

FIELD METER SET

PFK-100

User Manual

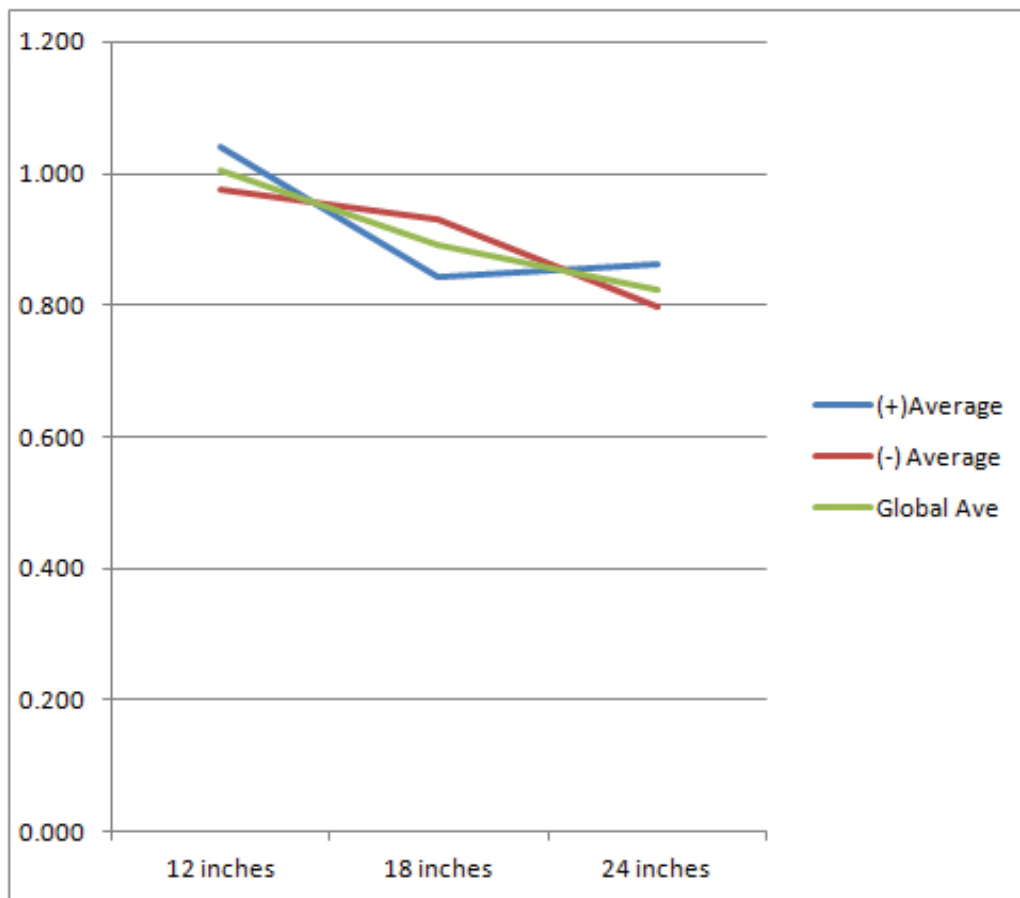


I. Introduction

The PFM-711A is an accurate, compact electrostatic fieldmeter used for locating and measuring static charge potentials. The Charge Plate Assembly CPM-720A allows the PFM-711A to be used to balance & Monitor air ionization equipment, and generally function as a Charge Plate Monitor (CPM). Using the PCS-730 Charging Source, decay performance of ionizers, materials and other equipment may be measured. Many other types of electrostatic measurements may also be made using the PFM-711A and its accessories.

- A. The PFM-711A features **SAMPLE** and **HOLD** measurement modes that allow measurements to be made in places that would be difficult to reach or see with other instruments.
 - 1. When using the CPM-720A Charge Plate Assembly, the **SAMPLE** and **HOLD** feature is useful for obtaining accurate readings.
 - 2. Note that all isolated plates will discharge over time, and the **HOLD** feature will retain the device's reading.
- B. Range switching is provided with the PFM-711A. In **V/inch** mode, the digital display covers the range of 0 - 1999 volts in one volt increments. In **kV/inch** mode, it covers the range of 10 volts to 19,990kV in ten volt increments.
 - 1. An analog output jack provides a 1 volt output corresponding to 10kV, which is independent of the range selected and meter indication.
 - 2. The circuitry is a digital, electronic chopper design and subsequently, the instrument is useful for making electrostatic field measurements in areas where ionized air is present.
 - 3. For accurate, repeatable performance, the PFM-711A must be grounded during normal operations.
- C. The CPM-720A Charge Plate Assembly has been designed specifically to match the small size and handheld convenience of the PFM-711A fieldmeter. It has been conceived as closely as possible to conform to the guidelines of ANSI/ESD STM3.1 air ionization standard.
 - 1. Because of small size, the Charge Plate Assembly CPM-720A does not meet the requirement of the EOS/ESD-S3.1 air ionization standard for 20pF plate assembly capacitance.
 - 2. The CPM-720A capacitance is approximately 15.6 to 15.8pF. The performance of the CPM-720A correlation to a 6 inch charge plate monitor such as the CPM-760A which meets ANSI/ESD STM3.1 air ionization standard, is as follows:

| Hand Held by Grounded Operator (Table 1) | | | |
|--|-----------|-----------|-----------|
| | 12 inches | 18 inches | 24 inches |
| (+)Average | 1.042 | 0.844 | 0.861 |
| (-) Average | 0.977 | 0.930 | 0.798 |
| Global Ave | 1.006 | 0.890 | 0.824 |

**Table 1: Hand Held by Grounded Operator**

| Mounted on 5lb. Weight with Grounded Wrist Strap (Table 2) | | | |
|---|-----------|-----------|-----------|
| | 12 inches | 18 inches | 24 inches |
| (+)Average | 1.054 | 0.912 | 0.932 |
| (-) Average | 0.929 | 0.927 | 0.901 |
| Global Ave | 0.962 | 0.920 | 0.914 |

