges Highlighted

Descriptive Information that was
input to the Session Wizard

General Calculations and Footer
Information, which includes File
Name, Time and Date document
was printed, and page numbers

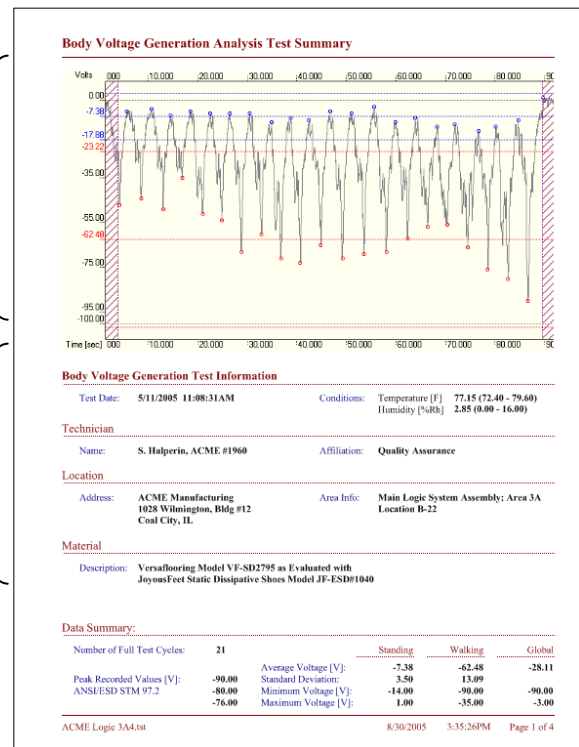


Figure 32: First Page of Body

Calculated Probable Body Voltage Range of Personnel Functioning at Workstations while **Standing** -- Based on Average Minimum Peaks (at 6-Step Pause) \pm 3 Standard Deviations

Calculated Probable Peak Body Voltage Range of Personnel while **Walking** -- Based on Average Maximum Peaks \pm 3 Standard Deviations

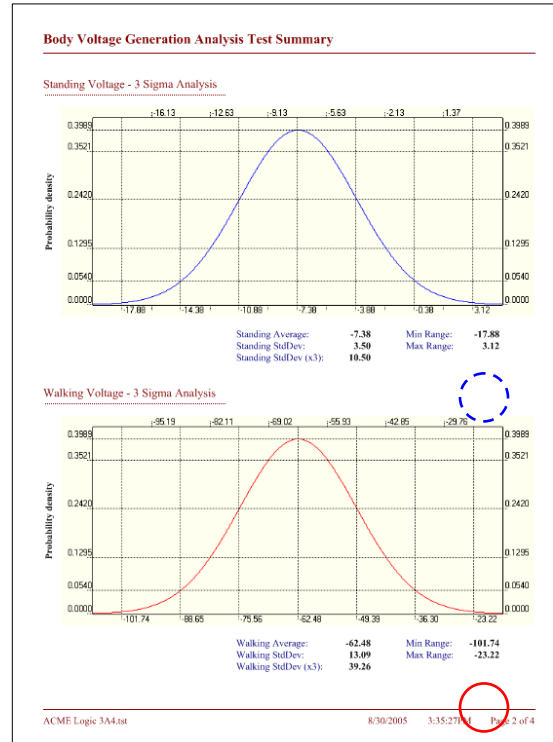


Figure 33: Second Page of Body Voltage Generation Report -- Probable Voltage

Calculated Probability of Equaling or Exceeding a given Body Voltage of Personnel while **Standing** and Functioning at Workstations -- Based on Average Minimum Peaks (at 6-Step Pause) \pm 3 Standard Deviations

Calculated Probability of Equaling or Exceeding a given Peak Body Voltage of Personnel while **Walking** -- Based on Average Maximum Peaks \pm 3 Standard Deviations

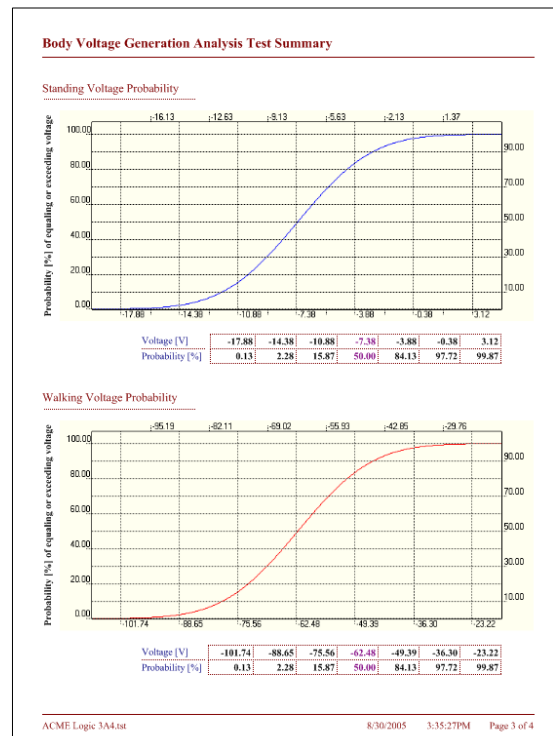


Figure 34: Third Page of Body Voltage Generation Report -- Probability of Equaling or Exceeding a defined Voltage

- f. The Operator may enter comments, references, testing notes, etc., into any report by selecting the **Document** drop down menu and clicking on **Remarks**. The Remarks window will open.

