

# 3M

## 713 Handheld Air Ionizer Tester/Field Meter

### Instructions



#### Intended Use

The 3M™ 713 Ionizer Tester/Static Field Meter is an electronic instrument designed to measure static electric charges existing in the air or on surfaces. Any deviation from this intended use could impair its effectiveness and possibly lead to an unsafe operating condition.

The 713CH Charger is an electronic instrument designed to apply a static, electric charge to a surface for the purpose of measuring static discharge time. Any deviation from this intended use could impair its effectiveness and possibly lead to an unsafe operating condition.

#### Product Description

The 713 is an accurate, compact electrostatic field meter that can be used for locating and measuring static charge voltages. In combination with the isolated plate test fixture and charger, it can also be used to test the function and balance of ionized air blowers and guns.

The 713 is battery powered and features a 3-1/2 digit LCD display. It has a range of 0 to  $\pm 1999$  volts when used at a distance of 1 inch or when used as an ionizer tester. The pocket-sized case is conductive and features a ground snap to facilitate accurate measurement. The circuitry has been

designed to make accurate measurements even in ionized air environments. The 713 features SAMPLE and HOLD modes that allow measurements to be made in places that would be difficult to reach or see with other instruments.

The isolated plate test fixture attaches to the meter and is used to measure ionizer discharge rate and ion balance. For discharge rate measurements, it can be charged using the small, battery-powered high voltage power supply, 3M™ 713CH charger.

#### General Operation

1. Controls — The 713 has switches for ON/OFF and SAMPLE/HOLD selection and a knob for rotary ZERO adjustment. Depressing the HOLD switch locks the display at the current reading; pushing the switch again releases the hold.
2. Battery installation — The DC 9V alkaline battery used with the 713 fits tightly in the battery compartment; correct installation is important. If the battery is not positioned correctly, it may be difficult to replace the battery compartment cover.  
The battery should be installed as shown in Figure 1 so that its negative pole is near the bottom of the 713 with the connecting wires wrapping back up along the top of the battery.
3. Battery check — If the battery power is low, the low battery indicator, BAT, will appear in the display when the meter is turned on. If the BAT indicator is lit, replace the battery before using the meter.

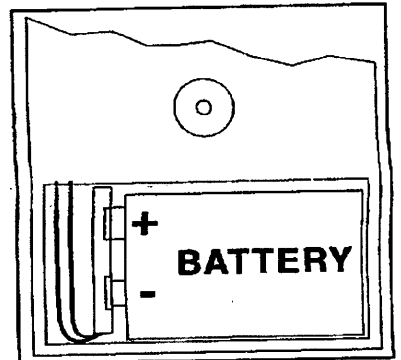


Figure 1

#### Making Electrostatic Voltage Measurements

1. Zeroing the meter — With the meter on, ensure that it is not in the HOLD position. Place the meter 1 inch from a grounded metal surface. Adjust the ZERO knob so that the display reads zero.  
**IMPORTANT:** The 713 is housed in a conductive case that provides the ground reference for the measuring circuit. For accurate measurements, the case must be

grounded either through the grounded individual holding the case or through a ground cord attached to the ground snap on the rear of the case.

2. Taking electrostatic voltage readings — At a distance of about 10 inches, point the meter toward the surface of the object to be measured. Move the meter toward the object while observing the display. Continue to move the meter toward the object until a minimum distance of 1 inch is reached or until you have over-ranged the display (i.e., gone "off scale"). The static voltage is equal to the meter value multiplied by the number of inches between the front of the meter and the surface of the object.
3. Holding a reading — Push the HOLD switch to freeze the reading currently in the display so that it can be more conveniently read. When the meter is in the HOLD position, the word HOLD will appear in the display.
4. Measurement accuracy — The accuracy of a field measurement is dependent on a stable ground reference and precise measurement distance. It is also dependent on the ratio of the size of the object being measured to the measurement distance. This ratio should be at least 3 for best accuracy. That is, the surface of the object to be measured should be at least 3 inches square when measuring at 1 inch.

### Testing Air Ionizers

1. Attach the isolated plate test fixture — Slide the meter into the test fixture so that the rails on the sides of the fixture slide into the upper grooves located on each side of the meter. Slide the meter into the fixture until the adjustment screw under the plate on the front of the fixture contacts the front of the meter. It is not possible to slide the meter too far into the fixture.
2. Zero the meter — With the meter on, press the right push-button down so that it latches in the lower or SAMPLE position. Ground the isolated plate by touching it to a known ground. If necessary, adjust the ZERO knob so that the display reads zero.

