718 Static Sensor
718A Air Ionizer Test Kit

3M 718 Static Sensor

Hand-held static sensor locates and measures static voltages and tests air ionizers.

The 3M™ 718 Static Sensor can help companies competing in the global high-tech marketplace prevent costly losses due to electrostatic discharge (ESD) damage by playing a vital and valuable role in their own ESD control program. Easy to use, the hand-held 718 Static Sensor is designed to measure static voltages on objects and surfaces arising from electrostatic charge buildups, and can help identify ESD trouble-spots — ensuring product reliability and customer satisfaction which translates into company profits. As a bonus, when used in conjunction with the 3M™ Model 718A Air Ionizer Test Kit, the 718 can also be used to verify the operation of air ionizers.

718 Static Sensor Features

- Small-size, lightweight, conductive plastic housing
- Membrane switches for Power, Range/Zero and Hold functions.
- Digital, LCD (liquid-crystal) display is easy to read and updates quickly.
- Ranging system assists user in making quick and easy measurements.
- Measurements accurate to 5%.
- Output jack available for continuous measurements.

Convenient Size/Low Power Requirements

The 718 is small enough to be carried in a pocket and weighs less than 5 oz. (142 g), including battery. The lightweight plastic housing is conductive, allowing a properly-grounded user to dissipate all electrostatic charges from the surface of the meter.

Meter Functions

The meter is equipped with three membrane switches which control different functions. The POWER switch turns the instrument on and off. The RANGE/ZERO button performs two functions; when pressed momentarily it switches between the two measurement ranges of 0-2,000 volts and 0-20,000 volts, and if held for longer than 3 seconds, it resets the voltage display to 0 volts. The HOLD button allows the user to freeze a measurement on the LCD for later review.

Ranging System

Included with the 718 Static Sensor is a ranging system consisting of two light-emitting diodes (LEDs) which each emit a circular red light onto the surface being measured for static. When the two lights intersect and form a single focused light, the measurement distance is the prescribed 1 inch (2.54 cm).

718 Range Finder Unfocused

718 Range Finder at 1" away

Accuracy

The 718 Static Sensor is accurate to within ±5% of the displayed measurement, at a distance of one inch (2.54 cm) from the target. Accuracy will vary as the distance between measured object and instrument changes from the one inch (2.54 cm) specification.

Analog Output Jack

The analog output jack located in the front of the unit provides a convenient hook-up, via a 3/32 inch (2.5 mm) monophone jack, to a recorder/data acquisition console. The 718 Static Sensor may then be used for remote monitoring or permanent recording of electrostatic voltage readings.

3M 718 Static Sensor Specifications

Dimensions	0.85" (H) x 2.4" (W) x 4.15" (L) 2.2 cm (H) x 6.1 cm (W) x 10.5 cm (L)
Weight	4.5 oz. (128 g) with battery
Power Requirements	One 9-volt alkaline battery
Measurement Ranges	0 – 2 kV Low Range 0 - 20 kV High Range
Voltage Display	3½ digit liquid crystal display
Voltage Output	1/1000 of measured voltage @ low range 1/10,000 of measured voltage @ high range
Distance Indicator	LED targets. Aligned targets indicate 1 in. (2.54 cm) measurement distance
Measurement Accuracy	Within 5% of actual voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

3M 718A Air Ionizer Test Kit

3M™ 718A Air Ionizer Test Kit

When used with the 3M™ 718 Static Sensor, the 3M™ 718A Air Ionizer Test Kit can provide periodic verification of air ionizer performance. The 718A Air Ionizer Test Kit consists of a charge plate and a charger. The system as a whole is designed to meet the guidelines specified in ESD Association Draft Standard D3.3.

The charge plate slides over the housing of the 718 Static Sensor. Placing the 718 in the air flow of an air ionizer allows for measurement of the ionizer's offset balance. The charger can be used to deposit an electrostatic charge on the plate. Measuring how long it takes the ionizer to neutralize this static charge gives the ionizer discharge time.

Calibration and Certification

The 3M 718 Static Sensor can be ordered as calibrated and certified by a 3M ISO9002 Registered Metrology Laboratory. Calibration can be traced back to National Institute of Standards and Technology (NIST) standards, as specified in MIL-STD-45662.