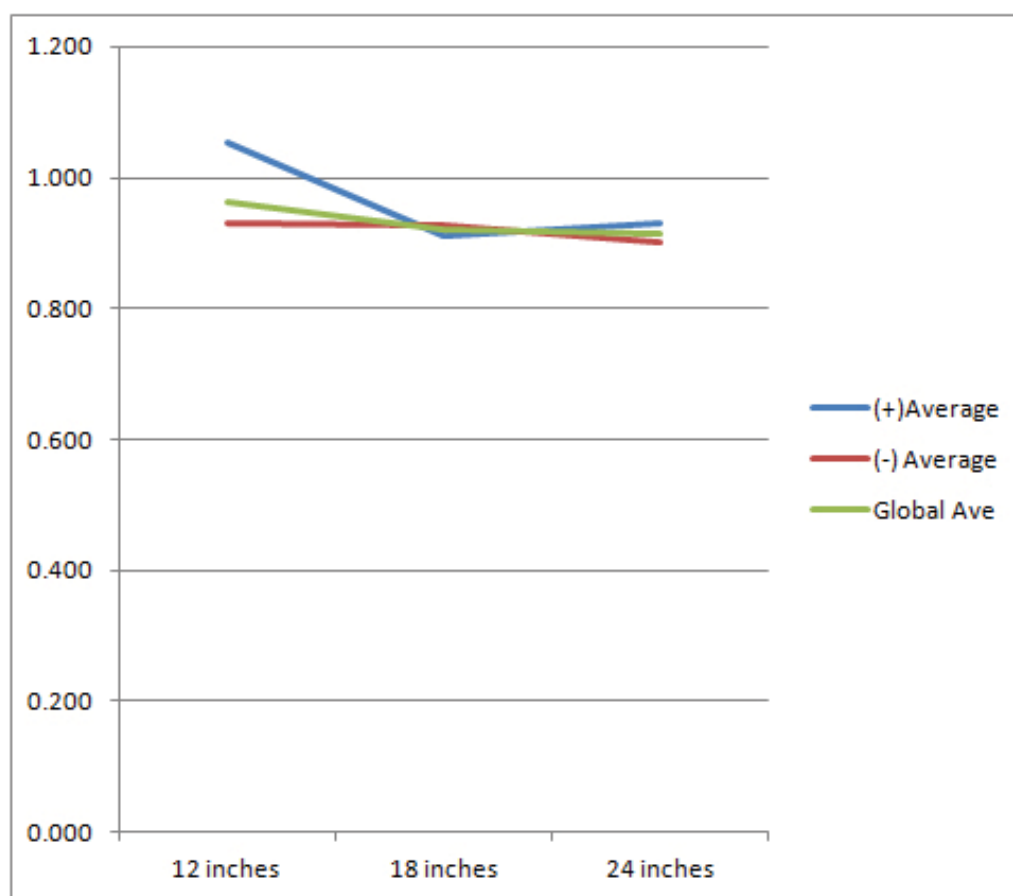


Table 2: Mounted on 5lb. Weight with Grounded Wrist Strap

- D. The PCS-730 Charging Source provides $\pm 1.25\text{kV}$ DC for applications where an auxiliary portable electrostatic power supply is useful. It is designed for use with the PFM-711A Field Meter and CPM-720A Charge Plate Assembly. In order to obtain power output from the PCS-730:
1. Its charging wand must be installed in the output receptacle.
 2. The PCS-730 must be grounded during normal operations.

II. Cautions & Warnings

- A. Do not point the PFM-711A Field Meter Ranging Lights into anyone's eyes.

CAUTION

Do not point ranging lights into anyone's eyes.

- B. Do not exceed 6,000 volts on CPM-720A Charge Plate Assembly.
- C. Only qualified instrument repair personnel should open or repair either the PFM-711A Field Meter or the PCS-730 Charging Source.

WARNING

Only qualified personnel should open or repair PFM-711A Field Meter or PCS-730 Charging Source.

- D. Do not use the PCS-730 Charging Source in close proximity to electrostatic discharge sensitive (ESDS) devices; do not make contact with ESDS devices.

CAUTION

Do not use PCS-730 Charging Source near ESDS devices.

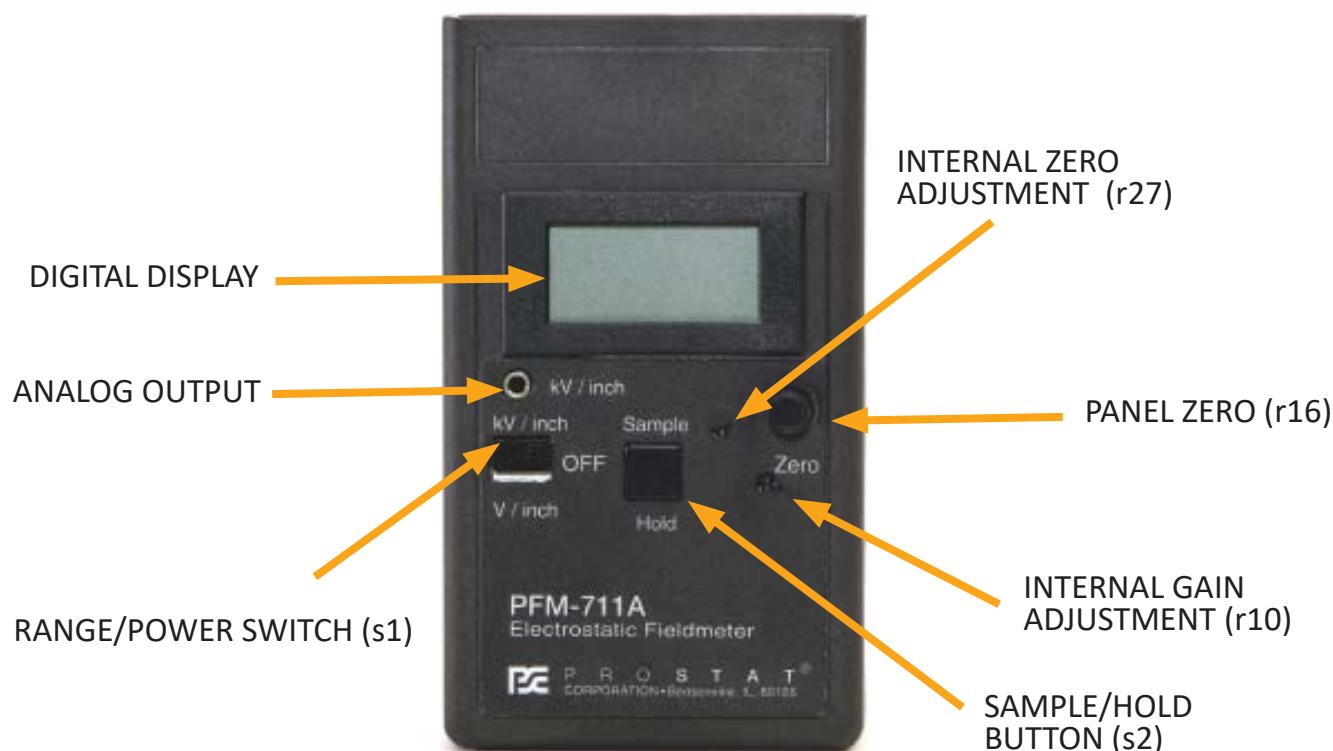
- E. Do not store the PCS-730 Charging Source with the Charging Wand Installed.
- F. Turn OFF all instruments when in storage or transit. Remove batteries when instruments are intended for long-term storage, i.e., six months or longer.