**IMPORTANT:** The 3M™ 713 is housed in a conductive case that provides the ground reference for the measuring circuit. For accurate measurements, the case must be grounded either through the grounded individual holding the case, or through a ground cord attached to the ground snap on the rear of the case.

3. Testing ionizer discharge ability — Locate the meter so that it is in the area of influence of the ionizer, and switch the ionizer on. Using the 713CH Charger, charge the isolated plate mounted on the 713.

The charger can be used to produce either a positive or negative charge. One of the metal charging contacts (on either side of the front end of the 713CH) is grounded through the index finger of the user while the other contact transfers the high voltage to the isolated test plate. For right handed use of the charger, the red button is depressed with the thumb while touching the contact on the upper right hand side of the charger with the index finger. Touching the free contact on the upper left side of the case to the isolated plate will charge the plate to about 1100 volts (positive). To charge the plate to a negative voltage, turn the case of the charger over and depress the

red button with the second finger while touching the contact with the index finger. Touching the free contact to the isolated plate will charge it to about 1100 volts (negative). Left handed operation is the reverse of that described.

When the charger is removed, the ionized air flow will neutralize the charge on the isolated test plate on the 713. Note the decrease in the voltage on the meter display. The rate of voltage decrease is a measure of the discharge ability of the ionizer under the conditions of the test.

4. Testing the ion balance of a bench top air ionizer — Zero the meter as in step 2, then place it in the area of influence of the ionizer, approximately 2 feet from the front of the bench top air ionizer and 6 inches above the table top surface. With the ionizer on, allow the reading on the meter to stabilize; this may take several seconds. The meter reading is a measure of the ionizer's ability to produce equal numbers of positive and negative ions. The closer to zero this reading is, the better the ion balance of the ionizer.

**NOTE:** The plate of this test fixture is 1.25" x 3.25" and has a capacitance of about 5pF, different from the 6" x 6", 20pF plate specified by the ESD Association standard method for ionizer testing. When making balance measurements, the use of the smaller plate will result in a faster discharge time than if the larger plate was used.

### Maintenance

1. Battery replacement — The 713 operates on a standard DC 9V alkaline battery. The battery life will be in excess of 40 hours of operation. When the battery power gets low, the word BAT will appear in the display. To change the battery, slide open the battery compartment door on the back of the meter and replace the battery with a fresh one. The battery should be removed from the meter if it is to be stored for an extended period of time.

The 713CH charger also operates on a standard DC 9V alkaline battery. The battery life will be in excess of 10 hours of operation. When the battery becomes discharged, the high voltage source will no longer be able to produce voltages in excess of 1000 volts. To change the battery, slide open the battery compartment door on the back of the charger and replace the battery with a fresh one. The battery should be removed from the unit if it is to be stored for an extended period of time.

2. Calibration — All 3M 713 units have been calibrated by 3M to NIST (National Institute of Standards and Technology) traceable standards as specified in MIL-STD-45662A. 3M 713 "Certified" units have been both calibrated and certified to NIST-traceable standards as specified in MIL-STD-45662A.  
If the unit needs repair or you wish to have 3M calibrate the unit, contact 3M Electronic Handling & Protection Division Customer Service at 1-800-328-1368.
3. Note: The 713 and 713CH are precision electronic instruments. They must not be subjected to extreme shock or vibration. Damage to the field sensor may result from dropping the meter from an excessive height onto a hard surface.

## 713 Air Ionizer Tester/Field Meter

Display	3-1/2 digit, 0.4" digit height, automatic polarity, HOLD and low battery BAT indicators.
Range	0 to $\pm 1999$ volts per inch for either polarity.
Accuracy	$\pm 5\%$
Controls	ON/OFF switch, SAMPLE/HOLD switch, ZERO knob.
Grounding	Through conductive case or snap fastener on case.
Power	DC 9V alkaline battery
Size	2.4" W x 4.2" L x 1.3" D
Weight	5 oz. with battery
Environmental	Operates at 0° to 50°C and 0 to 85% RH (noncondensing). Accuracy unaffected by air ionization.
Certifications	UL, C-UL, CE, CB scheme

## 713 Verification and Calibration Test Procedures

### Equipment Required:

6" x 6" metal plate, calibrated voltage source, voltmeter  
See Figure 2, page 4.

