CHARGED PLATE ANALYZER

Model 204

Plus

CHARGED PLATE ANALYZER KIT

Model 216

Operating Manual

9/08

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1.0 INTRODUCTION

The Model 204 Charged Plate Analyzer is a fully functional charged plate monitor that combines the ETS Model 212 Static Meter with a ±1200V low current power supply, timing circuit and a removable charged plate detector. The Model 216 Portable Charged Plate Monitor Kit contains the necessary accessories that provide a convenient and economical approach to performing electrostatic measurements requiring a charged plate monitor. The Model 204 meets the requirements of ESD STM3.1-2000, *Ionization* and ESD SP3.3-2000 *Periodic Verification of Air Ionizers* and SAE 1645 plus most other specifications requiring a charged plate monitor.

The standard Model 204 has a 60 second timer, however, when used to test the dissipation time of automotive fuel system components as specified in SAE J1645 the optional 6 second timer version is required.

This manual covers both the Model 204 alone and as part of the Model 216 Kit.

Typical charged plate tests consist of measuring ionizer balance and neutralization time, static propensity of floors and footwear, triboelectric charge evaluation of material, static dissipation plus evaluation of the effectiveness of personnel grounding systems. In addition, removing the detachable charged plate detector from the Model 204 converts it to an electrostatic fieldmeter.

1.1 Model 216 Charged Plate Monitor Kit

The standard Kit consists of the following instruments and accessories:

1. Model 204 Charged Plate Analyzer
2. Plug-in 6” x 6” (152x152mm) Detector Plate
3. Model 256 Utility Wiring Verifier with electrical ground banana jack (North American Std only. Omitted in kits destined for locations using 220-240 VAC.)
4. Tripod
5. 10’ coiled ground cord with clip
6. Model 5646A Humidity/Temperature/Dew Point Indicator

The Kit is housed in a soft shell zippered case that measures 12"W x 8"D x 4"H (300x200x100mm).

2.0 EQUIPMENT DESCRIPTION

This section provides a detailed description of the Model 204 plus each of the instruments and adaptors included in the Model 216 Kit.

2.1 Model 204 Charged Plate Analyzer

The Model 204 Charged Plate Analyzer, shown in Figure 2-1, is a compact “pocket size” charged plate analyzer that measures 8”Lx2.4”Wx0.9”H (203x146x229mm) and weighs only 9 oz. (255gm). It incorporates many of the features found in CPA’s much larger in size and

cost. The unit is a combination of an electrostatic fieldmeter, ±1200 Volt charging source and a digital timer. The electrostatic detector is a non-contacting, chopper type field sensor to ensure accurate and consistent continuous measurements both in and outside ionized fields. The Model 204 displays both electrostatic voltage and decay time on a single 3½-digit LCD meter with ½" character height. The meter is "zeroed" easily with the turn of a small knob and does not need re-zeroing between measurements.

The Model 204 has a detachable charged plate detector. When the detector is installed the unit is a charged plate monitor with a range of ±2000V and a resolution of 1V.

With the detector removed the unit performs as an electrostatic fieldmeter having a range of ±20kV at 1" (25.4mm) with a resolution of 10V. Measurement accuracy is ±10% in this mode. It includes a convenient ¼" (6.4mm) ground snap, compatible with most standard wrist strap cords, to facilitate grounding and to increase accuracy.

The charging function automatically activates the timing mode. As the applied 1200 Volt charge on the detector plate decays, either by ionization or by dissipation through a resistance. The timer starts when the measured voltage drops to 1000 Volts and stops when it decays to 100 Volts. Decay times to 60 sec. in 0.3 sec. increments, or as an option, to 6 sec. in 0.3 sec. increments can be measured.

The 3½-digit LCD meter displays the voltage, polarity, or dissipation time when the decay function of the Analyzer is used.

The Model 204 operates from a single 9V alkaline battery with a typical operating life of approximately 20 hours. Low battery is indicated by all decimal points illuminated on the DPM.

