711 Charge Analyzer Operation and Maintenance

Figure 1. SCS 711 Charge Analyzer.

Description

The SCS 711 Charge Analyzer is an electronic test instrument designed for ease of use. The lightweight and compact construction offers great versatility in the workplace. It can be used as a laboratory analytical tool, evaluating the performance of ionizing equipment, static-protective packaging, work surfaces and personnel grounding systems. It is also very effective for use as a demonstration tool in employee static awareness training programs.

All parameter settings are controlled via a built-in EEPROM. These parameters are defaulted to when the 711 Charge Analyzer is switched on again. In case of a malfunction, the unit will display a corresponding message and then automatically switch off.

The 711 Charge Analyzer operation works according to the field mill-principle. The field meter is a parametric amplifier. An electrostatic field induces a charge on the sensor electrode, generating an AC current that is proportional to the field strength. An amplifier measures this current without reducing the energy of the electrostatic field in average time.

Important Notice: Avoid extreme discharge of the rechargeable batteries. If the batteries require charging, do not allow the unit to sit idle for a period of time without first fully charging the batteries.

The 711 Charge Analyzer is powered by built-in rechargeable NiMH-batteries or an AC wall plug-in adaptor. When the unit is powered from the rechargeable batteries, the LCD-display will not be back illuminated to extend battery life. This power saving feature will initiate within 60 seconds after the last measurement or button depression. Also during battery operation, the continuous LED-bar indication changes to a single (momentary) action.

In case of a low battery power condition, the 711 Charge Analyzer automatically switches off, first displaying LOW BATTERY then SWITCHING OFF UNIT. If this occurs, continued operation of the 711 Charge Analyzer can be maintained through the AC adaptor. Recharge time is approximately 14 hours with unit off, when batteries are fully discharged.

Two vertical LED bars indicating 0 - 100% charge level and polarity are located on the left and right sides of the front panel. The alphanumeric LCD-display is the information center of the 711 Charge Analyzer and allows the user to observe the principles of static protection. The unit's high accuracy makes it well suited for product performance analysis.

All interfacing connections are made at the rear of the unit. The SCS 711 Charge Analyzer can be connected to a y (t)-recorder via the ± 2 volts analog output.

A Remote Field Sensor Probe is connected through a 4-Pin circular socket located on the rear of the unit. The sensor operates on the same measurement principle as described above. This feature allows to the user to make measurements by means of a hand-held or fixed position probe in remote locations, where it may be impossible to position the 711 Charge Analyzer. Measurement distances with the probe are 1, 2, 5, 10 and 20 centimeters. The built-in microprocessor automatically converts the measured field strength via the chosen distance into a charge of an equivalent potential in volts. The display automatically switches from volts to kilovolts.

The following operating functions will be automatically activated, when the appropriate electrode or sensor is connected to the base unit.

The 711 Charge Analyzer comprises of four types of independent operating functions:

- Static field meter sensor – Measuring electrostatic fields
- Voltmeter - Measuring the potential on charged objects
- Static decay time – Measuring charge-decay and balance of ionizing equipment by charge plate monitor (CPM) method
- Remote Field Sensor Probe – Measuring the potential on charged objects in confined areas.

Change between these operating functions will be verified on the display as CHANGE MODE OF OPERATION.

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Packaging

1 Charge Analyzer
1 Plate Electrode
1 Cup Electrode
1 Cylinder Electrode
1 Sensor Red Cover
1 Measuring Lead, 1m
1 Conductive Container with Insulating Handle
1 Insulated Bulldog Clip
3 Metal Spacers with Thread, 76 mm (3 in.) Length
1 Field Sensor Probe with 2 m Cable & Red Cover
1 Power Adapter, 12VDC
1 Carrying Case
1 Certificate of Calibration

Specifications

Description	Typical Value
Dimensions	Base unit: (6 x 6 x 6) inches (152 x 152 x 152) mm
Weight	1.8 kg (4 lbs.)
High Voltage Cascade	Built-in NiMH-rechargeable batteries,1400 mAh - Recharge time approximately 14 hours (unit off) when batteries are fully discharged. AC adapter: secondary side, 12VDC/500 mA
Operating Time (rechargeable batteries)	4 hours (approx.) with full charge.
Accuracy	± 10 % of range end value (digitized)
Operating Functions	CPM (positive/negative/ automatic), Voltmeter, and Field meter
Interfaces	Analog output ± 2V (± 1 V, in 500V range for voltmeter). Input to output ratio in Voltmeter Mode: 25VDC = 12.5 to 1, 100VDC = 50 to 1, 500VDC = 500 to 1, 1,000VDC = 500 to 1, 5,000VDC = 2500 to 1.
Remote Field Sensor Probe	34 mm diameter - 190 gms (6.7 oz.)
Displays	Two, 11-segment positive & negative LED-bar charge indicators 16-digit alphanumeric dual row LCD
Settings: CPM - Operating Function	Starting voltage: 600V - 1200V in 1V-steps Stop voltage: 1V - 500V in 1V-steps (in decimal mode)
Static Decay Time	0.1 seconds - 99.9 seconds
Offset-voltage Time	0 seconds (Indefinite time, CPM in floating mode) 1 - 10 seconds (1 second steps) 10 - 60 seconds (10 second steps)
Voltmeter Operating Function	Ranges: 25V, 100V, 500V, 1.0 kV, 5.0 kV and auto range
Fieldmeter Operating Function	Ranges: Manual 1.25 kV/m, 5 kV/m, 25 kV/m, 50 kV/m, 250 kV/m, and automatic
Plate Electrode	VA-steel (152 x 152) mm/ (6 x 6) inches, removable, capacitance (20 ± 2) pF
Cup Electrode	Gold-plated electrode with 4 mm-banana socket, for voltage measurements
Selection of Operarting Function	Pre-setting is "FIELD METER", additional automatic settings by applying the plate or cup electrode

Field Meter Operation

Figure 2. SCS 711 Charge Analyzer Field Meter Operation.