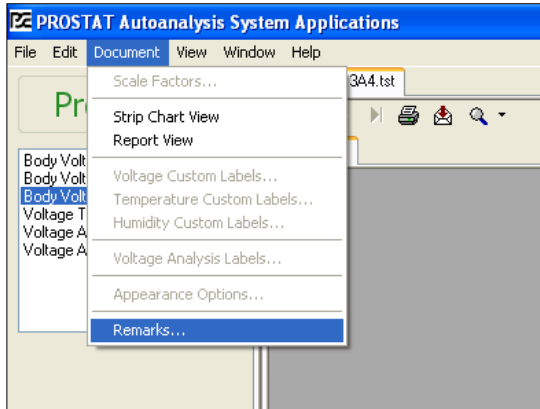


Figure 35: Opening Remarks Window in a Test Report

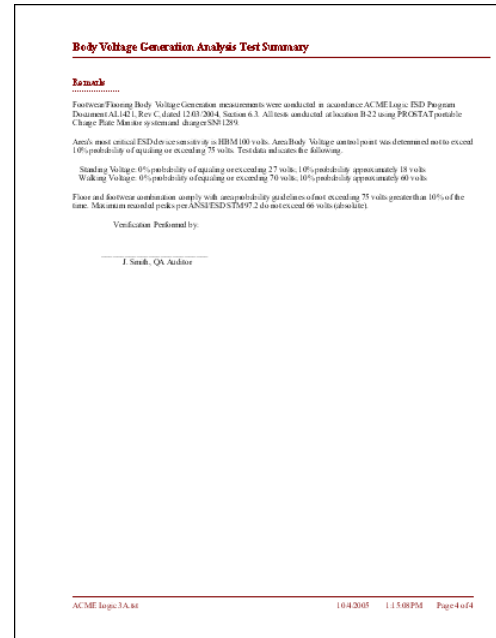


Figure 36: Optional Fourth Page of Body Voltage Report Documents Operator's Comments

Overview: Body Voltage Generation Analysis

ESD Analysis applications may require one to know how quickly electrostatic voltage will dissipate from a material, object or body when grounded, or exposed to ionized air. The process of measuring the time required for a defined voltage to dissipate is often referred to as “decay time”, i.e. determining how many seconds, or fractions of a second, are required for a voltage to dissipate from one magnitude to a defined lower level.

Decay analysis is often used for evaluating and auditing ionizing devices such as bench top units, compressed air ionization nozzles for removing particulate, and room ionization systems. A voltage is applied to a floating plate of a Charged Plate Monitor (CPM), which is positioned in the ion field or air flow. The time required in seconds for the ionizer to reduce that voltage to a predetermined level is measured. Decay analysis may also be used to evaluate various packaging materials and configurations. One may wish to measure how quickly a charge is dissipated from a person when grounded, or when wearing ESD footwear and stepping onto a floor surface.

The PGA-710 Autoanalysis System was originally designed primarily for ionization decay analysis. However, other decay analysis applications are apparent. The following illustrations focus on measuring decay time of a bench top ionizer. The principles apply to many other evaluations and measurements where the voltage change over time is an important measurement. For detailed information regarding Standard Test Methods and Standard Practices for evaluating and auditing ionizers and devices refer to ESD Association's documents:

ANSI-ESD-STM3.1-2000 *Ionization and*
ESD-SP3.3-2000 *Periodic Verification of Ionizers*

IV. Instrument Test Setup for Decay

The instrument setup for static decay measurement of ionizers is similar to body voltage measurement.

1. Mount the Prostat CPM-720 Charge Plate to the PFM-711A Field Meter and connect the field meter to ground. (See the instrument's operations manual for detailed instructions.)
2. Connect the analog output of the field meter to the input of the PGA-710 Autoanalyzer using the supplied lead.

CAUTION

To prevent system damage to the PROSTAT® PGA-710 Autoanalysis System and voiding your warranty, input to the Autoanalyzer **may not exceed ± 2.0 volts** without specific adjustments and recommendations from PROSTAT. Confirm proper non-PROSTAT instrument output voltages before connecting to, and energizing the

3. To prevent system damage to the PROSTAT® PGA-710 Autoanalysis System and voiding your warranty, input to the Autoanalyzer **may not exceed ± 2.0 volts** without specific adjustments and recommendations from PROSTAT. Confirm proper non-PROSTAT instrument output voltages before connecting to, and energizing the system
4. Use the Prostat PCS-730 ± 1 kV Charging Source for applying voltage to the charge plate for decay testing. Be sure the PCS-730 is grounded for proper operation.



Figure 37: Ground Charging Source for Proper Operation

V. Basic of Voltage Decay Analysis

Decay Test Session Wizard

A series of windows allow detailed documentation of the test set. Selecting the Decay Test button on the opening Session Window leads the operator to a test setup window. (Figure 38)

Once Decay Testing is selected the following windows allow detailed test information to be entered.

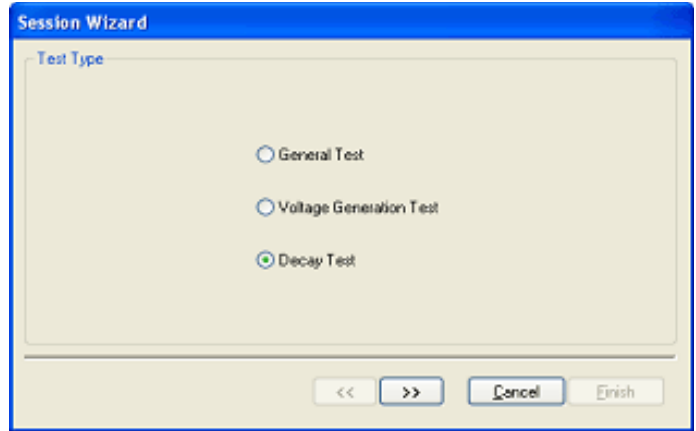


Figure 38: Use the first Session Wizard Window to designate the Decay Test

1. Designate the voltages used to Start and Stop the decay time period.
 - a. The **Reset Voltage** starts the timing calculation period.
 - b. **Cutoff Voltage** ends the timing calculation period.
2. The second Decay Window offers two means to designate **Reset** and **Cutoff Voltages**.

- a. Standard **Reset** and **Cutoff Voltages** are (See Figure 39):

1,000 Volts – 100 Volts
 1,000 Volts – 50 Volts
 1,000 Volts – 10 Volts

- b. Checking the **Custom Box** allow entry of any two pair of voltages necessary for the evaluation. Figure 40.