Figure 2-1: Model 204 Charged Plate Analyzer

2.1.1 Charged Plate Detector

The Charged Plate Detector converts the Model 204 to a charged plate monitor having the specified 20pf (ESD S3.1) capacitance with both the 2.5”x1” (161x25mm) detector plate and the optional 6”x6” (152x152mm) standard size plate. When installed, the detector plate contacts the charging source and the sensitivity of the measurement system is increased by a factor of 10. After + or -V is applied, the system automatically converts to a timer when the voltage on the plate drops to 1000V, within the range of 0-60 seconds with 0.3 seconds resolution. It then measures the time for the charge on the plate to bleed down to 100V at which time the DPM switches over from a voltage display to a time display. If the charging source is not activated then the instrument just measures the detected voltage generated by ionizer imbalance, static propensity, or any charged object placed onto the charged plate. The 6”x6” (152x152mm) square detector plate (included in the Model 216 Kit) plugs into the Model 205C detector plate to provide full size charged plate monitor capability. The maximum current output of the charging source is limited to 1 μAmp.

2.2 Model 216 Charged Plate Monitor Kit

This section describes the other functional components included in the Model 216 Kit shown in Figure 2-2. The included tripod is used to hold the Model 204 in either a vertical or horizontal position to facilitate ionizer (horizontal) and charged plate (vertical) measurements.

Figure 2-2: Model 216 Charged Plate Monitor Kit

2.3 Model 256 Utility Wiring Verifier

This device plugs into a standard (North American) 110 VAC outlet and checks both the wiring of the outlet and provides a convenient standard banana jack output to access electrical ground. **This device is not included in kits destined for locations using 220-240 VAC.**

2.4 Model 5646A Humidity/Temperature/Dew Point Indicator

The Model 5646A enables the user to establish the humidity and temperature at the time of test as required by most specifications. The Indicator measures relative humidity over the range of 5-95% RH with an accuracy of ±3% RH and temperature over the range of 32 to 122°F (-20 to +70°C) with an accuracy of ±0.9°F (0.5°C). °F or °C can be selected and the dew point automatically calculated and displayed at the press of a button. The Model 546 operates from 3 standard 1.5V AAA batteries. Refer to Figure 2-3 for the Model 5646A Operating Instructions.