3M 718A Air Ionizer Test Kit Specifications

Charge Plate Assembly	Per ESD Association Draft Standard D3.3
Charge Plate Bracket Dimensions	1" (H) x 3.1" (W) x 4.25" (L) 2.5 cm (H) x 7.9 cm (W) x 10.8 cm (L)
Charge Plate Area	3.25" (W) x 1.25" (L) 8.3 cm (W) x 3.2 cm (L)
Charge Plate Assembly Weight	2.5 oz (70 g)
Charger Dimensions	0.85" (H) x 2.4" (W) x 5.0" (L) 2.2 cm (H) x 6.1 cm (W) x 12.7 cm (L)
Charger Weight	6 oz. (170 g) with battery
Charger Power Requirements	One 9 volt alkaline battery
Charger Output	1100 V minimum for positive or negative voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

For ordering information, technical information,
Call or fax All-Spec Industries' Sales Department

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718 Static Sensor

Instruction Sheet

Safety Information

Intended Use

The 3M™ 718 Static Sensor is a portable, handheld instrument designed for measuring voltages associated with electrostatic charge. Its intended use is for measuring the amount of voltage, in a range from 0-20 kilovolts, associated with an electrostatic charge buildup on a surface. Any deviation from this intended use could impair the instrument's effectiveness and possibly lead to an unsafe operating condition.

The 3M™ 718A Air Ionizer Test Kit is a set of accessories for use in conjunction with the 3M 718 Static Sensor. Their intended use is for verifying the operation of air ionizers by measuring the neutralization time for a static charge placed on a stationary metal plate. Any deviation from this intended use could impair the instrument's effectiveness and possibly lead to an unsafe operating condition.

Caution Statements and Explanation of Symbols

- The 718 Static Sensor and 718A Charger use DC 9V power supplied by a 9V alkaline battery. Usage of any other power source may cause damage to the instruments.
- The 718 Static Sensor and 718A Air Ionizer Test Kit have no user-serviceable parts. Do not disassemble the products for any reason. UNAUTHORIZED SERVICE WILL VOID THE WARRANTY.
- The 718 and 718A are NOT designed for usage in hazardous environments where the possibility of explosion or fire exists.

Read and understand all safety information before installing and operating this equipment.

1.0 Description

The 3M 718 Static Sensor is a portable handheld instrument used for locating and measuring electrostatic charges. It can be used to locate ESD trouble-areas, and is a valuable tool for the ESD-control engineer. Used in conjunction with the 718A Air Ionizer Test Kit (available separately), it can be used for verification and auditing of air ionizers.
The 718 Static Sensor is battery-powered and has several measurement features:
Range: measurements can be taken in a 0-2 kV or 0-20 kV range
Automatic Zero: pushbutton feature allows easy adjustment to zero. No screws or dials to turn.
HOLD function: allows the User to "freeze" a displayed measurement, for later evaluation
Automatic shutoff: conserves battery power by shutting off the instrument after 20 minutes of inactivity.

2.0 Power Requirements and Battery Installation

2.1 Both the 718 and 718A Charger use DC 9V power supplied by a 9V alkaline battery.
2.2 To install the battery on either unit:
2.2.1 Remove the battery cover, located in the lower back of the unit. To do this, press down on the cover and slide it downward.
2.2.2 Pull the battery connector out of the housing, and align the male/female ends of the connector with the proper terminals on the battery.

2.2.3 Connect the two, and place the now connected battery into the housing by inserting the connector end first, then following up with the other end of the battery.
2.2.4 Replace the cover.

2.3 The 718 Static Sensor has a Low Battery indicator. Once the battery is depleted to approximately 6.5 volts, the instrument will show BAT in the display. At this time, the 718 will not produce accurate results, and the battery should be replaced. A fresh alkaline battery should last greater than 100 hours, when the instrument is in continuous usage.

2.4 The 718A Charger also has a low-battery indicator. This is an LED located at the left-hand side of the unit. When the battery voltage drops below operating level, the LED will light up. At this time, the user should

replace the battery. Usage of the 718A Charger under low-battery conditions would lead to insufficient voltage levels being generated.

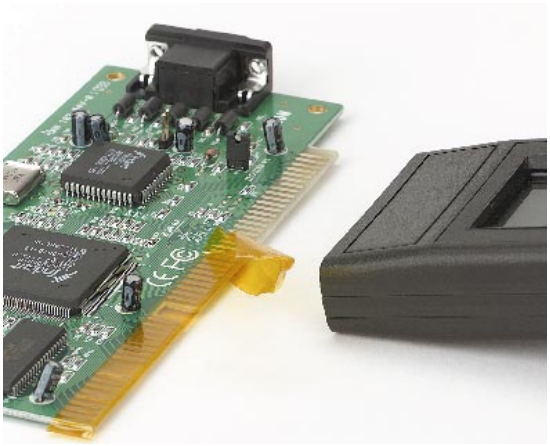
3.0 Operation of the 718 Static Sensor

Supplemental notes
For accurate measurements during usage, it is recommended that the outside housing of the 718 Static Sensor be connected to electrical ground. This can be accomplished by having the user holding the instrument connect to ground through either a static control wrist strap, or while wearing static control footwear. The enclosure of the 718 is made of conductive plastic and is, therefore, electrically connected to whomever is holding the instrument. In addition, ground for the instrument can be provided through the Voltage Monitor Output on the front of the case.