CAUTION

Ground Cases of PFM-711A Field Meter and PCS-730 Charging Source for proper operation.

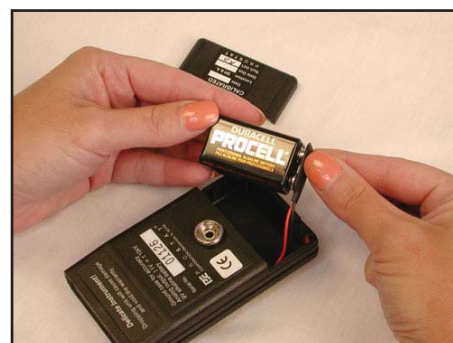
III. Equipment Inspection & Initial Preparation for Use

- A. PFM-711A Field Meter - Equipment and Accessories
- One PFM-711A Field Meter
 - One 36 inch analog output test cable equipped with two male banana plug
 - One 9 volt DC battery



B. PFM-711A Field Meter Preparation for use.

1. Install 9 volt battery provided by sliding battery compartment open and firmly snapping battery terminals to the appropriate connectors. Battery can only be connected in one way. Carefully reclose the battery compartment.
2. Before operating the PFM-711A, the operator should select and wear a wrist strap that is confirmed functional and properly grounded.



OPERATIONAL REQUIREMENT

Cases of PFM-711A Field Meter and PCS-730 Charging Source
MUST be grounded for proper operation.

3. With the operator's fingers contacting the grounding snap on the back of the unit, slide the three position Range/Power Switch (s1) (**kV/inch, OFF V/inch**) to the **kV/inch** position.
 - a. Confirm that the instrument's display is activated and that the battery low indication (**BATT**) is not displayed. If low battery is displayed, replace the battery.

- b. Cycle the **SAMPLE/HOLD** button (s2) by pushing it a few times; note the **HOLD** indication on the meter's display. Release **SAMPLE/HOLD** so that the meter is free to measure fields.
- c. Hold a flat sheet of material in front of the meter's sensing plate to confirm operation of the red ranging Bull's Eye light system. A circle with a spot in the middle should clearly appear on the material surface when held one inch from the meter's sensing plate.
- d. Point the unit away from surfaces and objects, and rotate the Black Panel (r16) **ZERO** knob until the display indicates 0.00.
- e. Experiment with the meter by measuring the surface of a charged material.
- f. Slide the three way **RANGE/POWER** Switch (s1) to the **V/inch** position. Allow the display to settle to a stable indication; this should require four to eight seconds.
- g. Point the unit away from surfaces and objects, and rotate the Black Panel **ZERO** knob (r16) until the display indicates 000.
- h. Experiment with the meter by measuring the surface of a charged material.

OPERATIONAL NOTE

The case of PFM-711A Field Meter is conductive and part of the instrument's grounding circuit. If one holds the meter in one hand, and attempts to measure voltage on the other hand, no reading can be obtained regardless of body voltage.

C. CPM-720A Charge Plate Assembly – Equipment and Accessories

1. One parallel plate assembly equipped with Teflon insulators between parallel plates:
 - a. Upper plate is a square sensing plate equipped with a banana receptacle.

NOTE

Each CPM-720A is calibrated at the factory to match its respective PFM-711A fieldmeter. Do not modify the CPM-720A calibration adjustment without following factory calibration procedure. Matched PFM-711A and CPM-720A units have the same serial numbers. Do not interchange.

- b. Bottom plate is a ground reference plate, notched and sized for attachment to the PFM-711A.
2. An insulating pad is installed beneath the square upper plate for separation between the CPM-720A sensing plate and the PFM-711A Field Meter case.
3. One female metal banana plug receptacle is installed on the sensing (upper) plate.
4. A calibration adjustment screw and nut assembly is installed beneath the upper plate,

between the sensing and notched ground plates.

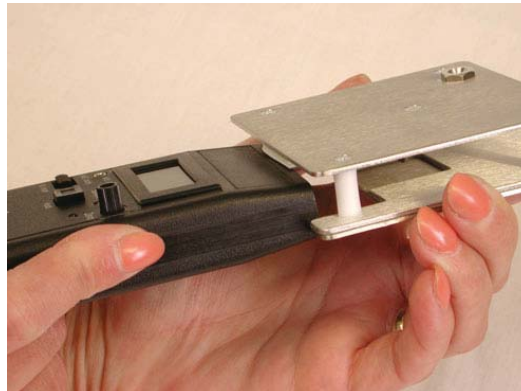
D. CPM-720A Charge Plate Assembly Preparation for use

1. With the PFM-711A Field Meter controls and the CPM-720A sensing plate facing up (the lower plate has a cutout for the meter), carefully slide the CPM-720A's lower ground plate into the LOWER mounting grooves molded into the sides of the PFM-711A's case.

OPERATIONAL NOTE

Initial mounting of the CPM-720A Charge Plate Assembly to the PFM-711A Field Meter Case will be extremely snug. Be sure that plate and meter case grooves are perfectly matched before mating the two instruments together. Subsequent uses will cause sufficient wear for easy mounting.

2. Carefully slide the plate towards the meter's sensor until the plate assembly is fully mounted to the PFM-711A.
 - a. The PFM-711A Meter case should be mounted snugly into the lower grounding plate notch.



- b. The insulated pad located beneath the upper plate isolates the upper plate from the PFM-711A Meter case.



3. Before operating the PFM-711A and CPM-720A Charge plate assembly, the operator should select and wear a wrist strap that is fully functional and properly grounded.

OPERATIONAL REQUIREMENT

Cases of PFM-711A field meter and PCS-730 charging source **MUST** be grounded for proper operation.