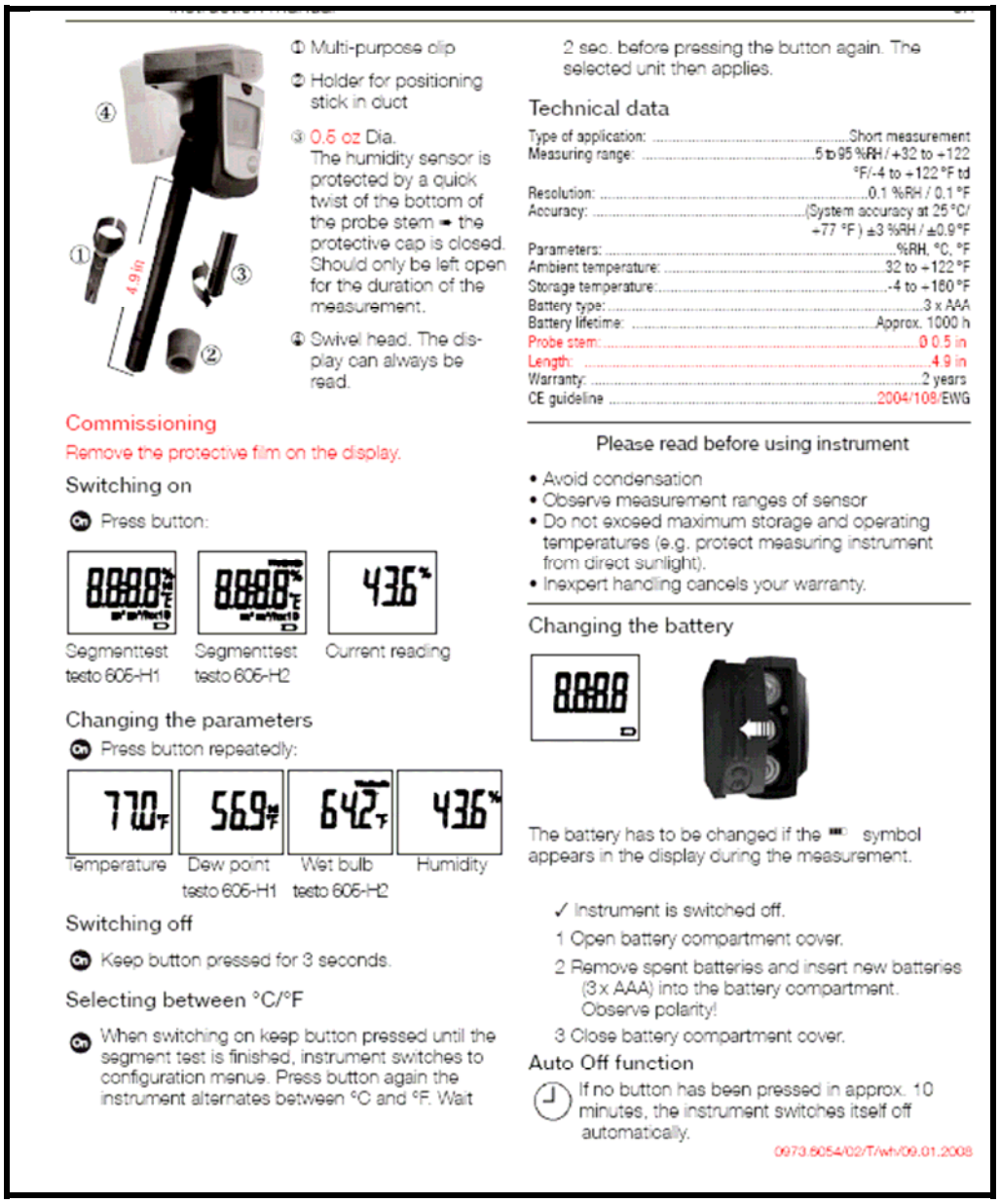

Figure 2-3: Model 5646A Operating Instructions

3.0 OPERATION

To use the Model 204 as a charged plate monitor, install the Charged Plate Detector onto the front of the unit. To measure the charge build-up on personnel or moving objects, plug a clip lead, probe or wrist strap into the detector plate. Ground the detector plate by depressing the ZERO/RESET button for approximately 1 second. Release the button. Any voltage generated will be transferred to the plate and measured directly by the static meter in Volts.

To install the 6”x6” (152x152mm) plate, plug it into the 2 banana jacks on the detector plate. Make sure the plate is seated fully so that the ends of the banana plugs fit into the holes in the lower plate.

To measure induced electrostatic fields such as ionizer imbalance, first zero the meter as above then hold it in front of the ionizer or other field being measured and monitor the meter reading.

To utilize the Model 204 as an electrostatic fieldmeter, remove the Charged Plate Detector by pulling down on the tab to unsnap it from the ground snap and then slide it forward. Turn on the POWER, depress the green ZERO/RESET push button for approximately 1 second to zero the meter. If a reading other than 000±2 is indicated, zero the meter using the ZERO control. If an offset is required adjust the ZERO control at this time. **CAUTION: When zeroing the meter make sure it is pointing away from any electrostatic fields. Covering the front of the meter with the hand will shield the input from any fields present.**

Bring the Meter towards the surface being measured. At a distance of 1" (25mm), read the magnitude and polarity. Multiply the reading on the DPM by 10 to obtain the actual voltage being measured. (The meter is permanently set to read 2000V full scale for the CPM mode.) All measurements are normally referenced to the potential of the user who may or may not be at ground. To obtain a solid ground reference, connect the Analyzer to ground using the coiled cord provided.

To return the Model 204 to the charged plate analyzer function, install the Charged Plate detector by sliding it over the front of the unit and snapping it onto the ¼" (6mm) snap located on the bottom of the instrument.

4.0 TEST PROCEDURES

The Model 216 Charged Plate Analyzer Kit is capable of performing many of the tests normally performed with laboratory grade equipment. The following describes recommended procedures for performing the most common CPM tests.

4.1 Ionizer Balance

This test is performed with either the Charged Plate detector attached or with the addition of the 6"x6" (152x152mm) detector plate. Turn on the ionizer. Hold the Analyzer approximately 12" (30cm) in front of the ionizer. Momentarily ground the detector plate by touching it with a finger or a grounded lead. Make sure the DPM reads zero. Observe the meter reading for approximately 15 seconds. The meter should read typically less than ±30 Volts or whatever maximum balance limit is specified.

4.2 Static Propensity

This test is the measurement of static charge build-up on personnel walking across a floor or performing a defined step test. It is used to evaluate flooring and footwear. However, this test procedure also applies to any activity that results in a static charge being generated.

The test set up consists of the Model 204 with the Detector attached. Connect either a wrist strap or a cable with probe. The test subject puts on the wrist strap or grasps the probe. The tripod can be used to hold the instrument.