Kilovolts/Meter Measurement Ranges: Manual/Auto; 1.25 kV/m, 5.0 kV/m, 25 kV/m, 50 kV/m, & 250 kV/m Meter display symbols in Field meter mode.

F = SCS 711 Charge Analyzer in Field meter mode (upper left corner).

R = Kilovolts/Meter measurement range (kV/m) selected.

AR = Auto voltage measurement range selected (arrow symbol will briefly flash in lower left corner before symbol appears. Arrow symbol will briefly flash during overflow condition when in the auto range).

E = Electrical field strength (V/meter) as measured. If range selected is too low OVERFLOW will appear.

Field Meter Operation Setup

Warning:

To reduce the risks associated with hazardous voltage:
- Connect the attached ground wire on rear panel to an electrical ground before operating the 711 Charge Analyzer
- Do not use if the 711 Charge Analyzer housing or power supply are damaged;
- Do not attempt to modify or repair – no user serviceable parts inside – contact SCS Service for repair.

To reduce the risks associated with fire or explosion:
- Do not operate the 711 Charge Analyzer in an explosive environment. The 711 Charge Analyzer is not designed to be intrinsically safe.

1. Ground the Charge Analyzer 711 by attaching the ground wire with alligator clip on the rear panel of the unit to an earth/electrical ground.
2. Remove the plate electrode (b) from the Charge Analyzer 711 if attached.

Note: If the unit is ON at this time, the display will briefly indicate CHANGE MODE OF OPERATION then FIELD METER IS ENABLED.

3. Press the on/off button to activate the SCS 711 Charge Analyzer.
4. Cover the measurement electrode on the top of the unit with the red sensor cover (e).
5. Select each range by pressing the “A” button RANGE momentarily. Be sure to allow a brief moment between each range selection to perform the zeroing. This completes the zeroing of all ranges.

Field Meter Use

1. Remove the red sensor cover (e) from the measurement electrode.
2. Select the desired voltage range by pressing the “A” button.

Note: If OVERFLOW appears during the measurement select a higher range

The SCS 711 Charge Analyzer is now ready to measure electrostatic fields on objects such as tapes, films, plastic objects, etc., indicating in kilovolts per meter.

Figure 3. Testing Low Tribocharging Tapes.

Demonstration #1 Testing of Low Tribocharging Tapes: With the Charge Analyzer 711 in the Field meter operating mode, pull the tape off the roll and hold it above the sensor. The digital display reads the field

strength in kV/m. To convert readings of kV/m into volts use the following formulas:

R/100 x D (cm) or R/39.37 x D (in.) Where: R = Reading indicated on the display and D = Distance between tape and sensor electrode, measured in centimeters or inches.

Example 1: If reading on the display of the Charge Analyzer 711 is 200 KV/m and the distance to the sensor electrode is 5 cm, the voltage on the tape is calculated by: 200/100 x 5 = 10 Kilovolts.

Example 2: If reading on the display of the Charge Analyzer 711 is 50 KV/m and the distance to the sensor electrode is 3 inches, the voltage on the tape is calculated by: 50/39.37 x 3 = 3.8 Kilovolts.

Note: Properly performing ESD control tapes must minimize charging when unwound from the carrier roll.

Voltmeter Operation

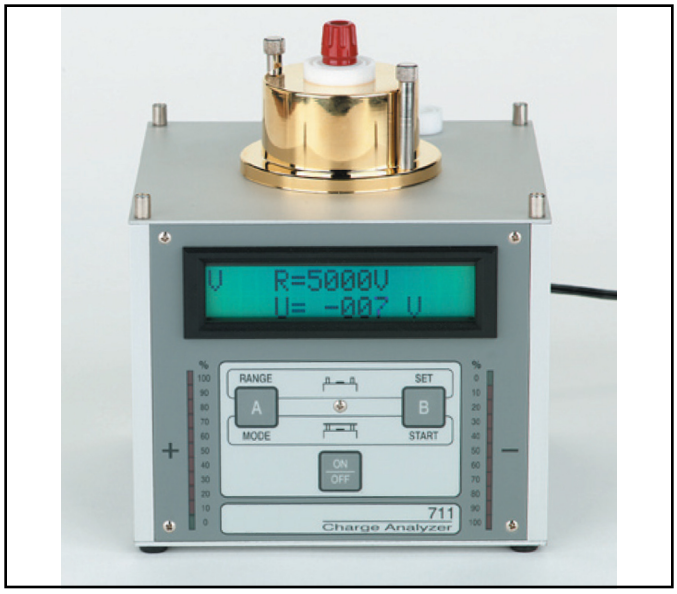

Figure 4. SCS 711 Charge Analyzer Voltmeter Operation.

Voltage Measurement Ranges:
Manual/Auto; 25V, 100V, 500V, 1000V, & 5000V

Meter display symbols in Voltmeter mode

V = SCS 711 Charge Analyzer in Voltmeter mode (upper left corner).