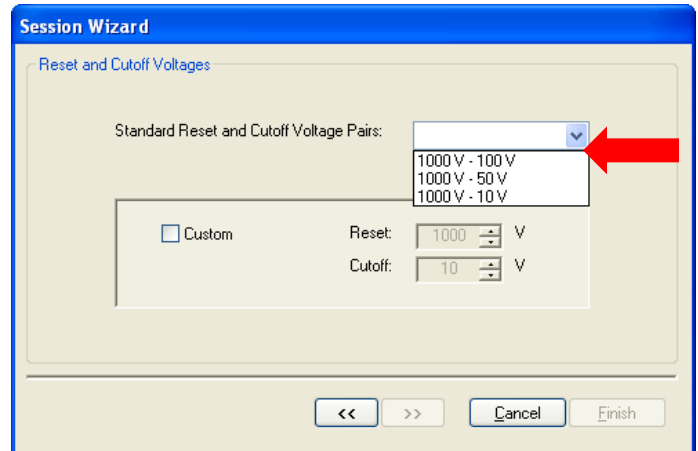


Figure 39: Highlight the Standard Reset and Cutoff Test Voltage that meet test criteria

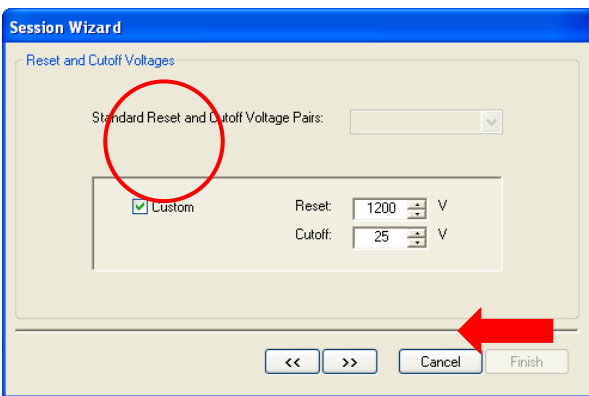


Figure 40: Check the Custom Box and Manually Enter Reset and Cutoff Voltages

3. Enter Technician information and material description in the next Session Wizard Window

- a. One line is available for Technician's name and affiliation
- b. Two lines are available for Material Description

4. The General Information Window provides entry of the following information.

- a. Facility Address
- b. Two lines can be used for Area Identification.

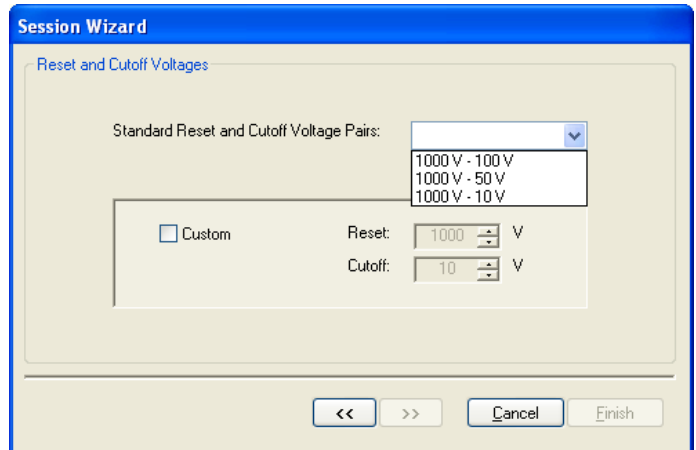


Figure 41: Technician & Material Information Window

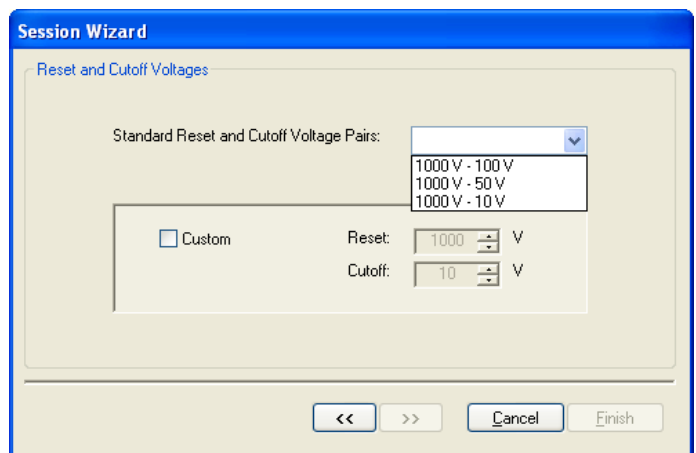
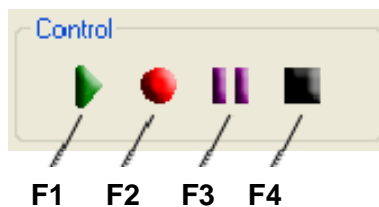


Figure 42: Address and Test Area Information Window

Once a new file is opened, decay test data is recorded using the same chart controls described above for recording voltage generation. Short Cut Keys are also used for this function:



F5 Preview: Starts chart display of voltage and measurement levels

F6 Record: Begins data capture of all measurement levels

F7 Pause: Stops and Starts Chart recording and playback

F8 Stop: Ends Preview, Recording or Playback.

F11 Auto Balance: Will align Preview or Recorded data to center of chart. It can also be used to automatically align Voltage, Temperature or Humidity.

F12 Auto Min Max: Will automatically align display data to vertically utilize the entire chart view using the maximum and minimum data values.