Before starting the test, both the test subject and meter should be momentarily grounded. The voltage displayed on the meter will be the voltage generated by the test subject during the activity.

4.3 Triboelectric Charge Analysis

This test uses the Charged Plate Detector plus the 6”x6” (152x152mm) detector plate. The assembly is mounted onto the tripod with the plate in the horizontal position. Momentarily ground the detector plate. Take the material being tested and rub it with an appropriate second material. Place the test material on the detector plate. The voltage measured is a relative indication of the antistatic characteristics of the material.

The test procedure can also be used to measure the build-up of static charge on material, objects, liquids and powders in motion by connecting the appropriate probes or test leads from the object or isolated detector (for powders and liquids in a contained environment) to the detector plate.

4.4 Static Dissipation of Material and Objects

The built-in timer is activated only when the CHARGE button is depressed and then it only measures dissipation time from 1000 to 100V up to 60 seconds. For measurements that do not require the application of voltage (Triboelectrically charged material, for example), having voltage levels less than 1000V or having dissipation times greater than 60 seconds the timer cannot be used. An external timing device such as an oscilloscope or chart recorder connected to the RECORDER output or a stopwatch will be required.

If the decay time is less than 60 seconds and the sample can be conductively charged by the charging source then the internal timer can be used.

If very quick decay times are required (<1 sec.) then the optional 6-second version with 0.03 second resolution should be used.

If the decay time of the sample, after being grounded, is desired first place the charged sample on the detector plate, **then connect a ground lead to the sample, NOT TO THE PLATE.**

To measure the decay time of a sample that is either conductive or dissipative, place it on the detector plate. Charge it by depressing the CHARGE button and holding it for several seconds to ensure the sample is charged to the full voltage. Connect a ground lead to the sample. The Analyzer will measure the time for the detector plate and sample to dissipate its charge.

Another dissipation test is to charge the detector plate and then place a grounded sample on the plate and measure the time for the plate to dissipate its charge through the sample.

4.4 Charge Neutralization Time

This test measures the time for an ionizer to neutralize a charge on an object. It is also referred to as "Discharge Time". This test can be performed with either the standard detector or with the 6”x6” (152x152mm) plate.

Turn on the ionizer and allow it to run long enough to stabilize. Hold the Analyzer 12” (305mm) or other specified distance away from the front of the ionizer. Momentarily ground the detector plate then depress either the + or – CHARGE button. The red LED indicator will light and the plate will charge up to approximately 1150 Volts. Release the CHARGE button. The ionizer will immediately start to neutralize the charge on the plate. When the charge drops to 1000V the built-in timer starts and the unit will start measuring the time for the charge on the plate to bleed down to 100V. When the voltage on the plate reaches 100V the meter switches over from reading voltage to reading time as indicated by the yellow “TIME-SEC” LED. Depressing the ZERO/RESET pushbutton grounds the detector plate and resets the timer.

4.5 Static Dissipation of Personnel

This test measures the time it takes a charged person to bleed off the charge when a static control procedure is implemented such as stepping onto a conductive floor or sitting down in a conductive chair. The above test set up, without the 6”x6” (152x152mm) detector plate is used. The test subject is connected to the detector plate using a wrist strap or a probe assembly.

Momentarily ground the detector plate and test subject. Depress the CHARGE button to charge both plate and test subject. The meter should indicate a reading of approximately 1150V. The test subject must be standing on an insulated surface during charging. The test subject should then immediately step onto the surface being evaluated. The Analyzer will measure the time for the voltage on the test subject to bleed down to 100V.

4.6 Static Dissipation of Fuel system Components per SAE J1645

This test is similar to the measurement of dissipation time of material and objects described in Section 4.4. Refer to the Model 832 Clamp electrode manual for detailed set up and operating instructions to perform this test.

5.0 Calibration

The Model 204 is a complex instrument. It is recommended that it be calibrated at the factory.

However, the customer can check the voltage reading calibration by applying a known voltage, such as 500 or 1000V directly to the detector plate and compare it with the meter reading. If out of tolerance, the Charged Plate Detector Assembly can be moved slightly in to increase or out to decrease the meter reading.