The 718 Static Sensor is a precision electronic instrument. Improper use or rough treatment can damage the unit, and render it incapable of providing accurate measurements.

3.1 Turning the unit ON and OFF: To turn on the 718 Static Sensor, momentarily press down on the membrane switch labeled POWER. That the power is on can be verified by seeing that the liquid-crystal display (LCD) is on, and that the red light-emitting diodes in the front of the sensor are lit. To shut off the 718 Static Sensor, momentarily press down on the membrane switch labeled POWER. That the power is off can be verified by seeing that the liquid-crystal display (LCD) is off.

3.2 Making Electrostatic Voltage Measurements: hold the instrument 1-inch (2.54 cm) away from the object being measured. The display will update with the voltage measurement, in kilovolts. If the measured voltage is greater than the measurement range of the instrument



a **–1.** will be displayed. At this time, switch to a greater range (see MEASUREMENT RANGE below). If over-ranging occurs even with the 20 kV range activated, the static charge on the object cannot be measured with the 718 Static Sensor.

3.3 Measurement Range: all measurements are in kilovolts (kV), as stated on the front label of the unit. The 718 has two measurement ranges: 0-2 kV, and 0-20 kV. The Measurement range mode that the unit is currently in can be verified by checking the display. Three digits following the decimal point indicate that the unit is in 0-2 kV range. Two digits following the decimal point indicate that the sensor is in 0-20 kV range.
To change between measurement ranges, press the RANGE/HOLD button once, momentarily.

3.4 HOLD Function: in the event that the user wishes to freeze the current measurement, the HOLD function of the 718 Static Sensor may be used. Simply press the HOLD switch momentarily, and the currently displayed voltage will be frozen. A

HOLD notice will also be displayed, to alert the user that the instrument is currently in HOLD Status. To unfreeze the display and return to floating measurement, momentarily press the HOLD switch once again. Please note that during HOLD condition the distance-indicating LED's are turned off.

3.5 Zero adjustment: the 718 Static Sensor has a zero adjustment function, which sets a zero reference point for all subsequent measurements. This zero reference can be set by pointing the instrument at a known zero-voltage surface, and holding down the RANGE/ZERO button for longer than 3 seconds. After 3 seconds, the display will flash and adjust to zero. Repeat this step for both the 2 kV and the 20 kV ranges. The zero adjustment should be performed every time the unit is turned on.

3.6 Measurement Accuracy

3.6.1 Distance indicator: the 718 Static Sensor is factory calibrated to give accurate measurements when it is placed one inch (2.54 cm) away from the object to be measured. To assist the user in gauging this distance, two light-emitting diodes (LED's) are present on the front face of the instrument. These LED's emit two red, bullseye targets on the surface of the object being measured.

As the instrument gets closer to the one inch measurement distance, the bullseyes begin to converge. When they converge and become one, the instrument is approximately one inch away, and the measurement can be made.

For more accurate measurements, it is recommended that the user manually measure the distance between the front housing of the instrument, and the object being measured.

3.6.2 Accuracy and Size of Object to be measured: the minimum surface area, on an electrostatically charged object, which can be accurately measured is a 5 square inch (32.3 cm^2) area.

3.6.3 Measurements from Greater than one inch (2.54 cm) Away: in the event that a one inch separation between object-to-be measured and the 718 cannot be achieved, it is possible to get approximate readings. This can be accomplished by holding the instrument at multiples of one inch (two inches, three inches, etc.) away from the object. The measurement reading is then adjusted according to the following equation:

Measurement distance (in inches) x displayed voltage (in kilovolts) = approximate voltage in kilovolts

3.7 Continuous Output: an output jack is provided on the front of the 718 static sensor. This output can be used to feed a continuous signal into a data storage device, for continuous monitoring of measured voltages. Please use a 3/32" (2.5 mm) monophone plug to connect into the output jack. The output is designed to drive a digital voltmeter with an input impedance of greater than 50 kW . The output signal is dependent on the measurement range currently selected. For the low (2 kV) range, the output signal is 1/1000 of the measured electrostatic voltage. For the high (20 kV) range, the output signal is 1/10,000 of the measured voltage.