VI. Understanding Ionization & Measurement Objectives

Ionizers have an effect on airborne gases to produce positive (+) and negative (-) ions:

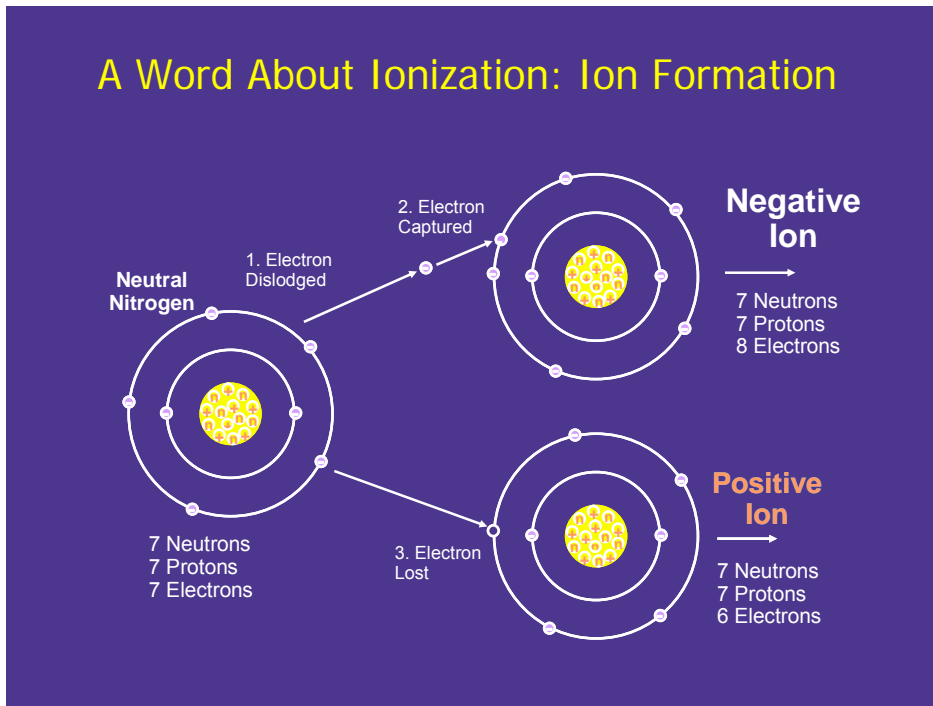


Figure 43: Ion Production

Whether caused by electrical voltage, nuclear alpha source or even X-ray, a negative electron is “dislodged”¹ from a nitrogen molecule and attached to another nitrogen molecule. This leaves the donor molecule positively charged, and the absorbing molecule negatively charged. In theory, an equal number of positive and negative ions are generated.

Once the ions are generated within the bench top system, a fan blows the ions out of the box into the work area as shown in Figure 44.

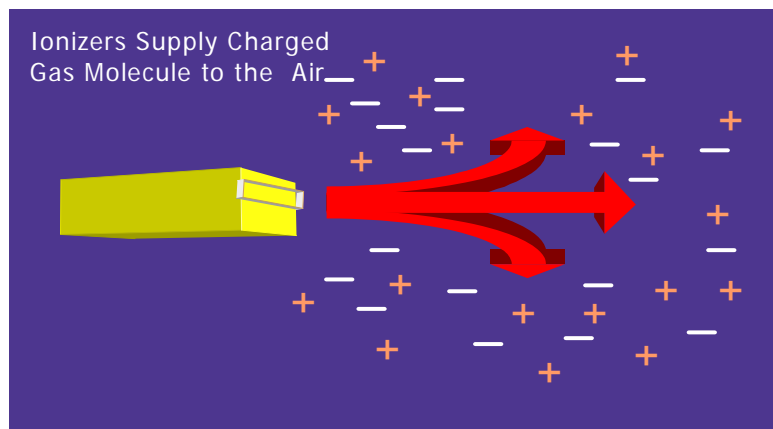


Figure 44 Ions are Distributed by Fan or Compressed Air

¹ Diagram courtesy of Arnold Steinman, Technical Director, Ion Systems, Inc
PGA-710 Autoanalysis System – How To Measure Guide

Ions are attracted or repelled by materials and grounded conductors within their environment. Thus, a positively (+) charge material's electrostatic field will reach out and attract negative (-) ions to offset the material's charge as in Figure 45.

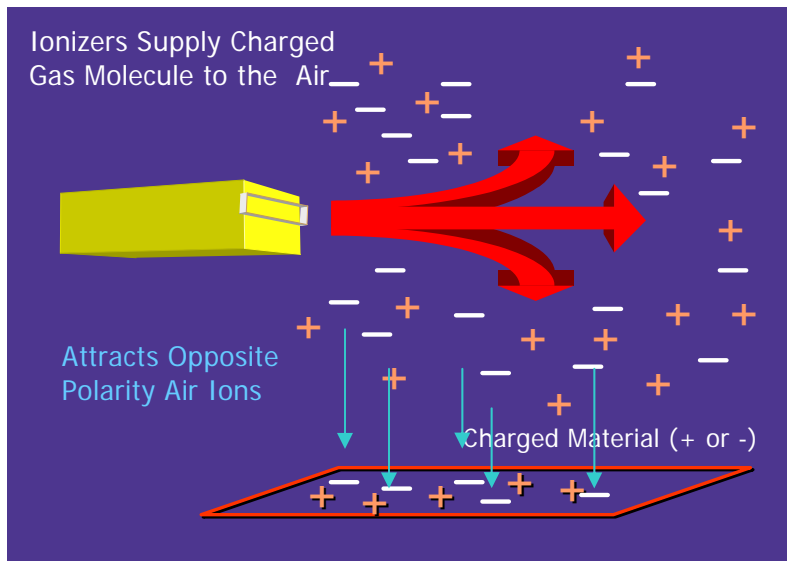


Figure 45: Positively Charged Material Attracts Negative Ions

Consequently, one will want to Measure and confirm that:

1. The number of positive and negative ions generated by the ionizing process is close to equal, or balanced. If the numbers of positive and negative ions are unbalanced, they will create an "off set voltage" on an exposed surface.
2. The ions generated are sufficient to neutralize an unwanted charge on the critical surface or device in a reasonable time period. In other words, dissipate a charge in an acceptable "decay time".

Thus, two measurements of an ionizer device or system are required: Offset Voltage in electrostatic volts; and, Decay Time in seconds.