R = Voltage measurement range selected. If range selected is too low OVERFLOW will appear.

AR = Auto voltage measurement range selected (arrow symbol ← will briefly flash in lower left corner before symbol appears. Arrow symbol → will briefly flash during overflow condition when in the auto range.

U = Voltage level on cup electrode.

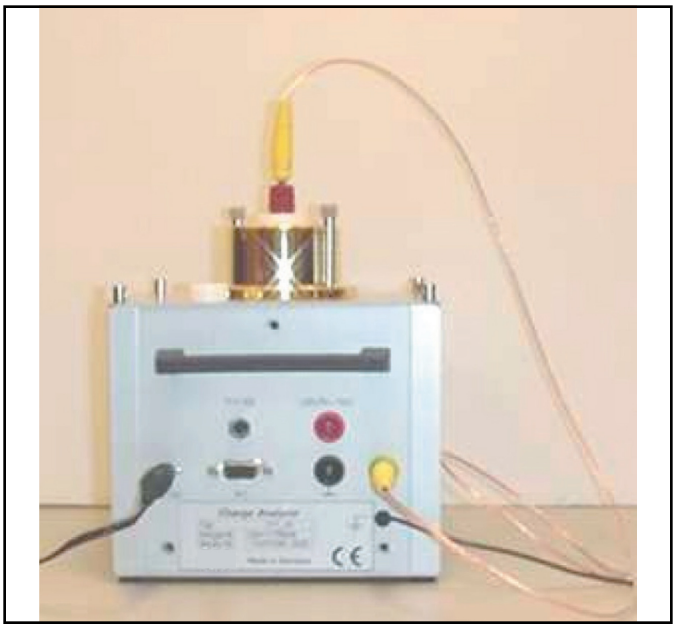

Figure 5. SCS 711 Charge Analyzer Voltmeter Operation (Back of Unit).

Voltmeter Setup

Warning:

To reduce the risks associated with hazardous voltage:
- Connect the attached ground wire on rear panel to an electrical ground before operating the SCS 711 Charge Analyzer;
- Do not use if the 711 Charge Analyzer housing or power supply are damaged;
- Do not attempt to modify or repair – no user serviceable parts inside – contact SCS Service for repair.

To reduce the risks associated with fire or explosion:
- Do not operate the 711 Charge Analyzer in an explosive environment. The 711 Charge Analyzer is not designed to be intrinsically safe.

The following procedure zeros each voltage range in the Voltmeter measurement mode.

1. Remove the plate electrode and red sensor cover from the 711 Charge Analyzer, if attached.
2. Mount the gold cup electrode (a) to the top of the 711 Charge Analyzer and secure with the attached long-knurled screws.
3. Insert the banana plug on one end of the lead wire (f) into the ground jack on the back of the 711 Charge Analyzer.
4. Insert the other banana plug end of the lead wire (f) into the gold cup electrode (a).
5. Ground the unit by attaching the ground wire with alligator clip on the rear panel of the unit to an earth/ electrical ground.

6. Press the on/off button to activate the 711 Charge Analyzer. The display will briefly indicate CHANGE MODE OF OPERATION then VOLTMETER IS ENABLED (if cup has not been previously attached).
7. Press the “B” button (SET) to display OFFSET A.
8. Select OFFSET A by pressing the “A” button to display UPDATE OFFSET menu.

Note: If you should press the “B” button (SETUP), you will have to switch off the Charge Analyzer 711 to get back into the Voltmeter mode.

9. Select YES by pressing the “A” button. GROUND CUP, READY >B will appear on the display for verification that the cup electrode is indeed grounded.
10. Select the “B” button to activate the automatic zeroing feature in the Voltmeter mode. Display will indicate READ ALL OFFSET, UPDATING, zeroing all ranges.

This completes the zeroing procedure. The display returns to the measurement mode.

Voltmeter Use

1. Unplug the lead (f) from the ground jack at the rear of the 711 Charge Analyzer.
2. Plug the lead (f) into the cylinder electrode (c).
3. Select the desired voltage range by momentarily pressing the “A” button.

Note: If OVERFLOW occurs during the measurement select a higher range.

The 711 Charge Analyzer is now ready to monitor the effectiveness of static control products, measuring electrical charge on people and conductive objects, indicating in volts.

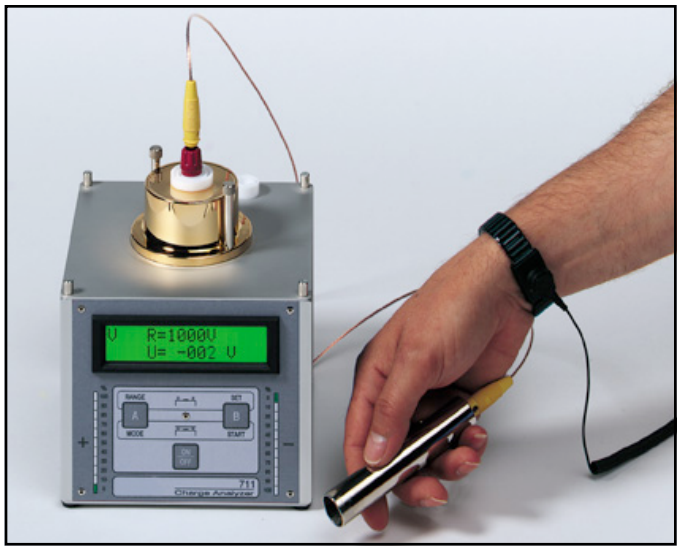

Figure 6. Performance of a Wrist Strap.