### Verification Procedure

1. Isolate the 6" x 6" plate from ground. Attach the plate to the output of a calibrated high-voltage power supply (CAUTION: EXPOSED HIGH VOLTAGES). Mount the field meter so that it points directly at the center of the plate. Verify that the field meter case is precisely 1 inch away from the plate. Attach a ground wire from the power supply ground to the field meter ground snap. Connect a digital voltmeter (1999 volt scale) between the plate and ground.
2. Set switch S1 on the field meter to ON and S2 to the SAMPLE position. Verify that the LCD display does not show a BAT indication. If it does, replace the DC 9V alkaline battery before proceeding.
3.
  - a. Ground the metal plate and note that the voltmeter reads zero.
  - b. Continue to ground the metal plate and set the field meter LCD display to zero using the Front Panel Zero control of the field meter.
  - c. Unground and charge the metal plate to +1000V. The field meter LCD display should match the voltmeter display,  $\pm 50V$ .
  - d. Charge the metal plate to -1000V. The field meter LCD display should match the voltmeter display,  $\pm 50V$ .
  - e. Ground the metal plate. The field meter should return to zero,  $\pm 10V$ . If not, adjust the field meter front panel zero control until the LCD display reads zero, and repeat steps 3a to 3e.

## 713CH Charger

Output	Greater than $\pm 1000$ volts
Current	Less than 1 micro amp
Controls	ON/OFF switch
Grounding	Through charging contacts.
Power	DC 9V alkaline battery
Size	2.4" W x 3.75" L x 1" D
Weight	4 oz. with battery
Environmental	Operates at 0° to 50°C and 0 to 85% RH (noncondensing).
Certifications	UL, C-UL, CE, CB scheme

4. Field meter isolated plate test fixture verification —
  - a. Install the field meter in its isolated plate test fixture. Check that the serial numbers of the field meter and isolated plate fixture agree.
  - b. Connect a wire from the isolated plate to a voltage source of  $\pm 1000V$ . Connect a wire from the field meter ground snap to the ground of the voltage source.
  - c. Charge the plate to +1000V. The field meter LCD display should read 1000,  $\pm 50V$ .
  - d. Charge the plate to -1000V. The field meter LCD display should read -1000,  $\pm 50V$ .
  - e. Ground the plate. The field meter should return to zero,  $\pm 10V$ . If not, adjust the field meter front panel zero control until the LCD display reads zero, and repeat steps 4b to 4e.

### Calibration Procedure

**NOTE:** The internal Gain control R10 and internal ZERO control R27 interact, so the calibration process will be a 'back-and-forth' adjustment of these two controls. This will take a number of passes through the adjustment of these two controls. The amount of adjustment required will gradually decrease with each pass.

1. Isolate the 6" x 6" plate from ground. Attach the plate to the output of a calibrated high voltage power supply (CAUTION: EXPOSED HIGH VOLTAGES). Mount the field meter so that it points directly at the center of the plate. Verify that the field meter case is precisely 1 inch away from the plate. Attach a ground wire from the power supply ground snap. Connect a digital voltmeter (1999 volt scale) between the plate and ground.
2. Set switch S1 on the field meter to ON and S2 to the SAMPLE position. Verify that the LCD display does not show a BAT indication. If it does, replace the DC 9V alkaline battery before proceeding.
3.
  - a. Ground the metal plate and note that the voltmeter reads zero.
  - b. Set the front panel zero control R16 to its physical midpoint. Ground the metal plate. Adjust the field meter zero trimpot, R27, until the LCD display reads zero. (Do not adjust the field meter front panel zero control

- R16. Leave it set at the mid-point of its range; if the LCD display does not "0" out, then the front panel zero control, R16, is probably not at its mid-point. Physically find the mid-point and repeat the step.)
- Charge the metal plate to +1000V. Adjust the field meter Gain trimpot R10 until the LCD display matches the voltmeter display,  $\pm 50V$ .
  - Ground the metal plate. Note that the field meter does not return exactly to zero. Once again, adjust the field meter zero trimpot, R27, until the LCD display reads zero.
  - Charge the metal plate to +1000V. Repeat the Gain trimpot adjustment so that the LCD display matches the voltmeter,  $\pm 50V$ .
  - Do the following steps: metal plate charge/field meter Gain adjust, metal plate zero field meter zero adjust, in sequence. Repeat until the field meter tracks the metal plate readings for both zero and voltage readings;  $\pm 50V$ .

- Charge the metal plate to -1000V and verify that the field meter tracks the voltage and polarity change. A "-" sign should appear on the display when reading a negatively charged surface. (There is no "+" sign for reading positive charges).
- Front Panel Zero Range Test — Ground the metal plate. The field meter should read "000";  $\pm 10V$  [+010 or -010]. Turn the front panel zero control R16 all the way clockwise. The LCD display should read approximately "150." Turn R16 all the way counter-clockwise. The LCD display should read approximately "150." Re-adjust R16 so that the LCD display reads "000." R16 should once again be set at about the middle of its range. If there is more than a 150V offset to either side of "000," R16 should be re-centered and the field meter should be re-calibrated.