VII. Offset Voltage & Decay Time Measurement Procedures

The following describes decay and offset voltage measurements of bench top ionizers. Room systems and compressed air or gas devices may be measured in a similar manner but may require use of a six inch square plate (15.24 x 15.24 cm) depending on company ESD Program requirements.

Measuring Offset Voltage

Offset voltage indicates the degree of ion imbalance produced by the ionizer at a distance from its outlet, or at the "work point" where the ionization effect is desired. To measure offset voltage, use the following procedure:

1. Confirm the Charge Plate Monitor (CPM) is zeroed and floating (Figure 46).
2. Position the CPM at the point that offset voltage is to be measured. Typically this is approximately 15 to 40 inches from the outlet of the ionizer, depending on process and work requirements.

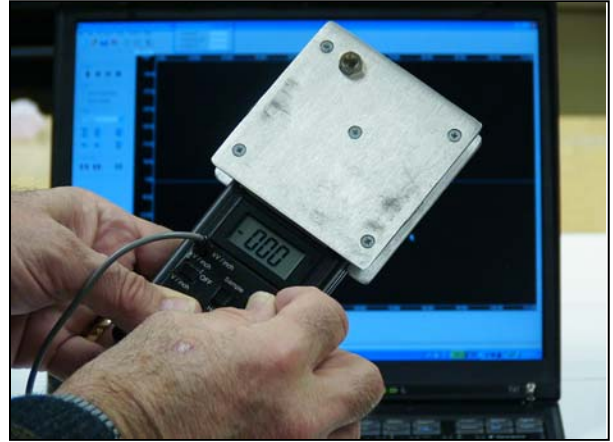


Figure 46: Ground the Charge Plate Monitor and Confirm the zero (0) reference setting

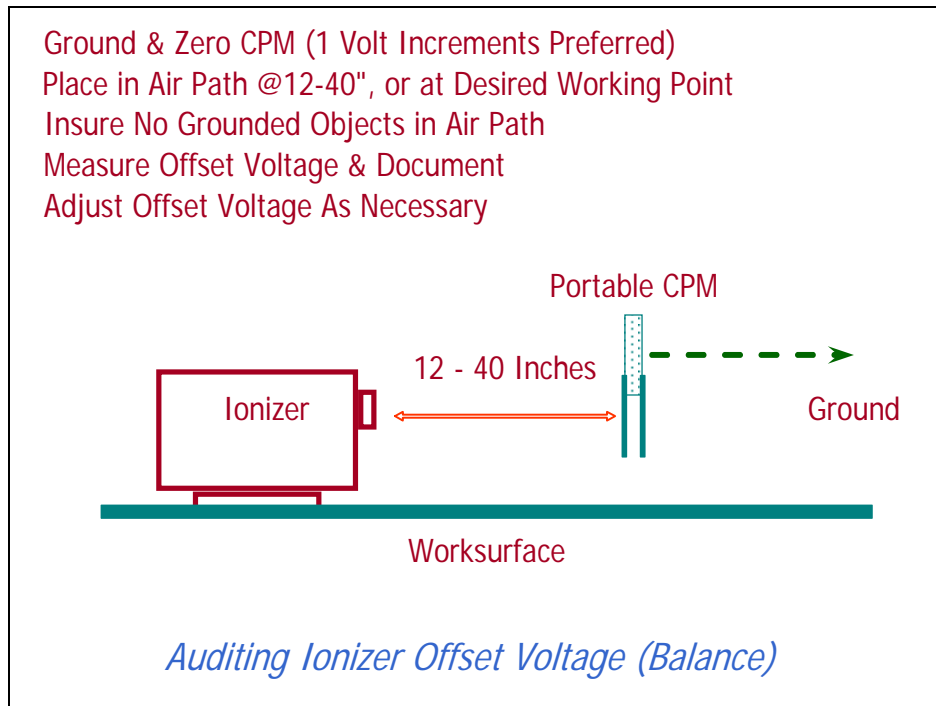


Figure 47: Offset Voltage Measurement Concept

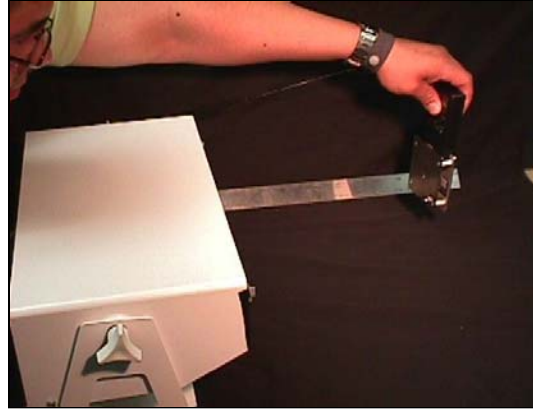


Figure 48: Making Offset Measurements on Bench Top Ionizing Blowers

3. Start the **Preview** mode on the PGA-710 software clicking the green arrow or pressing F5, then start **Record** to capture the offset voltage data.
 - a. To automatically adjust the chart scale press **F11**
 - b. Note the actual offset voltage as displayed on the CPM and on the computer screen (Figure 49).

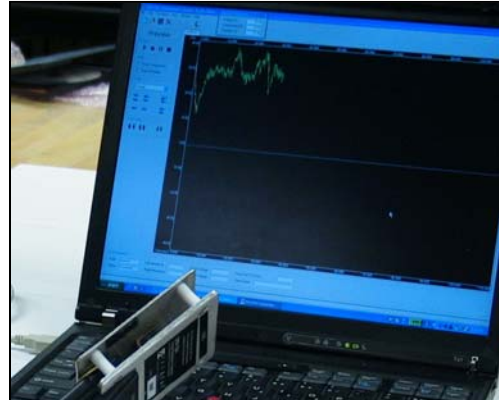


Figure 49: Recording Offset Voltage

VIII. Measure Decay Time

Ionization decay time indicates the number of seconds required for a voltage on a charged plate to dissipate to a defined level when in the presence of ionized air. Typically, decay time is measured from $\pm 1,000$ volts to less than ± 100 , 50 or 10 volts during audits of ionizers. Other requirements may be dictated by the company's ESD program. Decay time is measured at the same distance from the ionizer outlet, or at the "work point" as where the offset voltage was measured, described above. To measure decay time, use the following procedure:

1. Confirm the Charge Plate Monitor (CPM) is zeroed and floating (See Figure 46, above).
2. Start the **Preview** mode on the PGA-710 software clicking the green arrow or pressing F5, then start **Record** (F6) to capture test data.