Demonstration #2 Performance of a Wrist Strap

1. Hold the cylinder electrode in one hand and perform normal body movements (e.g., sitting down, standing up, walking back and forth, etc.), experienced in the work environment. Observe voltage variations on the SCS 711 Charge Analyzer.
2. Now attach a static control wrist strap to the arm and connect to an earth/electrical ground as recommended by the manufacturer. Perform the same body movements and observe the reduced or eliminated voltage variations on the 711 Charge Analyzer.

Note: Properly performing ESD control tapes must minimize charging when unwound from the carrier roll.

Demonstration #3 Performance of ESD Control Flooring

1. Stand on a non-static control flooring (e.g., mat, tile, epoxy, etc.).
2. Hold the cylinder electrode in one hand and perform normal body movements (e.g., sitting down, standing up, walking back and forth, etc.), experienced in the work environment. Observe voltage variations on the 711 Charge Analyzer.
3. Now stand on a static control flooring (e.g., mat, tile, epoxy, etc.) using ESD control footwear/straps.
4. Hold the cylinder electrode in one hand and perform some body movements and observe reduced or eliminated voltage variations on the 711 Charge Analyzer.

Note: Properly performing ESD control flooring in conjunction with ESD control footwear/straps must be able to minimize and quickly drain electrical charges developed by a person.

Demonstration #4 Performance of a Static Control Work surface

1. Plug the lead (f) into the banana jack on the conductive container (h).
2. Hold the container by insulating handle being careful not to contact the sides of the container.
3. Charge yourself up by rubbing your feet on a non-static flooring material and touch the container with other hand to charge it. Notice the level of charge on the SCS 711 Charge Analyzer.
4. Contact an ESD control work surface with the container and observe the voltage reduction and removal.

Note: Properly performing conductive containers must be able to quickly drain a charge from their surface when ESD control surface.

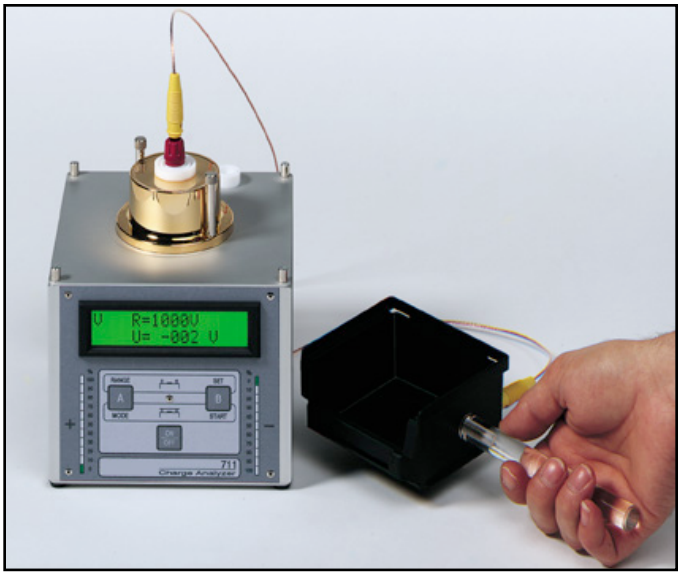

Figure 7. Performance of a Static Control Worksurface.

Demonstration #5 Discharge Performance of Static Control Packaging Material

1. Place a packaging material on top of a grounded static control work surface.
2. Charge up the conductive container as described above in Demonstration #4 and contact the top of the packaging material with the charged container. Observe the amount of charge draining through the packaging material on the 711 Charge Analyzer.

Note: Properly performing packaging materials must be able to quickly drain a charge from their surface when placed on an ESD control surface.

Static Decay Time and Balance Operation

Figure 8. SCS 711 Charge Analyzer Static Decay Time and Balance Operation.

Voltage Decay Ranges:
Start: 600 to 1100 volts
Stop: 1 to 500 volts

Meter display symbols in Static Decay mode:
TIMER = Mode
000V-000V = Start & stop voltage range

U = Voltage level on plate

OFFS-TIME = Offset time in seconds

Warning:
To reduce the risks associated with hazardous voltage:
- Connect the attached ground wire on rear panel to an electrical ground before operating SCS 711 Charge Analyzer.
- Do not use if the 711 Charge Analyzer housing or power supply are damaged;
- Do not attempt to modify or repair – no user serviceable parts inside – contact SCS Service for repair.

To reduce the risks associated with fire or explosion:
- Do not operate the 711 Charge Analyzer in an explosive environment. The 711 Charge Analyzer is not designed to be intrinsically safe.

Static Decay Time and Balance Setup

The following procedure zeros each voltage range, adjusts the start and stop voltage, and adjusts the offset time in the Static Decay Time measurement mode.

Note: You must remove the charge plate to change to Field meter mode to perform the following procedure.

Voltage range zero procedure:
Perform zeroing on first power up.
1. Ground the Charge Analyzer 711 by attaching the ground wire with alligator clip on the rear panel of the unit to an earth/electrical ground.
2. Remove the plate electrode (b) from the Charge Analyzer 711.
3. Press the on/off button to activate the Charge Analyzer 711. The display will briefly indicate CHANGE MODE OF OPERATION then Field meter IS ENABLED.
4. Cover the measurement electrode on the top of the unit with the red sensor cover (e).
5. Select each range by pressing the “A” button RANGE momentarily. Be sure to allow a brief moment between each range selection to perform the zeroing. This completes the zeroing of all ranges.