4. With the operator's fingers contacting the grounding snap on the back of the PFM-711A Field Meter unit, slide the three position (**kV/inch**, **OFF**, **V/inch**) **RANGE/POWER** switch (s1) to the **kV/inch** position.
 - a. Confirm that the instrument's display is activated and that the battery low indication (**BATT**) is not displayed. If low battery indication is displayed, replace the battery.
 - b. With the PFM-711A meter case grounded, hold the unit away from surfaces and objects, and rotate the Black Panel **ZERO** knob (r16) until the display indicates 0.00.
 5. Experiment with the PFM-711A/CPM-720A combination by touching a charged object to the upper sensing surface of the CPM-720A. (Note: review the functions of the PCS-730 for this experiment; meter indication should be approximately ± 1.20 kV) Discharge the upper plate to ground, or short the upper and lower plates, until the PFM-711A meter reads zero.
 6. Slide the three way **RANGE/POWER** switch (s1) to the **V/inch** position. Allow the display to settle to a stable indication; this should require four to eight seconds.
 7. Hold the unit away from surfaces and objects, and rotate the Black Panel **ZERO** knob (r16) until the display indicates 000.
 8. Experiment with the PFM-711A/CPM-720A combination by touching a charged object to the upper sensing surface of the CPM-720A. (Note; review the functions of the PCS-730 for this experiment; meter indication should be approximately $\pm 1,200$ volts.) Discharge the upper plate to ground, or short the upper and lower plates, until the PFM-711A meter reads zero.
- E. PCS-730 Charging Source - Equipment and Accessories
- One PCS-730 Charging Source instrument equipped with three position rocker switch and female banana receptacle at the front end of the PCS-730 case.
 - One Charging Wand equipped with male banana plug
 - One 9 volt DC Battery



F. PCS-730 Charging Source Preparation for Use

1. Install provided 9 volt battery by sliding battery compartment open and firmly snapping battery terminals to the appropriate connectors. Battery can only be connected in one way. Carefully re-close the battery compartment.
2. Before operating the CPM-730, the operator should select and wear a fully functional wrist strap that is properly grounded.
3. Mount the CPM-720A Charge Plate Assembly to the PFM-711A Field Meter as described above.
4. Install the charging Wand male banana snugly into the female receptacle located at the front of the PCS-730's case.



OPERATIONAL REQUIREMENT

Both cases of PFM-711A Field Meter and PCS-730 Charging Source must be grounded. In addition, the PCS-730 Charging Wand **MUST** be fully seated in the output receptacle for proper operation.

5. With the operator's fingers contacting the grounding snap on the back of the PFM-711A unit, slide the three position (**kV/inch**, **OFF**, **V/inch**) **RANGE/POWER** switch (S1) to the **kV/inch** position.
 - a. Confirm that the instrument's display is activated and that the battery low indication (**BATT**) is not displayed. If low battery indication is displayed, replace the battery.
 - b. Hold the PFM-711A/CPM-720A combination away from surfaces and objects, and rotate the PFM-711A's Black Panel **ZERO** knob (r16) until the display indicates 0.00.
6. With the operator's fingers contacting the metal grounding snap on the back of the PCS-730 Charging Source, press the three position rocker switch to the front, +1kV position. Touch the tip of the charging wand directly to the upper sensing plate of the CPM-720 Charge Plate

Assembly and Charge the CPM-720A to approximately +1.20kV.

7. Discharge the upper plate to ground, or short the upper and lower plates, until the PFM-711A meter reads zero.
8. With the operator's fingers contacting the metal grounding snap on the back of the PCS-730 Charging Source, press the three position rocker switch to the rear, -kV position. Touch the tip of the Charging Wand directly to the upper sensing plate of the CPM-720 Charge Plate Assembly and Charge the CPM-720A to approximately -1.20kV.
9. Discharge the upper plate to ground, or short the upper and lower plates, until the PFM-711A meter reads zero.



OPERATIONAL NOTE

The PCS-730 Charging Source's three position rocker switch is spring loaded to the center OFF position. For proper operations the Charging Wand **MUST** be firmly installed, the unit case grounded by the operator, and the switch firmly pushed in either the + 1kV or - 1kV position.

G. Confirming PFM-711A Field Meter Analog Output Function.

1. Connect the conductor analog cable to the PFM-711A **kV/inch** OUTPUT jack.
2. Connect the RED output banana plug to the Positive (+) input of an X-Y Plotter or digital Multimeter (DMM).
3. Connect the BLACK output banana plug to the Negative (-) input of the X-Y plotter or digital Multimeter (DMM).
4. Perform the procedure "PCS-730 Charging Source Preparation for Use" outlined above in Section F.
5. When the PFM-711A displays 1,000 volts, the analog output should be approximately 0.1 volts.

IV. Applications

- A. The PFM-711A Field Meter is an accurate electrostatic field measuring device. Used by itself, the PFM-711A will measure electrostatic fields emanating from virtually any flat surface or object. In the **kV/inch** range, the PFM-711A will indicate electrostatic field voltage from 0 to $\pm 19,990$ volts in 10 volt increments at one inch distance from the charged surface. In the **V/inch** range, it will indicate electrostatic field voltage from 0 to ± 1.999 volts in 1 volt increments at one inch distance from the charged surface.
- B. The CPM-720A Charge Plate Assembly is designed specifically for use with the PFM-711A Field Meter. Once installed on the PFM-711A, the assembly becomes a portable, battery operated Charge Plate Monitor (CPM). Primary applications for CPM assemblies are:

1. Confirming the electrostatic voltage balance of ionizer blowers and systems
2. Measuring electrostatic voltage generation of personnel in conjunction with footwear and floor surfaces.
3. Measuring electrostatic voltage generation related to chairs, carts and equipment.

The voltages generated or applied to the CPM-720A Charge Plate Assembly are read directly on the PFM-711A Meter instrument.

- C. The PCS-730 Charging Source is an auxiliary battery operated electrostatic power supply for use with the CPM-720A Charge Plate Assembly. The PCS-730 provides approximately $\pm 1.25\text{kV}$ when grounded and used with its charging wand. Once the PFM-711A Field Meter and CPM-720A Charge Plate are assembled, the PCS-730 Charging Source will apply a defined electrostatic voltage to the CPM-720A plate. Having the capability to charge the CPM-720A provides a multitude of electrostatic auditing and performance test capabilities. Primary applications for the CPM-730 Charging Source are:

1. Confirming the electrical decay performance of ionizers and other equipment
2. Confirming electrostatic decay of personnel, clothing, materials and equipment
3. Performing suppression analysis on work surfaces, production aids and other materials and devices

V. General Operations

A. Field Measurements using the PFM-711A Field Meter

1. Before operating the PFM-711A, the operator should select and wear a fully functional wrist strap that is properly grounded.
2. With the operator's fingers contacting the grounding snap on the back of the unit, slide the three position (**kV/inch**, **OFF**, **V/inch**) **RANGE/POWER** switch (s1) to the **kV/inch** position.