Figure 50: Charging the Charge Plate Monitor (CPM) to > 1,000 Volts

3. Charge the CPM to greater than $\pm 1,000$ volts (Figure 50) and place it into the ionized air stream.
4. Allow the test voltage to dissipate to its minimum level.
5. Repeat the test cycles several times with both positive and negative test voltages.
6. A minimum of three to six (3 to 6) test cycles should be recorded for each positive and negative test voltages, for a total of 6 to 12 test cycles per bench top ionizer audit.



Figure 51: Performing Decay Tests on Bench Top Ionizer

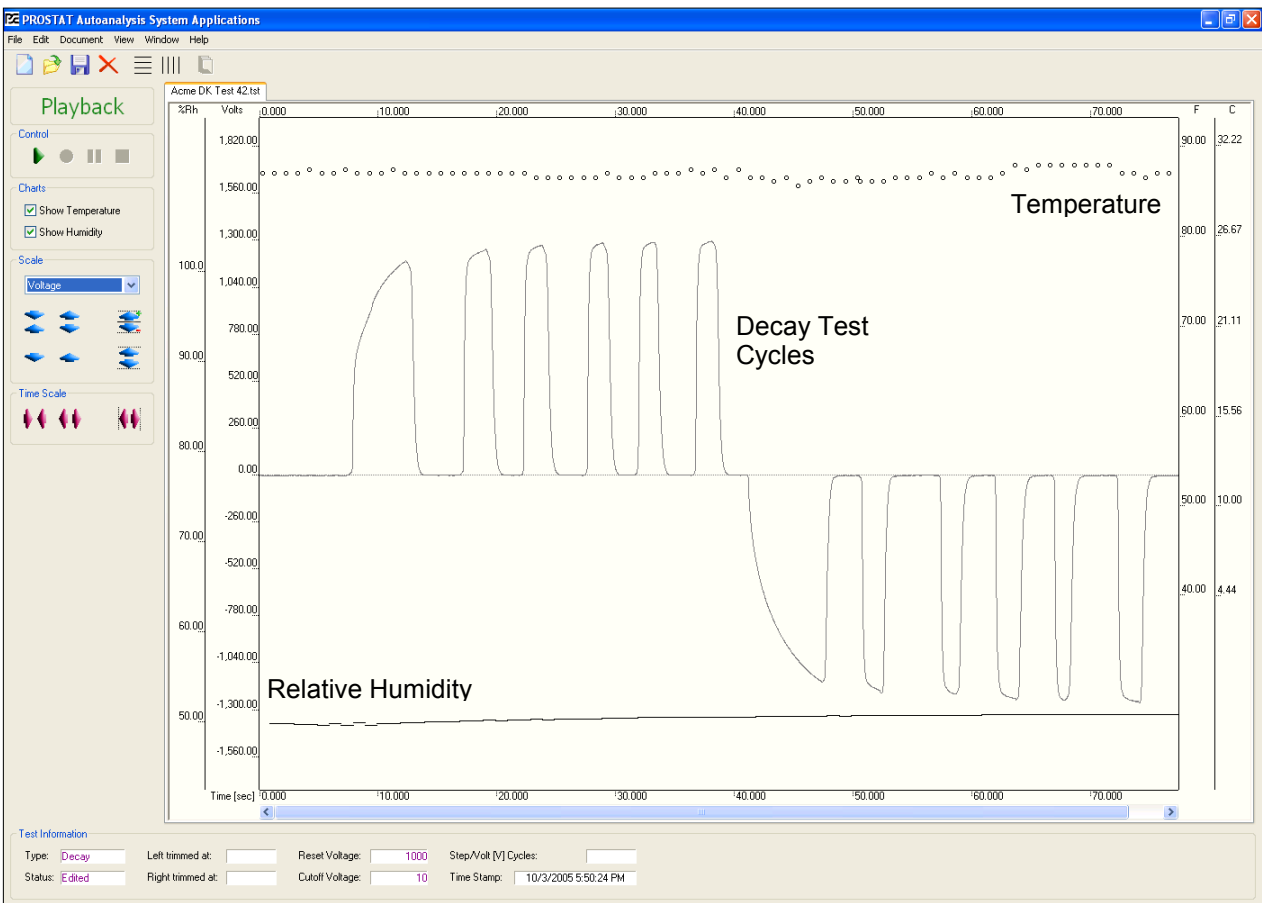


Figure 52: Recorded Decay Data. Note Temperature and Humidity Data

IX. Analyzing Decay Time Data & Generating Reports

Use the **Edit** drop down menu to open the **Decay Analysis** window and enter desired decay test parameters if not previously entered through Session Wizard. In this illustration the decay test cycle time starts at $\pm 1,000$ volts and ends at ± 10 volts, as shown in Figure 53.



Figure 53: Decay Analysis

Once the Decay Parameters are set, click **Analyze** to begin the decay analysis process. This will insert vertical start and stop time lines in the chart area indicating those test cycles that have the desired parameters, in this case $\pm 1,000$ to ± 10 volts. If the cycle does not meet these parameters, no vertical start/stop time lines will be entered. Click **Adjust** then **Release** to complete the analysis. The horizontal voltage lines at $\pm 1,000$ and ± 10 volts will be inserted at this point in the process. See Figure 54.