Setting the START & STOP voltage:
Note: The Start voltage can only be adjusted from 600 to 1100 volts. The Stop voltage can only be adjusted from 1 to 500 volts. The maximum period of time that the 711 allows for the measurement of the start to stop voltage is 99.9 seconds.

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1. Press the “B” button (SET) to display SETUP B.
2. Press the “B” button to display the START 600-1100 voltage range menu.
3. Notice the blinking cursor under the thousandths position of the four-digit voltage value located on the second line of the display. Change the value of this digit by pressing the “A” button momentarily.
4. Press the “B” button once to move the cursor to the next digit and adjust the value (0-9) with the “A” button.
5. Continue adjusting the value of the remaining digits to the desired level. If you make a mistake continue to press the “A” & “B” buttons consecutively to obtain the desired value.
6. When the desired voltage value is obtained, continue to press the “B” button until the display reads A<YES & NO>B.
7. Press the “A” YES button to verify and store the start voltage value. Pressing the “B” NO button repeats the voltage value setting menu again.
8. The STOP 1-500 voltage range menu is now displayed. Adjust the stop voltage using the “A” & “B” buttons as described in the Start voltage procedure above.
9. Press the “A” button YES to verify and store the stop voltage value. Pressing the “B” NO button repeats the voltage value setting menu again.

Note: If you should select a start or stop voltage outside of the ranges listed above, the SCS 711 Charge Analyzer will not store that value. If the charge plate does not reach the set stop voltage within 99.9 seconds the counter stops and the display flashes TIME EXCEEDED. This message will appear in Positive, Negative, and Auto decay modes.

Setting the Offset Time: When the start and stop voltage procedure is completed the OFFSET menu will be displayed. The offset time can be adjusted from 0 (Indefinite time), 1 to 10 seconds (1-second steps), and 10 to 60 seconds (10-second steps). To change the offset time perform the following steps:

1. Press “A” CHANGE button repeatedly to move through time settings.
2. When the desired time is set, press the “B” OK button to store. The start and stop voltage values with the offset time value will then be displayed momentarily.
3. Next the display will indicate TIMER+ OFFSET OK. If values are correct, press the “A” YES button. If not, press the “B” NO button which will restart the start voltage menu.
4. The display will then indicate CLEAR MEMORY if changes were made. Press the “A” YES button to store the revised settings. PARAMETER CHANGED will momentarily appear. If no changes were made, display will indicate PARAMETER NOT CHANGED.

Note: To measure offset balance for time periods longer than 60 seconds, set offset time to zero seconds “0 s”. This puts the Charge Analyzer CPM in a floating mode for an indefinite time period. The unit will not have an active timer in this mode. Elapsed time must be recorded by the operator using a stop watch or other time recording device. Connection to the analog output using a chart recorder e.g. allows for monitoring of the offset voltage during long time periods. Pressing the “B” button twice during the indefinite offset time mode returns the display to the DECAY TIME/START mode.

This completes the voltage range zeroing, start/stop voltage, and offset time setup.

Static Decay Time and Balance Use

1. Remove the red sensor cover from the measurement electrode.
2. Mount the plate electrode (b) to the 711 Charge Analyzer. Be sure that the red sensor cover (e) is removed from the sensor electrode. Display will indicate DECAY TIME, voltage polarity (“Either” POS, NEG, or AUTO) and PRESS START.
3. Press the “A” MODE button to select Positive, Negative, or Auto (Positive & Negative) decay.

Note: In AUTO mode there will be an approximate 5 seconds delay between positive & negative decay tests.

4. The display will now indicate DECAY TIME: POS, NEG, or AUTO on the first line and PRESS START on the second line.
5. Pressing the “A” YES button again after AUTO decay is displayed will select the READ OFFSET CPM menu. Pressing the “A” YES button will initiate the system verification and the display will respond with UPDATING.

Note: System verification (Zero point adjustment) is only recommended before the first measurement, when parameters are first set with the attachment of the plate electrode. If the “B” button (NO) is pressed you will return to the start of the DECAY TIME menu.

The SCS 711 Charge Analyzer is now ready to measure static charge neutralization effectiveness and the offset balance of ionizers.

Demonstration #6 Charge Plate Monitor and Static Decay Time Measurements – Air Gun Ionizer

Figure 9. Charge Plate Monitor and Static Decay Time Measurements using 980/980E Air Gun Ionizer.

Static neutralization (the ability to reduce or eliminate a charge on a surface) is an important quality for ionizers. Static decay time is defined as the time interval needed to reduce a defined voltage potential on an object to a defined lower potential by means of applied ionized air. Another important aspect for ionizers is the ability to produce a balanced stream of positive and negative ions. The 711 Charge Analyzer can be used to accurately measure both of these parameters.
Note: For more detailed information on measuring the performance of ionizers refer to the ESD standard ANSI/EOS/ESD-S3.1 for Protection of Electrostatic Discharge Susceptible Items-Ionization.

1. Press the “B” (START) button to charge the plate and begin the measurement menu.
2. On the first line the selected start and stop voltages are indicated. On the second line, the plate default charge-voltage is indicated (approximately 1200 volts).