OPERATIONAL REQUIREMENT

Cases of PFM-711A Field Meter and PCS-730 Charging Source **MUST** be grounded for proper operation.

- a. Confirm that the instrument's display is activated and that the battery low indication (**BATT**) is not displayed. If low battery indication is displayed, replace the battery.
 - b. Insure the **HOLD** feature is **OFF**. Turn the **HOLD** feature **OFF** by pushing the **SAMPLE/HOLD** (s2) control button once.
 - c. Hold the unit away from surfaces and objects, and rotate the Black Panel **ZERO** knob (r16) until the display indicates 0.00.
3. Position the front sensor of the PFM-711A Field Meter approximately one inch from the sur-

face or object being measured. Move the instrument toward, or away from the surface until the RED Bull's Eye is focused on the test surface.

CAUTION

Do not shine the RED Bull's Eye Ranging lights into yours or anyone else's eyes.



4. Once the instrument is properly positioned, the PFM-711A will indicate the electrostatic field measured on its display. If desired, push the **SAMPLE/HOLD** button (s2) once to lock the indication on the display. The **HOLD** indication will also appear on the instrument display.
 5. For very low voltage measurements, repeat the procedure with the PFM-711A in its low range. Slide the **RANGE/POWER** switch (s1) to **V/inch** position. Re-zero the instrument and repeat the meter positioning and measurement procedures in points 2-4, above.
- B. Ionizer Blower Balance Check using the PFM-711A Field Meter & CPM-720A Charge Plate Assembly combination.
1. Allow the ionizer to be measured to operate at normal speed for a minimum of 30 minutes prior to measuring balance. Follow the manufacturer's instructions for normal operations.
 2. Mount the CPM-720A Charge Plate Assembly on the PFM-711A Field Meter Case.
 3. Ground the case of the PFM-711A. Note there are two ways to use Prostat devices to ground the PFM-711A/CPM-720A combination.
 - a. If the operator is wearing a properly grounded wrist strap and making direct contact with the metal ground snap mounted on the back of the PFM-711A's case, the unit will be sufficiently grounded.
 - b. Use an auxiliary worksurface common point ground snap
 - i. Mount the 10mm male common point ground snap directly to the 10mm female snap located on the back of the PFM-711A's case.
 - ii. Attach the common point ground cord to a previously tested ground point.
 4. Select the range you wish to use for balancing the ionizer.
 - a. Select the **V/inch** range on the PFM-711A Field Meter and zero the unit, ± 2 volts to ground. This will provide the most precise balance indication and result in ± 5 volts balance.
 - b. Select the **kV/inch** range on the PFM-711A Field Meter and zero (0) the unit to ground. This will provide a good balance indication and result in approximately ± 15 volts balance.

OPERATIONAL REQUIREMENT

If documentation of ionizer balance is required, connect the analog output of the PFM-711A to PGA-710 Autoanalysis System or an X-Y Plotter. Note that the RED analog output lead is Positive (+) and the BLACK is Negative (-). Zero the PFM-711A/CPM-720A combination and the X-Y Plotter to ground. Operate the plotter per manufacturer's instructions during the balancing procedure.

5. Position the sensing surface of the CPM-720A Charge Plate perpendicular to the ionizer's air flow, approximately 12 inches from its front air outlet.
 - a. Hold the instrument combination so that the CPM-720A Charge Plate is in the airflow; minimize the airflow to the PFM-711A's meter case.
 - b. Make sure good contact is made with the PFM-711A's ground snap.

OPERATIONAL HELPFUL HINT

Zero the PFM-711A/CPM-720A combination while grounded and the upper and lower CPM plates shorted with a small screw driver. Perform the Zeroing process away from the ionizer. Hold the assembly by the PFM-711A case with your fingers touching the metal ground snap. Approach the ionized air flow from above the ionizer with the sensing CPM plate pointing down into the air stream.

6. Allow the PFM-711A/CPM-720A combination to stabilize in the ion air flow for approximately 30-45 seconds and note the ion offset voltage, i.e., the difference in voltage from the Zero set point on the PFM-711A.
 7. Adjust the ion balance in accordance with the manufacturer's instructions such that the displayed offset voltage on the PFM-711A/CPM-720A combination is 0, ± 5 volts.
 8. Remove the PFM-711A/CPM-720A combination from the ion air flow and re-zero the system. Repeat the balance measurement to insure accuracy.
- C. Ionizer Blower Decay Performance Check using the PFM-711A Field Meter/CPM-720A Charge Plate Assembly combination, and the PCS-730 Charging Source.
1. Allow the ionizer to operate at normal speed for a minimum of 30 minutes prior to measuring balance. Follow the manufacturer's instructions for normal operations.
 2. Mount the CPM-720A Charge Plate Assembly on the PFM-711A Field Meter Case.
 3. Ground the case of the PFM-711A, as described below.
 - a. If the operator is wearing a properly grounded wrist strap and making direct contact with the metal ground snap mounted on the back of the PFM-711A's case, the unit will be sufficiently grounded.
 - b. Use the auxiliary work surface common point ground
 - i. Mount the 10mm male common point ground snap directly to the 10 mm female snap located on the back of the PFM-711A's case. Attach the common point ground cord to a previously tested ground point.