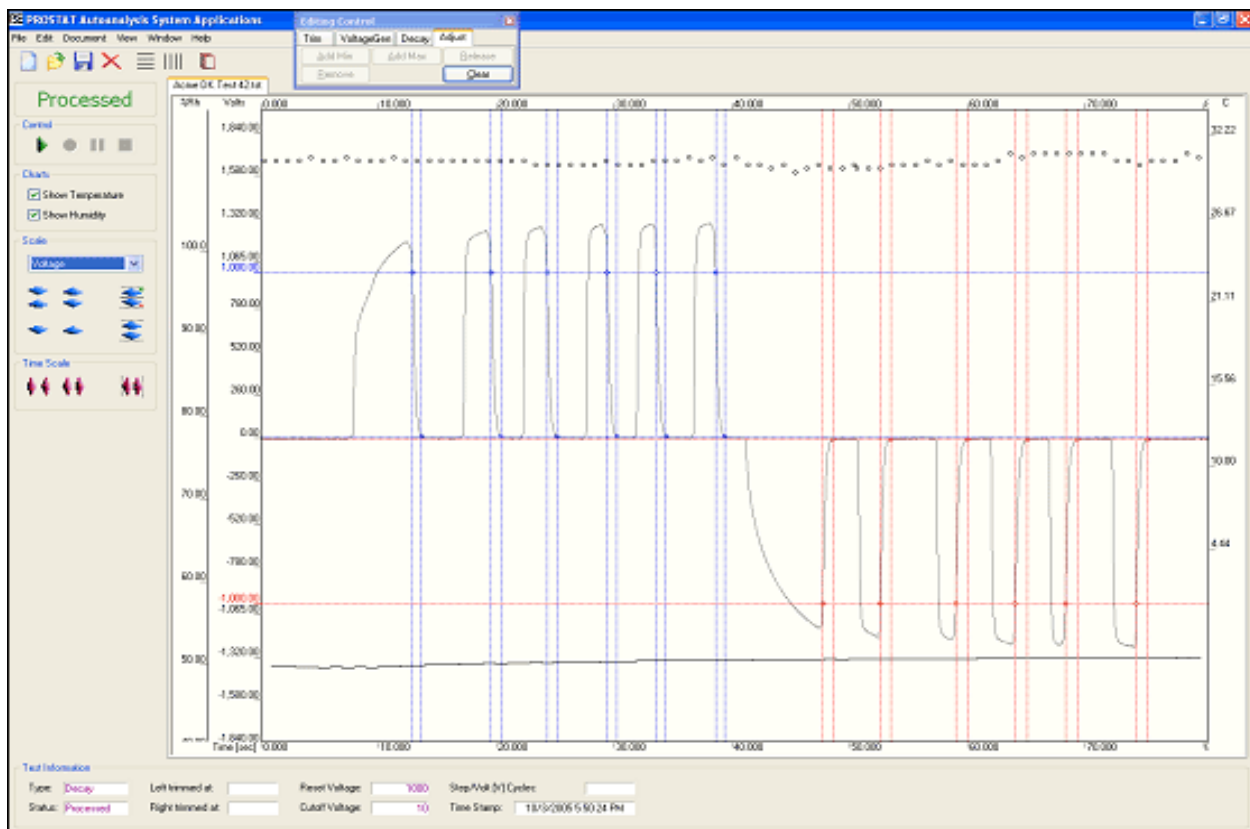


Figure 54: "Processed" Decay Test Cycles from $\pm 1,000$ to ± 10 Volts

To generate a written decay analysis report either open the **Document** drop down menu and select **Report View** or click on the Report View Toggle Button as shown in Figure 55. Note that the Report View Toggle Button allows the view to shift between Strip Chart and Report Views.

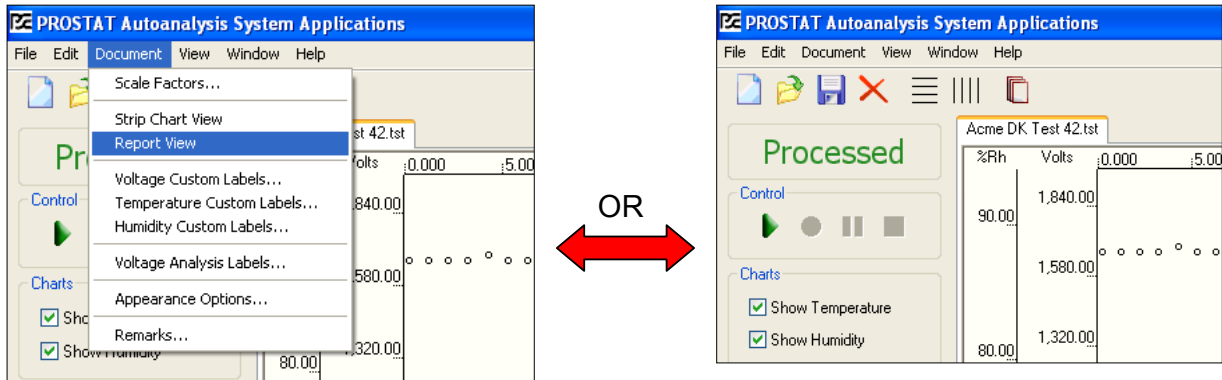


Figure 55: Generating Report

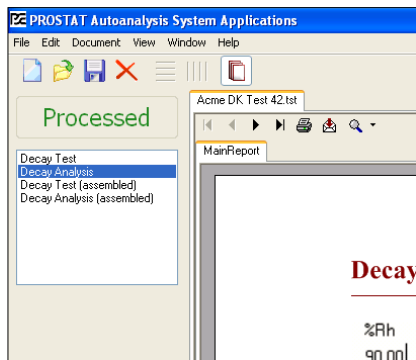


Figure 56: Report View

In Report View one may select a full size chart that is produced in a landscape mode, or a detailed report produced in the standard portrait mode.