Note: If the charge plate does not retain the applied voltage it may be due to a high level of room humidity or contamination on one or more of the four spacers. Spacers should be cleaned with laboratory grade alcohol. Use clean cotton or latex gloves when directly handling these spacers.

3. Position the ionizing air gun above the charge plate and activate the air gun blowing ionized air at the plate. The timer in the 711 Charge Analyzer will begin counting (in 1/10’s of seconds) when the set start voltage is reached on the plate. At this time the display will indicate TIMER (present timer count in seconds) and U (present voltage level on the charge plate).
4. When the stop voltage is reached, the unit will begin the offset time (ionizer balance) mode. The display will indicate OFFS-TIME (starting timer at set time) and U (current charge plate voltage).
5. When the offset time is complete, the display will indicate the following: OFF (Maximum voltage offset observed during offset time period), T (Set offset time), and NEG. or POS. DECAY (Time to reach the stop voltage). In the Auto mode both positive and negative decay time will alternately be displayed.

Note: If the charge plate does not reach the set stop voltage within 99.9 seconds the counter stops and the display flashes TIME EXCEEDED.

6. Shortly after the measurement is completed, the display will alternately indicate the decay time test results and A<CONTINUE. Pressing the “A” (Continue) button will display the SAVE VALUES menu. Selecting “A” (YES) button will allow saving of the static decay time measurement test data into a file location numbered 01 - 99. Press the “B” (OK) button to store the data in the displayed file number location.

To store data in a previously used file location number, press the “A” (Change) button. File locations can be changed in steps of ten using the “A” button or in steps of one within an indicated decade, by using the “B” button. Once you have selected the previously used file location press the “B” (OK) button to store the data. The display will then indicate that the file selected is about to be overwritten by OVERWRITE NO. Select button “A” YES to proceed. The display will then briefly indicate Please Wait Saving and then return to the DECAY TIME/START menu.

If after performing a static decay time measurement and storing of the test data is not required, press the “B” button. The display will briefly indicate BREAK and then return to the DECAY TIME/START menu.

Demonstration #7 Charge Plate Monitor and Static Decay Time Measurements – SCS Ionized Air Blower

Figure 10. Charge Plate Monitor and Static Decay Time Measurements Using 963E Ionized Air Blower.

1. Attach the three metal-spacers (j) by screwing into the three locations at the rear of the SCS 711 Charge Analyzer.

2. Position the 711 Charge Analyzer in front of the ionizer blower with the display facing upward.
3. Measure the static decay rate and offset balance by following the procedure outlined in Demonstration #6 above.

Note: For more detailed information on measuring the performance of ionizers refer to the ESD standard ANSI/EOS/ESD-S3.1 for Protection of Electrostatic Discharge Susceptible Items-Ionization.

Remote Field Sensor Probe Operation

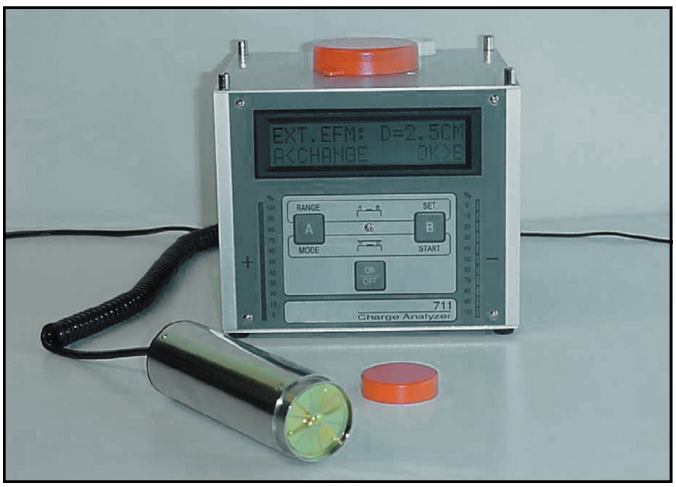

Figure 11. Remote Field Sensor Probe Operation.

Measurement Ranges:

Distance	Voltage	Resolution
1 cm	0 to 10kv	1V
2.5 cm	0 to 20vk	2V
5 cm	0 to 50vk	10V
10 cm	0 to 100vk	10V
20 cm	0 to 200vk	20V

Display automatically converts from volts to kilovolts. Meter display symbols in Remote Field Sensor Mode:

“EFM” = SCS 711 Charge Analyzer in External Field mode (upper left corner).

“D” = Distance between probe and surface to be measured.

“U” = Voltage level on charged surface or object.

Remote Field Sensor Probe Setup

The following procedure activates the SCS 711 Charge Analyzer for use with the Remote Field Sensor Probe.

1. Turn off the 711 Charge Analyzer.

Note: If the plate electrode is not attached to the Charge Analyzer 711, place the red cover over the measurement electrode to prevent accidental damage.

2. Insert the 4-Pin plug (observing keyed position at bottom of socket) of the Remote Field Sensor Probe cable into the 711RS socket on the rear of the 711 Charge Analyzer Tighten the outer shell onto the socket (clockwise motion), until secured.
3. Ground the unit by attaching the ground wire with alligator clip on the rear panel of the unit to an earth/ electrical ground.
4. Press the on/off button to activate the SCS 711 Charge Analyzer. The display will briefly indicate RECEIVED DATA WAIT.
5. The display will next indicate EXTERN EFM, A<OFF & ON>B. Press the “B” button (ON) to activate the Remote Field Sensor Probe. Selecting the “A” button (OFF) will deactivate the sensor and return the 711 Charge Analyzer to an internal measurement mode.
6. When ON is selected the display will indicate EXT. EFM, D = CM, A<CHANGE, & OK>B. Select the desired measurement distance by pressing the “A” button (CHANGE) momentarily until desired distance is displayed.