4. Select the range you wish to use for auditing the ionizer's decay performance. NOTE: Most accurate decay time measurements are obtained using the analog output connected to a PGA-710 Autoanalysis System or an X-Y plotter, PDT-740B Timer or digital Multimeter.
 - a. Select the **V/inch** range on the PFM-711A Field Meter and zero the unit, ± 2 volts to ground. This will provide the most precise voltage indication. However, the instrument meter indication is dampened so that time of decay will be slower than actual decay time.
 - b. Select the **kV/inch** range on the PFM-711A Field Meter and zero (0) the unit to ground. This will provide good indication and result in a faster decay time because the meter dampening is less pronounced. The instrument meter indication is dampened in this range so that time of decay will be slower than actual decay time.
 - c. For accurate decay times that are documented, perform this procedure with the analog output of the PFM-711A Field Meter connected to the input of a PGA-710 Autoanalysis System or an X-Y plotter as described below. After charting the charge and decay process, calculate the actual decay time based on the chart speed of the plotter. (See Step 11, below).
5. Position the sensing surface of the CPM-720A Charge Plate perpendicular to the ionizer's air flow, approximately 12 inches from its front air outlet.
 - a. Hold the instrument combination so that the CPM-720A Charge Plate is in the airflow; minimize the airflow to the PFM-711A's meter case.
 - b. Make sure good contact is made with the PFM-711A's ground snap.
6. Allow the PFM-711A/CPM-720A combination to stabilize in the ion air flow for a minimum of 30-45 seconds and note the ion offset voltage.
7. Install the Charging Wand in the front of the PCS-730 Charging Source. Ground the PCS-730 Charging Source by making direct contact with the metal snap located on the back of its case.
 - a. To charge the Wand to $>+1.0\text{kV}$ push the three position rocker switch toward the front of the unit.
 - b. To charge the Wand to $>-1.0\text{kV}$, push the three position rocker switch toward the back of the unit.
8. Touch the wand to the CPM-720A's sensing (upper) plate and note the voltage indicated on the PFM-711A meter.
9. Once the desired voltage level is achieved, discontinue the charging process and remove the PCS-730 Charging Source from the air path.
10. Observe the voltage drop indicated on the PFM-711A meter. Voltage should decay over time to the initial offset point indicated during the balance test procedure outlined above.
11. To obtain an accurate measurement of decay time from 1,000 volts to 100 volts, use the following procedure employing an X-Y plotter for documentation and calculation purposes.



- a. Install the analog output cable in the **ANALOG OUTPUT** jack on the front of the PFM-711A.
- b. Connect the analog output cable to an X-Y plotter, or other suitable recording device.
 - i. The RED output plug is Positive (+).
 - ii. The BLACK output plug is Negative (-).
- c. Zero the PFM-711A/CPM-720A combination and X-Y plotter to ground.
- d. Start the X-Y plotter and perform the charge/decay procedure, above.
- e. At the end of the decay cycle, stop the X-Y plotter.
 - i. Calculate the decay time indicated on the X-Y plotters recording chart using 1,000 volts as time zero (0).
 - Locate the point on the chart where the voltage plot line intercepts the 1,000 volt value.
 - Locate the point on the chart where the voltage plot line intercepts the 100 volt value.
 - Based on chart speed, define the time in seconds required to decay from the 1,000 to 100 volt intercepts.
 - ii. Multiply the X-Y plotter's defined decay time by two (2) to obtain the decay time from 1,000 to 100 volts so that the value is compatible with ESD STM3.1-2000 guidelines.

OPERATIONAL NOTE

The capacitance of the CPM-720A plate is 1- pF. Decay times obtained from the analog output of the PFM-711A, should be multiplied by 2, in order to be comparable to decay times obtained using ANSI/ESD STM3.1 Ionization Test method.
ANSI/ESD STM3.1 CPM capacitance is 20pF.

D. Using the PFM-711A/CPM-720A combination to Measure Body Voltage Generation related to Footwear and Flooring combinations.

1. Mount the CPM-720A Charge Plate Assembly on the PFM-711A Field Meter case.
2. Ground the case of the PFM-711A, as described below.
 - a. Using a Prostat® wrist strap cuff, mount the cuff on one of the five pound NFPA electrodes found in Prostat® kits.
 - b. Remove the insulated cap covering the 10 mm male snap located in the cuff fabric approximately 1.5 inches from the cuff buckle.



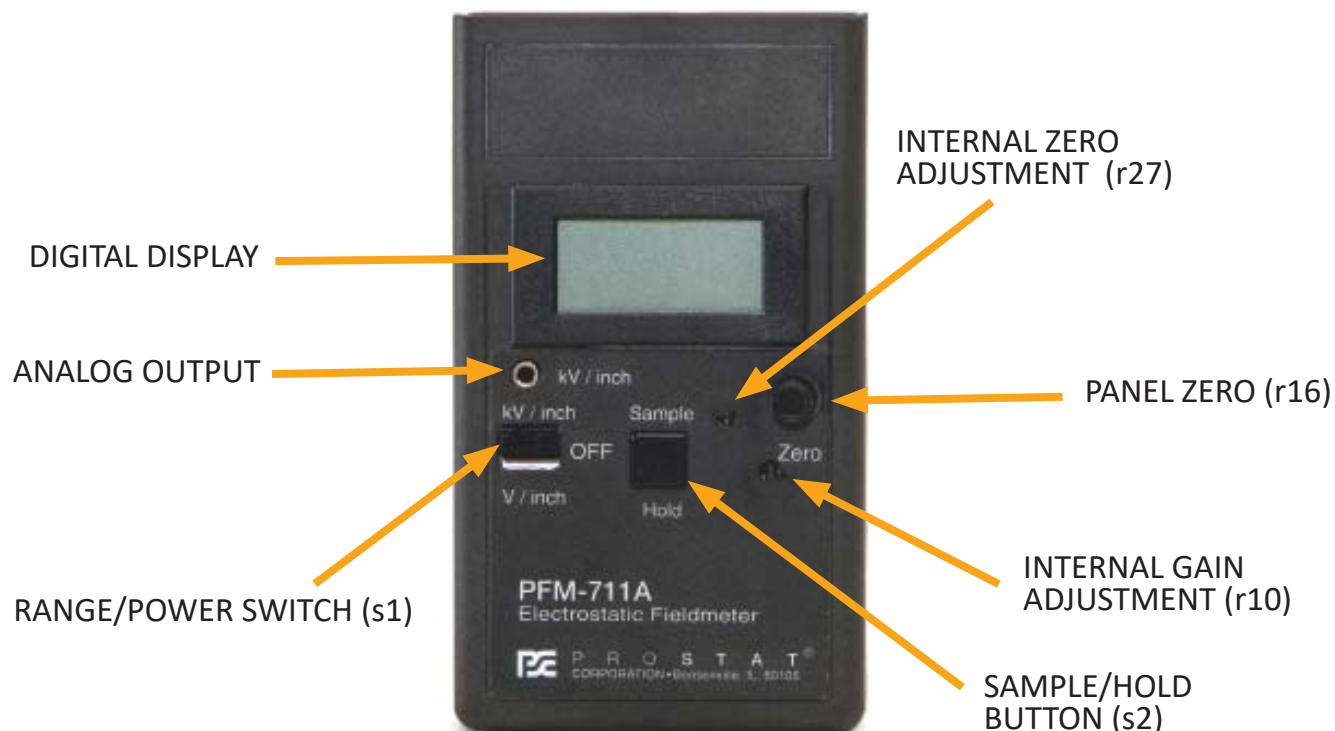
- c. Snap mount the PFM-711A's 10 mm female snap (located on the back of the PFM-711A's case) onto the wrist strap 10 mm male snap.
 - d. Adjust the wrist strap cuff so that the instrument is held firmly to the electrode; lock the adjustment buckle.
 - e. Attach the wrist strap cord to the standard 4 mm snap connection located on the cuff buckle.
 - f. Connect the groundable end of the wrist strap cord to a previously tested ground point.
3. Connect a wire test lead to the CPM-720A Charge Plate Assembly banana plug receptacle. One of the PRS-800L ten-foot leads may be used for this purpose.
- a. Connect the opposite end of the test lead to a metal object, or the PFA-860 Footwear Auditor handle.
 - b. Grasp the metal handle during walking tests to "share" one's body charge with the CPM-720A sensing plate.
 - c. Generated body voltage will be indicated on the PFM-711A Field Meter.
4. Select the range you wish to use for measuring body voltage generation.
- a. Select the **V/inch** range on the PFM-711A Field Meter and zero the unit, ± 2 volts to ground. This will provide the slowest indication of body voltage indication due to meter dampening. Consequently, indicated voltages will be less than actual voltages generated.
 - b. Select the **kV/inch** range on the PFM-711A Field Meter and zero (0) the unit to ground. This will provide better measurements of body voltage, which is the result of less meter dampening. Again, however, indicated voltages will be less than actual voltages generated.