The decay reports and charts may be generated in a standard format as shown in Figure 57, or in a unique “assembled” format

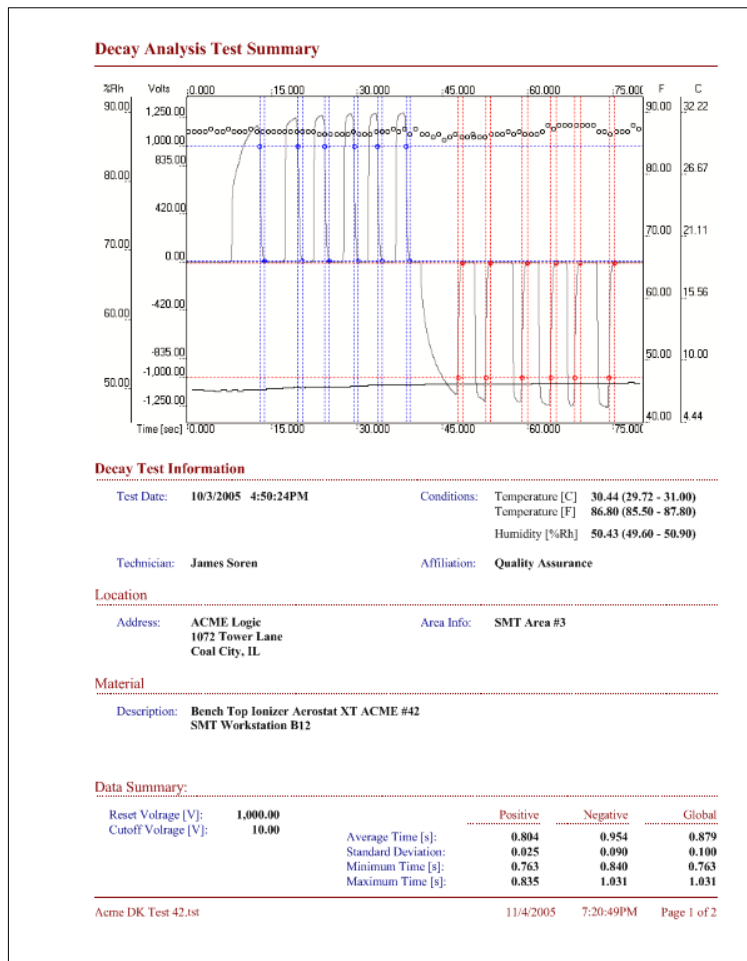


Figure 57: Page 1 of Standard Decay Report

X. Assembled Decay Charts

In the “assembled” format, all decay cycles are compared to each other regardless of how long it required generating the entire test series.

In effect, the test set is “taken apart” by each test cycle and reassembled in sequence. The Positive cycles are compared to the Negative cycles as shown in Figure 58. For example, the total decay time of all Positive cycles was slightly more than 4.8 seconds, while the total of all Negative cycles is approximately 5.7 seconds.

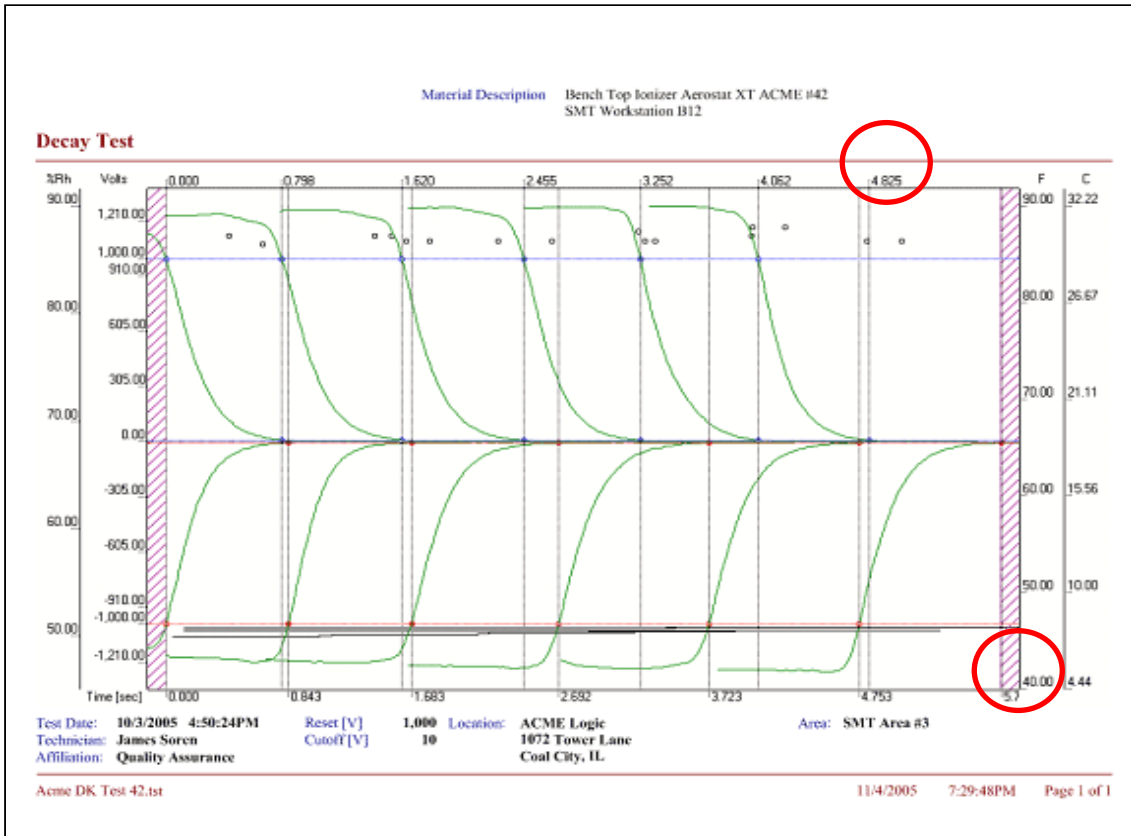


Figure 58: A Full Size Landscape Chart in the “Assembled” Format

NOTE

For additional information, review the PGA-710 Operations Manual and industry test standards.

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