3.8 Automatic Shut-Off: the 718 Static Sensor will automatically shut-off 20 minutes after the last switch activity. This is done in order to conserve battery power. In the event that the user needs to have the unit stay ON continuously, when turning the unit on depress the POWER AND RANGE switches simultaneously. This deactivates the Automatic Shut-Off feature. The BAT indicator will then flash three times to indicate that the automatic shut-off features has been disabled. The Automatic Shut-Off feature will reset itself the next time the instrument is turned on.

4.0 Operation and Use of the 718A Air Ionizer Test Kit

It is recommended that the user be familiar with ionizer test standards ANSI/ESD S3.1 and draft standard ESD DSP3.3 if the 718A Air Ionizer Test Kit is used to perform verification testing on ionizer performance.

4.1 Assembly: slide the charge plate over the 718 Static sensor until it stops. The charge plate slides onto the lower groove, on the sides of the 718.

4.2 Charging the plate: holding the 718 Static Sensor (with charge plate attached) in one hand, use the other hand to touch the probe of the 718A Charger to the charge plate. Press either the + button (for a positive voltage) or the – button (for a negative voltage), then remove the probe from the charge plate. Be sure

to keep the button pressed while removing the probe from the charge plate. The display on the 718 should now read 1.25 kV (for positive) or –1.25 kV (for negative), ± 5%. If it does not, verify that the low battery indicator for the charger is not lit, and that the battery does not need replacement. If the unit continues to supply an incorrect voltage to the charge plate, please contact 3M for additional instructions.

4.3 Testing ionizer discharge time: after charging the plate, hold the 718 approximately one foot (30.5 cm) away from the ionizer. Monitor the display to see how quickly the 1.25 kV charge is dissipated to 0.1 kV. The speed at which this occurs (the discharge time) indicates how well the ionizer is operating. Please refer to the specific ionizer's operating manual or consult with the ionizer manufacturer to determine what this discharge time should be. Repeat this procedure for both a positively and a negatively charge plate.

4.4 Testing ionizer offset balance: Zero the charge plate by touching it with a grounded object. This can either be the finger of a grounded person, or some other item which is connected to electrical ground. In either case, zeroing the charge plate should make the display on the 718 read zero. Hold the 718 approximately one foot (30.5 cm) in front of the ionizer. Monitor the display. The value displayed is the offset balance of the ionizer, which is the difference between the number of positive and negative ions being emitted. Please refer to the specific ionizer's operating manual or consult with the ionizer manufacturer to determine what this offset balance should be.

5.0 Service/Calibration

5.1 Service and Repair: in the event that you believe the 718 Static Sensor or the 718A Air Ionizer Test Kit is in need of repair, please contact your local 3M representative for troubleshooting help, and, as needed, repair information. There are no user-serviceable parts on either product.

5.2 Calibration: The 3M 718 and 718A products are supplied by the factory pre-calibrated. 3M does not specify a minimum calibration cycle for the 718 or 718A products. The user, usually according to internal Quality procedures, determines calibration cycles. 3M does offer calibration services on these instruments. Please contact your local 3M representative for information on this service. In the event that the user wishes to perform a self-calibration, the following steps should be followed for the 718 Static Sensor (user-calibration not possible on the 718A product).

5.3 Equipment Needed:
Test fixture
High-Voltage Power Supply, capable of supplying voltages up to 10,000 V
Voltmeter, with > 50 kΩ input impedance, capable of measuring voltages down to the μV range.
Cable with a 3/32 inch (2.5mm) mono plug and secondary connector to interface with voltmeter

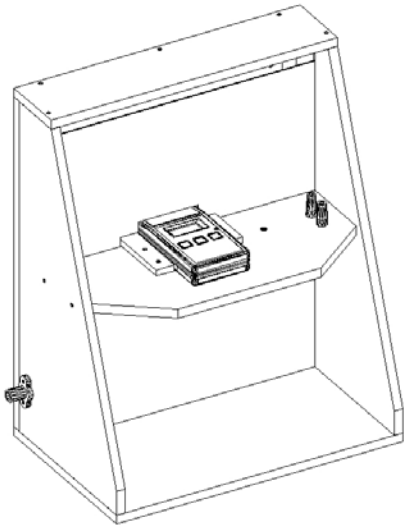
5.4 Test fixture

Metal plate of at least 5 square inches area (38.7 cm^2) area.