Note: This value represents the distance in centimeters between a charged surface and the sensor head.

7. Press the “B” button (OK) to select. The display will briefly indicate PARAMETER CHANGED when distance value is changed.
8. The display now indicates external field mode, distance, and measured voltage. To change the distance setting again while in the external field mode, press the “B” button momentarily and repeat steps 5-7.
9. With red cover on probe, zero the SCS Remote Field Sensor Probe by inserting a small probe or tool into the hole located at the rear of the sensor. At the bottom of the hole there is a membrane switch. Momentarily apply light pressure to activate the zeroing feature. The 711 Charge Analyzer display will briefly indicate ZERO ADJUSTMENT.

Note: When changing to a lower distance setting, re-zeroing is recommended. For higher distances it is not necessary to re-zero.

This completes the Remote Field Sensor Probe setup and zeroing.

Remote Field Sensor Probe Use

Important Notice: When measuring an unknown voltage on a surface, position the probe at a far distance away and approach the surface slowly to prevent accidental discharges to the sensor element. If there is a suspected high charge or if the surface of the object is uneven, the measuring distance should be increased.

1. Remove the red cover from the Remote Field Sensor Probe.
2. Position the sensor in front of the charged surface or object to be measured.
3. Observe the measured voltage (U = Volts or Kilovolts) on the 711 Charge Analyzer display.

Note: The Remote Field Sensor Probe measures the electrical field in V/m. The electrical field is measured automatically based on the set measurement distance and is then internally calculated and indicated as volts in the displayed U = V.

Example 1: If the distance between the object and sensor equals 2.5 cm and the “U” value indicates 500 volts, then the strength of the electric field is in this case 500V/inch (Since 1 inch = 2.5 cm approximately).

To change the measurement into V/m, multiply the indicated U = V value displayed by the appropriate factor to obtain 100 cm, (1 m) length.

Example 2: If the distance between the object and the sensor equals 10 cm and the “U” value indicates 500 volts, using chart below, then the V/m is in this case 5,000 volts.

Distance (cm)	Factor
1	100
2.5	40
5	20
10	10
20	5

To convert readings into volts/inch or volts/cm use the following two formulas:
R/100 x D (cm) or R/39.4 x D (in.) Where:

R = Reading indicated on the 711 Charge Analyzer display.

D = Distance between object and sensor electrode, measured in inches or centimeters.

The SCS 711 Charge Analyzer is now ready to perform measurements through the Remote Field Sensor Probe.

Demonstration #8 Measuring a Charge on an Object Using the Remote Field Sensor Probe:
Hold the conductive container (h) in one hand and rub the handle against the sleeve of your shirt or pants to accumulate a charge on the handle. Hold the Remote Field Sensor Probe in front of the handle at the distance selected on the Charge Analyzer 711 and observe the voltage.

Analog Output

The 711 Charge Analyzer has red and black analog output banana jacks located at the rear of the unit. Use these jacks to connect the 711 to an analog y(t) recorder. The recorder's internal resistance must be greater than 1,000 ohms.

Verification Procedure

The following procedure can be used to determine if the SCS 711 Charge Analyzer is operating within the stated specifications:

Equipment required
- DC ± 5,000V (≤ ± 1% tolerance) adjustable high voltage power supply
- Four lead wires (banana plug style)
- Digital Multi meter (Voltmeter scale), ≤ ± 0.1% tolerance

Important Note: Do not discharge to the sensor element.

711 Charge Analyzer Internal Sensor:
1. Mount the cup electrode (a) to the top of the 711 Charge Analyzer and perform the zeroing function described in Section 5. Voltmeter Operation/Setup.
2. Connect a lead wire between the ground jack of the unit and the low/return side of the DC high voltage power supply.
3. Connect a lead wire between the DC power supply output connection and the banana jack of the cup electrode (a).
4. Connect remaining two wires between the digital voltmeter (± voltage inputs) and the red/black banana jacks (analog output) at the rear of the 711 Charge Analyzer. (Select meter scale ± 2vdc)
5. Select the proper range on the unit, apply DC high voltage power supply to each full range, (25 VDC, 100VDC, 500VDC, 1,000VDC, and 5,000VDC). Verify that the display indicates within ± 2.5% of full range. See verification check list form on next page.

Note: Also verify during Step 5 that the analog output is within tolerance. Input to output ratio for each voltage range is as follows:

SCS 711 Charge Analyzer Voltage Range Setting	Ratio Input to Analog Output Multiply analog output voltage by the appropriate value below to obtain SCS 711 Charge Analyzer input value	Decimal Value Multiply input voltage to the SCS 711 Charge Analyzer by the appropriate factor below to obtain analog output value
25Vdc	12.5 to 1	0.08
100Vdc	50 to 1	0.02
500Vdc	500 to 1	0.002
1,000Vdc	500 to 1	0.002
5,000Vdc	2500 to 1	0.0004

6. Repeat Step 5 for Negative voltages.

Maintenance

If the charge plate does not retain the applied voltage, it may be due to high level of room humidity or contamination on one or more of the four spacers. Spacers should be cleaned with laboratory grade alcohol. Use clean cotton or latex gloves when directly handling these spacers.