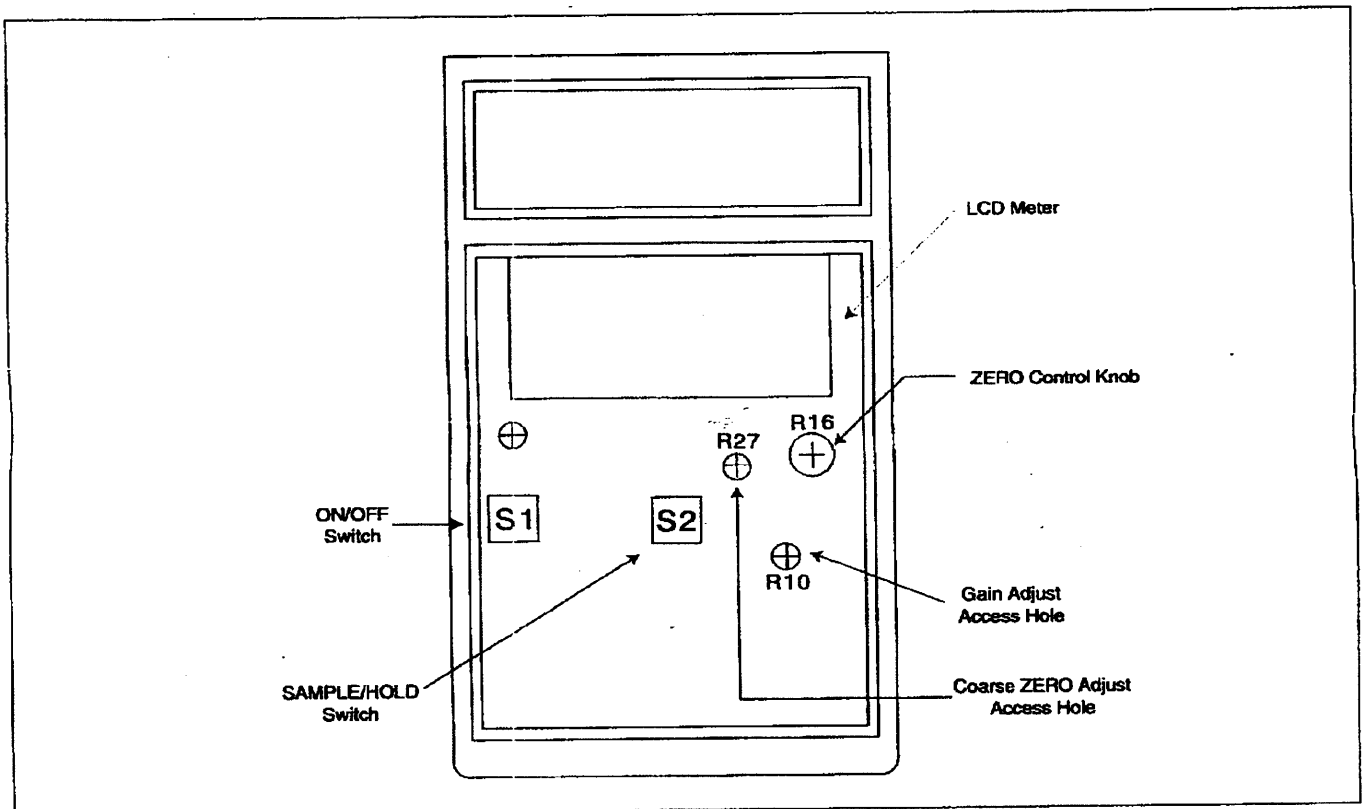


Figure 2

**Limited Warranty-** 3M expressly warrants that for a period of twelve (12) months from the date of purchase, 3M static control products will be free of defects in materials (parts) and workmanship (labor).

Defects occurring during the warranty period will be repaired or products will be replaced at 3M's option and expense, if 3M receives notice during the warranty period. Defective products must be returned to 3M with proof of purchase date.

**Warranty Exclusions-** THE FOREGOING EXPRESS WARRANTY IS MADE IN LIEU OF ALL OTHER PRODUCT WARRANTIES, EXPRESS,

AND IMPLIED, INCLUDING FITNESS AND MERCHANTABILITY. The express warranty will not apply to defects or damage due to accidents, neglect, misuse, alterations, operator error, or failure to properly maintain, clean, or repair products.

**Limit of Liability-** In no event will 3M or Seller be responsible or liable for direct, incidental, or consequential losses or damages, under any legal theory including but not limited to contract, negligence, or strict liability. Fulfillment of 3M's warranty obligations will be Customer's exclusive remedy and 3M's and Seller's limit of liability for any breach of warranty or otherwise.

**3M**

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