Metal stand capable of supporting 718, and holding it one inch (2.54 cm) away from the metal plate, centered.

Connectors on the plate, with which it can interface with the high voltage power supply.

Connections on the metal stand, with which it can be connected to electrical ground.



5.5 Procedure:

5.5.1 Place the 718 Static Sensor on the metal stand. Verify that it is exactly one inch (2.54 cm) away from the metal plate, and that its position is centered, relative to the plate.

5.5.2 Connect the stand to ground.

5.5.3 Turn the 718 on, and set it to the 2 kV range.

5.5.4 Ground the plate. Zero the display.

5.5.5 Remove the ground from the plate, and connect it to the high voltage power supply. Apply a 1 kV charge to the plate.

5.5.6 The instrument should now be reading 1.000. If it is not, remove the battery door and use a screwdriver to turn the small screw located inside the battery compartment. Use a small screwdriver to turn the small screw, located on the front right side of the instrument. This screw should adjust the reading on the display. Once the display has been adjusted to read 1.000, the low range of the 718 is now calibrated.

5.5.7 Repeat procedures 5.5.2 - 5.5.6 for the 20 kV range of the meter, using a test voltage of 5,000 volts.

6.0 Physical Characteristics (All values typical)

(at 1 inch distance from sensor to target)

3M 718 Static Sensor

Dimensions	0.85" (H) x 2.4" (W) x 4.15" (L) 2.2 cm (H) x 6.1 cm (W) x 10.5 cm (L)
Weight	4.5 oz. (128 g) with battery
Operating conditions	41º F - 95º F (5º C - 35º C) up to 80% RH, non-condensing Indoor use only For use at altitudes below 42, 300 ft. (2000 m) Pollution Degree II Class III
Enclosure	Conductive Polycarbonate
Power Requirements	One 9-volt alkaline battery
Measurement Ranges	0 – 2 kV 0 – 20 kV
Voltage Display	3 1/2 digit liquid crystal display
Display Resolution	1 V/inch (0.39 V/cm) @ low range 10 V/inch (3.9 V/cm) @ high range +/- 10 counts
Display Update Rate	3 Hz
Voltage Output Jack	3/32 in. (2.5 mm) monophone Tip: signal Sleeve: ground
Voltage Output	1/1000 of measured voltage @ low range 1/10,000 of measured voltage @ high range
Automatic Shut-off	20 minutes after last switch activity
Operating time for battery	Greater than 50 hours, with new battery, @ 21º C Continuous usage
Distance indicator	LED targets. Aligned targets indicate 1 in. (2.54 cm) measurement distance
Measurement accuracy	within 5% of measured voltage
Measurement stability	± 10 counts
Certifications	UL, C-UL, CE, CB-scheme, NOM

3M 718A Air Ionizer Test Kit

Charge Plate Assembly	Per ESD Association Draft Standard D3.3 Aluminum bracket, conductive point finish Bare stainless steel plate Teflon spacers isolate plate from bracket
Charge plate bracket dimensions	1" (H) x 3.1" (W) x 4.25" (L) 2.5 cm (H) x 7.9 cm (W) x 10.8 cm (L)
Charge plate area	3.25" (W) x 1.25" (L) 8.3 cm (W) x 3.2 cm (L)
Charge plate assembly weight	2.5 oz (70 g)
Charger Dimensions	0.85" (H) x 2.4" (W) x 5.0" (L) 2.2 cm (H) x 6.1 cm (W) x 12.7 cm (L)
Charger Weight	6 oz. (170 g) with battery
Charger Power Requirements	One 9 volt alkaline battery
Charger Output (using 718 with charge plate)	Positive: 1250 V ± 5% Negative: -1250 V ± 5%
Certifications	UL, C-UL, CE, CB-scheme, NOM

7.0 Parts Listing

718 Static Sensor
1 ea. 3M 718 Static Sensor
1 ea. 3M 718/718A Operator's Manual
1 ea. Certificate of Conformance

718A Air Ionizer Test Kit
1 ea. 718A Charge Plate Assembly
1 ea. 718A Charger
1 ea. 3M 718/718A Operator's Manual
1 ea. Certificate of Conformance

8.0 Contact Information:
Customer and Technical Service

Within the U.S. : Customer service and technical support can be obtained by calling the 3M Electronic Handling & Protection Division

Customer Service: (800) 328-1368
Technical Support: (512) 984-3200

Outside of the U.S.: For customer service and technical support, please contact your local representative of the 3M Electronic Handling & Protection Division.

Warranty — 3M expressly warrants that for a period of one (1) year 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 data.

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.

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