Caution: To reduce the risks associated with use of alcohol for cleaning:
- When cleaning the 711 Charge Analyzer per the operating instructions, follow the MSDS procedures for safe use and handling of laboratory grade isopropyl alcohol.

To reduce the risks associated with environmental contamination from the NiMH battery pack and circuit boards containing lead-bearing solder:
- The 711 Charge Analyzer contains a NiMH battery pack and circuitry that contains lead in the solder. At the end of service life, dispose of the 711 Charge Analyzer in accordance with federal, state and local requirements.

When not in use, the field sensors should be covered at all times with the supplied red covers. Extreme care should be taken to prevent contact to the sensor elements. They should be kept free of insulating coatings caused by dust, paint, or varnish vapors, and condensed water. To clean the sensor element, use a laboratory grade alcohol applied to a lint-free cloth. Lint-free cotton swabs may also be used. Care must be taken not to cause damage to the impeller or sensor surface at all times.

Caution: To reduce the risks associated with property damage due to improper repair or modification:
- Do not attempt to modify or repair — no user serviceable parts inside — contact SCS Service for repair.

To reduce the risks associated with property damage from improper maintenance:
- Unit must be cleaned and checked periodically for correct operation

Warning: To reduce the risks associated with hazardous voltage:
- Do not attempt to modify or repair – no user serviceable parts inside – contact SCS Service for repair.

ERROR CODES

Error No.	Description
E01	PC-interface time out
E02	PC-interface error checksum
E03	Internal EEPROM defect
E04	PC-interface invalid command received
E05	Measured value is lower than offset
E06	Measured value is not constant
E08	Internal EEPROM error checksum
E09	Internal EFM defect
E10	Internal A/D converter defect
E11	Pos. high voltage when charging to low
E12	Neg. high voltage when charging to low
E13	Error mode switching
E14	PC-interface defect
E15	Ext. EFM sensor no receive on interface
E16	Ext. EFM sensor no End-byte received
E17	Ext. EFM sensor wrong byte received
E18	Ext. EFM sensor error range
E19	Ext. EFM sensor error distance
E32	Wrong offset

Safety Information

Read, understand, and follow all safety information contained in this User's Guide prior to use of the SCS 711 Charge Analyzer. Retain this User's Guide for future reference.

Intended Use: The 711 Charge Analyzer is intended for use in testing the performance of static control products. This device is designed for use as specified in the operating instructions. It is intended for use in an indoor environment and has not been evaluated for other uses or locations.

Warning: To reduce the risks associated with hazardous voltage, which if not avoided, could result in death or serious injury:
- Connect the attached ground wire on the rear panel to an electrical ground before operating.
- Refer to SCS 711 Charge Analyzer User's Guide

Warning: To reduce the risks associated with hazardous voltage:
- Connect the attached ground wire on rear panel to an electrical ground before operating the 711 Charge Analyzer;
- Do not use if the SCS 711 Charge Analyzer housing or power supply are damaged;
- Do not attempt to modify or repair – no user serviceable parts inside – contact SCS Service for repair.

To reduce the risks associated with fire or explosion:
- Do not operate the 711 Charge Analyzer in an explosive environment. The 711 Charge Analyzer is not designed to be intrinsically safe.

Caution: To reduce the risks associated with use of alcohol for cleaning:
- When cleaning the 711 Charge Analyzer per the operating instructions, follow the MSDS procedures for safe use of the required cleaning solution.

To reduce the risks associated with environmental contamination from the NiMH battery pack and circuit boards containing lead-bearing solder:
- The 711 Charge Analyzer contains a NiMH battery pack and circuitry that contains lead in the solder. At the end of service life, dispose of the 711 Charge Analyzer in accordance with federal, state and local requirements.

To reduce the risks associated with property damage due to improper repair or modification:
- Do not attempt to modify or repair – no user serviceable parts inside – contact SCS Service for repair.

To reduce the risks associated with property damage from improper maintenance:
- Unit must be cleaned and checked periodically for correct operation

Important Note:
- Avoid extreme discharge of the rechargeable batteries. If the batteries require charging, do not allow the unit to sit idle for a period of time without first fully charging the batteries.
- Do not use the 711 Charge Analyzer or Remote Field Sensor Probe in areas where high AC or DC field strengths are present.
- Do not discharge to the sensor element of the 711 Charge Analyzer or Remote Field Sensor Probe.
- Do not allow any object to contact the sensor elements. Permanent damage to the sensor elements may occur. When not in use, keep sensor heads protected with supplied covers.

Regulatory Information

WEEE Statement
The following information is only for EU-members States: The mark shown to the right is in compliance with Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE).

The mark indicates the requirement NOT to dispose the equipment as unsorted municipal waste, but use the return and collection systems according to local law.

FCC
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Note: Modifications to this device shall not be made without the written consent of SCS. Unauthorized modifications may void the authority granted under Federal Communication Rules and Industry Canada Rules permitting the operation of this device.

ICES Statement
This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

CE Statement
Meets EU safety, health and environmental protection requirements.

Limited Warranty, Warranty Exclusions, Limit of Liability and RMA Request Instructions

See the SCS Warranty - http://staticcontrol.descoindustries.com/warranty.aspx

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