6.0 MAINTENANCE

The Model 204 Charged Plate Analyzer and the respective kits contain both electronic instruments (Charged Plate Analyzer and Humidity/Temperature/Dew Point Indicator) plus mechanical fixtures (Charged Plate Detector, 6”x6” [152x152mm] Detector Plate and tripod). As with all instrumentation, care should be exercised in handling and using the equipment. If not exposed to hostile environments, the mechanical fixtures should not require any maintenance. To clean the fixture, wipe with only isopropyl alcohol using a soft lint-free cloth and let air-dry.

DO NOT USE ANY OTHER TYPE CLEANER AS THIS WILL PRODUCE A LEAKAGE PATH TO THE ISOLATED CHARGED PLATE.

When used with reasonable care, the instruments should provide many years of trouble-free service. If either electronic unit fails to operate properly, first check the battery. The sensors, both static and humidity/temperature, should never be touched by a charged object or by personnel. Also, the sensors could be permanently damaged if the instruments are dropped.

Note:

The sensor used in the Model 204 is very sensitive to shock. Dropping the unit could result in permanent damage to the sensor and will require replacement.

To clean the conductive ABS plastic case, a damp cloth should be used. Do not use any solvents as these may react with the plastic and damage the case.

The Model 5646A Humidity/Temperature/Dew Point Indicator does not contain any user serviceable parts and must be returned to the factory for service or replacement.

7.0 SPECIFICATIONS

FIELDMETER/POWER SUPPLY

Sensor: Vibrating Reed
Range: ±20 kV @ 1" (25.4mm)
Display: 3 ½-Digit LCD
Resolution: 1V (10V as a Fieldmeter)
Accuracy: ±10% (Fieldmeter)
Linearity: ±10%
HVPS: ±1200V (approx)
Timer: 0-60 sec. (0-6 sec. optional)
Accuracy: 5% of Reading
Resolution: 0.3 sec. (0.03 sec.)
Rec. Out:
2.5 mm Jack
Signal: 10 mV/kV (200mV FS)
Power: 9V Battery
Life: 20 Hrs. typical.
Bat Low: All decimal pts. Illuminated

CHARGED PLATE DETECTOR

Capacitance: 20±3pf
Detector Plate: 1"x3" (2.5x7.6cm)
Plug-in option:.6"x6" (152x152mm)
Accuracy: ±20%
Ground:
Cord: 10' (3m)
Connection: ¼" (6mm) Male Snap

MECHANICAL

Dimensions: 8"Lx2.4"Wx0.9"H (203x146x229mm)
Weight: 9 oz. (255gm)
Case: Conductive

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8.0 WARRANTY

Electro-Tech Systems, Inc. warrants its equipment, accessories and parts of its manufacture to be and remain free from defects in material and workmanship for a period of one (1) year from date of invoice and will, at the discretion of Seller, either replace or repair without charge, F.O.B. Glenside, similar equipment or a similar part to replace any equipment or part of its manufacture which, within the above stated time, is proved to have been defective at the time it was sold. All equipment claimed defective must be returned properly identified to the Seller (or presented to one of its agents for inspection). This warranty only applies to equipment operated in accordance with Seller's operating instructions.

Seller's warranty with respect to those parts of the equipment that are purchased from other manufacturers shall be subject only to that manufacturer's warranty.

The Seller's liability hereunder is expressly limited to repairing or replacing any parts of the equipment manufactured by the manufacturer and found to have been defective. The Seller shall not be liable for damage resulting or claimed to result from any cause whatsoever.

This warranty becomes null and void should the equipment, or any part thereof, be abused or modified by the customer of if used in any application other than that for which it was intended. This warranty to replace or repair is the only warranty, either expressed or implied or provided by law, and is in lieu of all other warranties and the Seller denies any other promise, guarantee, or warranty with respect to the equipment or accessories and, in particular, as to its or their suitability for the purposes of the buyer or its or their performance, either quantitatively or qualitatively or as to the products which it may produce and the buyer is expected to expressly waive rights to any warranty other than that stated herein.

ETS must be notified before any equipment is returned for repair. ETS will issue an RMA (Return Material Authorization) number for return of equipment.

Equipment should be shipped prepaid and insured in the original packaging. If the original packaging is not available, the equipment must be packed in a sufficiently large box (or boxes if applicable) of double wall construction with substantial packing around all sides. The RMA number, description of the problem along with the contact name and telephone number must be included in formal paperwork and enclosed with the instrument. Round trip freight and related charges are the owner’s responsibility.