E. Operational Summary

The PFM-711A Field Meter, CPM-720A Charge Plate Assembly, and PCS-730 Charging Source work together to give an ESD Auditor unique evaluation capabilities even in the most remote environments. The applications for these unusual devices are limited by one's imagination and understanding of their various functions.

With a minimum of accessories, these devices can assist the proficient auditor in examining many items for electrostatic fields, voltage generation, decay performance or ionization offset (balance).

NOTE: Review all **CAUTIONS & WARNINGS** in this booklet.



1. PFM-711A Controls

The PFM-711A has two switches and a rotary knob. A three-position slide switch (S1) provides Range Selections and **ON/OFF** control. A push button switch (S2) provides **SAMPLE/HOLD** selection. A rotary **ZERO** adjust control (R16) is also provided. The **SAMPLE/HOLD** push button switch has two positions; depressing the button latches it into the lower Sample position. Pressing it again releases it into its upper **HOLD** position. The **ZERO** knob may be turned to the left or right to change the zero setting of the display. The unit must be operated while grounded.

2. Turning the PFM-711A Field Meter ON and OFF

Push the slide switch Range/Power (S1) to its upper position (towards the display) to select **kV/inch**. The display will come ON, a decimal point will be displayed, and the meter will measure up to 19.99kV at one inch in 10 volt increments. Placing the slide switch in the lower position will select **V/inch**. There will be no decimal point in the display and the meter will measure up to 1999 volts on one inch, in one volt increments. Moving the switch to its center position will turn the meter OFF.

3. Install the CPM-720A Charge Plate Assembly

Note that the PFM-711A meter case has two slots along its sides. The LOWER slot is toward the bottom of the case. The Charge Plate Assembly has two functional plates, an isolated upper sensing plate and grounded lower plate. To install the Charge Plate Assembly on the meter, slide the lower plate assembly into the LOWER slot of the meter case as far as it will go.

4. Zero the PFM-711A Field Meter

Ground the case by wearing a functional wrist strap that is properly grounded. Turn the meter on by selecting the desired range. Press the **SAMPLE/HOLD** button down so that it latches in the lower or **SAMPLE** position, and **HOLD** is not indicated in the meter display. Adjust the display to zero (0) volts by rotating the ZERO control.

IMPORTANT: The PFM-711A meter case is conductive. It provides the ground reference for its measuring circuit. For accurate measurements it is necessary that the person holding the meter be properly grounded, or the meter has a ground connection made to the metal snap on the rear of the case.

5. Take an Electrostatic Field Measurement with the PFM-711A Field Meter

Turn the meter ON to the desired range. Hold the front of the meter approximately one inch from the surface to be measured. Adjust the distance from the test surface until the RED ranging lights form a Bull's Eye. Allow the instrument indication to stabilize. Record the measurement.

6. HOLD a PFM-711A Measurement

With the meter in the measurement position described above, press the **SAMPLE/HOLD** button so that it latches in the upper or **HOLD** position. This will freeze the reading on the display, allowing the meter to be moved to a position where it may be more easily read and documented. When the meter is in the **HOLD** position, the "**HOLD**" will appear in the display.

7. PCS-730 Charge Source

The Charging Wand rod assembly is inserted into the output jack. The momentary rocker switch is depressed and held to produce the desired polarity. The contact rod is then touched against the isolated plate of the CPM-720A. Releasing the rocker switch turns off power to the unit.

The PCS-730 **MUST** be grounded for proper performance. A 10mm metal snap is provided on the rear of the case to accomplish this. The user must be adequately grounded and touch the snap while operating the PCS-730. Alternatively, a grounding cord may be attached to the snap. Improper grounding will result in low or erratic output voltages. The output current of the PCS-730 is limited to less than 1 micro amp to minimize the possibility of personnel shock hazards. To avoid static damage; Do not make contact with electrostatic discharge sensitive devices.

VI. Maintenance & User Adjustment

A. PFM-711A Field Meter

The PFM-711A is factory calibrated and other than battery replacement, external cleaning, and occasional adjustment of the front panel **Zero** knob range position, general user maintenance is not required. The case has been sealed and **BREAKING THE SEALS WILL VOID THE WARRANTY**. If for any reason you believe the meter is not working correctly, contact Prostat Corporation for assistance.

USER CAUTION

Other than battery replacement & front panel zero range adjustment, there are no user serviceable parts. Any unauthorized service will void the warranty and result in additional repair charges.

1. Cleaning the PFM-711A Case & Display

- a. Clean the meter case and display lens with a dry, soft, non-scratching cloth.
- b. DO NOT USE solution to wet the case, display or controls.
- c. Carefully wipe the case and display until dust and dirt are removed.

USER CAUTION

In rare cases cleaning the PFM-711A case and display with a slightly dampened cloth may be required. Should this be required, use a very weak solution of liquid soap and water. The cloth should be barely damp. DO NOT allow cleaning solution to enter the unit through control or circuit zero adjustment openings. Should the unit become damaged through the use of cleaning solutions, the warranty is voided.

2. Adjusting PFM-711A Field Meter Front Panel Zero Knob to Mid Range.

The front Black panel **Zero** knob (r16) adjustment range is less than a full turn. Occasionally, it may need to be adjusted to its midpoint due to environmental temperature variations.

- a. Select the **kV/inch** range using the three position Range/Power operating switch (s1)
- b. Turn the Black Panel **Zero** knob (r16) fully counter clockwise
- c. Using a small blade screwdriver, adjust the Internal calibration adjustment (r27) located next to the Zero knob, until the display reads "1.60 kV/inch".
- d. Rotate the Black Panel Zero Knob (R16) fully clockwise. The display should indicate approximately +1.60 (± 0.10) kV/inch.
- e. Rotate the Black Panel **Zero** Knob (r16) to mid position, approximately $\frac{1}{2}$ turn, until the display indicates 0.00.
- f. This completes the Black Panel **Zero** Knob (r16) adjustment.

B. CPM-720A Charge Plate Assembly

1. Cleaning CPM-720A Teflon Insulators

Care should be taken when using the CPM-720A Charge Plate Assembly to avoid touching the Teflon insulators.

- a. If necessary, the Charge Plate Assembly insulators and plates should be cleaned periodically using a clean laboratory wipe and methanol or isopropanol.

b. Dry the assembly using gentle heat for at least 15 minutes after cleaning.

C. Adjusting CPM-720A to a known Electrostatic Voltage Reference.

To adjust sensing accuracy of the CPM-720A a qualified instrument technician may perform the following adjustment.

1. Mount the CPM-720A to the PFM-711A Field Meter as described in General Operations.
2. Ground the PFM-711A, temporarily short the upper and lower PCM-720A plates, and Zero the unit in the **V/inch** range.
3. NOTE: The proper grounding and zeroing are critical to achieving PFM-711A/CPM-720A accuracy.
4. Connect a precision electrostatic (DC) power supply output to the CPM-720A upper sensing plate.
5. Energize the electrostatic power supply and adjust to 100 ± 1 volt.
6. Adjust the CPM-720A screw/nut assembly until the meter display reads 100 volts.
7. Shift the range selector to KV/INCH and confirm indication of 0.10kV.

NOTE: To monitor this process, install the PFM-711A analog output cable and connect it to a precision Digital Multimeter (DMM). Monitor the PFM-711A's output in millivolts (mv). The system output at 100 volts input should be $10.0 \text{ mv} \pm 0.5 \text{ mv}$.

If for any reason you believe the CPM-720A Charge Plate Assembly is not working correctly, contact Prostat Corporation for assistance.

D. PCS-730 Charging Source

1. The Model PCS-730 is calibrated at the factory.
2. User adjustment is not recommended.
3. Low output voltage is usually due to a weak battery or improper grounding.
4. The PCS-730 should only be serviced by Prostat or Qualified Instrument Repair Technicians. Opening the unit will void warranty.

Specifications for the PFM-711A Electrostatic Field Meter

| | |
|----------------------|--|
| Overall Range | <p>High Range 0 V to ± 19.99 kV (at 1" distance): Least significant digit indicates volts at one inch (kV/in) in 10 Volt increments</p> <p>Low Range 0 V to $\pm 1,999$ V (at 1" distance): Least significant digit indicates volts at one inch (V/in) in 1 Volt increments.</p> <p>Measures higher voltages at greater distances, e.g., at 2" double indicated voltage, at 4" multiply indicated voltage by four.</p> |
| Instrument Tolerance | <p>$\pm 5\%$ from 0 V to 10 kV Tolerance at > 10 kV depends on conditions and handling Accuracy unaffected by the presence of air ionization. Note: Performance when mounted in laboratory fixture positioned 1 inch from a 6"x6" reference plate</p> |
| Range Lights | Red "Bulls Eye" at 1" distance |
| Meter Display | 3½ digit Liquid Crystal Display with 0.4" digit height. Automatic polarity, HOLD and LOW BATTERY indicators |
| Response | <p>Digital display updates three (3) times per second.</p> <p>Analog Output Time Constant: Either Range 0.1 sec. Display Time Constants: High Range 0.2 sec. Low Range 2.0 sec.</p> |
| Output | Analog signal output and 30" two conductor cable provided. ± 10.0 kV meter reading equals ± 1.0 Volt output |
| Controls | Three position slide switch: KV/INCH - OFF - V/INCH Sample/HOLD push button, and ZERO adjust knob |
| Grounding | Meter circuit grounded through the conductive case and 10 mm snap fastener mounted on back of case |
| Power | 9 Volts alkaline battery. Battery life minimum 40 hours |
| Dimension (LxWxH) | 2.4" x 4.2" x 0.9" (6.1 cm x 10.7 cm x 2.3cm) 1.3" deep with zero knob and snap fastener (3.3 cm) |
| Weight | 5 oz with battery installed (142g) |

Specifications for the CPM-720A Charge Plate Assembly

| | |
|-------------------|--|
| Tolerance | Matches the PFM-711A Field Meter within 5% when calibrated together |
| Capacitance | <p>Plate Capacitance 10 picofarads (pF) ± 1 pF Note: Plate capacitance is 15.8 pF when mounted to PFM-711A Field Meter</p> |
| Range | 0 to ± 5.5 kV $\pm 2\%$ at 23 °C, 30% Rh. |
| Grounding | Through conductive case and snap fastener of PFM-711A Field Meter. |
| Dimension (LxWxH) | 3.25" x 3.25" x 0.9" (8.25 cm x 8.25 cm x 2.3cm) |
| Weight | 8 oz (227g) |

Specifications for the PCS-730 Charging Source

| | |
|-------------------|--|
| Input Power | 9 Volts Alkaline Battery. Battery life in excess of 40 hours continuous operation |
| Output | $\pm 1,250 \pm 5\%$ volts DC Current limited to less than 1 Microamp. |
| Output Connector | Female banana jack provided with mating contact wand. |
| Grounding | 10mm female snap fastener on rear of case. Note: Wand must be installed and unit grounded for proper operation |
| Dimension (LxWxH) | 2.5" x 4.0" x 1.5" (6.3 cm x 10 cm x 3.8cm) 2.5" x 4.2" x 1.8" with input jack, switch and snap (6.3 cm x 10.7 cm x 4.6 cm) |
| Weight | 6 oz with battery installed (170g) |

NOTES

NOTES

Specifications are subject to change without notice.
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P R O F E S S I O N A L S T A T I C C O N T R O L P R O D U C T S

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