TECHNICAL MANUAL

Sentinel II Benchtop Ionizer Installation, Operation and Maintenance

Made in the United States of America

Figure 1. Static Clean Sentinel II Benchtop Ionizer

Description

The Static Clean Sentinel II Benchtop Ionizer is a compact and lightweight steady state DC auto-balancing benchtop worksurface ionizer with integrated closed-loop feedback. The unit is normally placed at one end of the workbench or area to be neutralized. It may also be mounted to a wall or shelf. The Ionizer's neutralization discharge time will be best approximately 12" to 48" directly in front of the unit and will increase as the distance from the unit increases.

The Static Clean Sentinel II Benchtop Ionizer employs Steady State DC technology. Steady State DC systems consist of separate negative and positive ion emitters connected by a pair of high-voltage cables to their respective high-voltage power supplies. The spacing between emitters varies depending on the design, and DC power is constantly applied to the emitter points. The ionizer uses feedback from the internal sensor grill to continuously adjust the output to maintain balance.

Ionizers are useful in limiting electrostatic charge generation, ElectroStatic Discharge, ElectroStatic Attraction, as well as preventing equipment latch-up. Per ANSI/ESD S20.20 section 6.2.3.1. Protected Areas Requirement states: "Ionization or other charge mitigating techniques shall be used at the workstation to neutralize electrostatic fields on all process essential insulators if the electrostatic field is considered a threat." "Air ionization can neutralize the static charge on insulated and isolated objects by producing separate charges in the molecules of the gases of the surrounding air. When an electrostatic charge is present on objects in the work environment, it will be neutralized by attracting opposite polarity charges from the ionized air. Note that ionization systems should not be used as a primary means of charge control on conductors or people." (Reference: EN 61340-5-2:1 clause 5.2.9)

"The primary method of static charge control is direct connection to ground for conductors, static dissipative materials, and personnel. A complete static control program must also deal with isolated conductors that cannot be grounded, insulating materials (e.g., most common plastics), and moving personnel who cannot use wrist or heel straps or ESD control flooring and footwear.

Air ionization is not a replacement for grounding methods. It is one component of a complete static control program. Ionizers are used when it is not possible to properly ground everything and as backup to other static control methods. In clean rooms, air ionization may be one of the few methods of static control available." (ESD Handbook ESD TR20.20 Ionization, section 5.3.6.1 Introduction and Purpose / General Information)

Ionizer Selection

ANSI/ESD S20.20 section 6.1.1.2. ESD Control Program Plan Guidance states: "The Plan should include a listing of the specific type of ESD protective materials and equipment used in the Program." When selecting an ionizer, life cycle costs should be considered, including:

- equipment cost
- installation cost
- operation and maintenance cost

Static Clean ionizers meet the ANSI/ESD S20.20 required limits of less than ± 35 volts offset voltage balance tested in accordance with ANSI/ ESD STM3.1. All Static Clean benchtop ionizers greatly exceed the requirement providing ±5 to ±25 volt auto-balancing.

The High Output Benchtop Ionizer is available in two models:

Part #	Input Voltage
BLSNTLBTI-II	115 VAC
BLSNTLBTI-II-230	230 VAC

Packaging

1 High Output Benchtop Ionizer
1 Power Cord, North America
1 Emitter Point Cleaner Pack
1 Certificate of Calibration

Features and Components

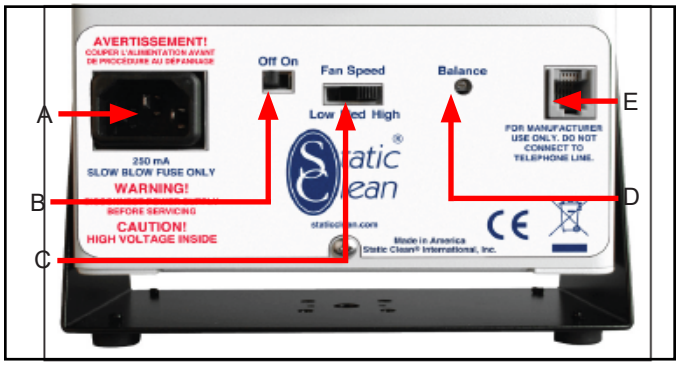

Figure 2. Sentinel II Benchtop Ionizer features and components

A. Power Cord Connection: Connect the power cord here.

B. Power Switch: Toggle the switch to the left to turn the ionizer OFF. Toggle the switch to the right to turn the ionizer ON.

C. Fan Speed Switch: Toggle the switch to the left to set the fan speed to Low. Toggle the switch to the middle to set the fan speed to Medium. Toggle the switch to the right to set the fan speed to High.

D. Balance Adjustment: Turn the potentiometer clockwise for positive adjustment. Turn the potentiometer counter-clockwise for negative adjustment.

E. RS-485 IN: For manufacturer use only.

Installation

Place the unit at a desired location where that the airflow will not be restricted. Be sure that the ON/OFF switch located on the rear of the unit is in the OFF position. Plug the power cord into the unit and then into the appropriate AC power source.

Operation

1. Set the fan speed switch on the rear of the unit to the Low, Medium, or High position (see Figure 2). Higher airflow will result in faster neutralization rates.
2. Position the ionizer so that maximum airflow is directed towards the items or area to be neutralized.
3. Turn the unit ON. When the unit is first turned on, it conducts a self-test. The audible alarm will sound and the LED will cycle through the colors red, yellow, and green. The LED will remain green during normal operation.

Maintenance

"All ionization devices will require periodic maintenance for proper operation. Maintenance intervals for ionizers vary widely depending on the type of ionization equipment and use environment. Critical clean room uses will generally require more frequent attention. It is important to set-up a routine schedule for ionizer service. Routine service is typically required to meet quality audit requirements." (ESD Handbook TR20.20 section 5.3.6.7 Maintenance / Cleaning)

EIA-625, recommends checking ionizers every 6 months, but this may not be suitable for many programs particularly since an out-of-balance may exist for months before it is checked again. ANSI/ESD S20.20 section 6.1.3.1 Compliance Verification Plan Requirement states: "Test equipment shall be selected to make measurements of appropriate properties of the technical requirements that are incorporated into the ESD program plan."

CLEANING THE EMITTER POINTS

The maintenance interval of the High Output Benchtop Ionizer is extended with the use of its auto-balancing closed-loop feedback technology. The ionizer will detect any shifts in the offset voltage (balance) and adjust its output to compensate for the change. This shift in offset voltage (balance) is often caused by particle build-up on the ionizer's emitter points. To maintain optimum neutralization efficiency and operation, cleaning should be performed on a regular basis.

Use the included Emitter Point Cleaners or a swab dampened with Isopropyl alcohol to clean the ionizer's emitter points.

1. Turn the unit OFF and unplug the power cord.
2. Open the rear screen by loosening the screw and swinging the grill to one side.
3. Clean the emitter points using the included Emitter Point Cleaners or a swab dampened with Isopropyl alcohol.
4. Reattach the rear screen.
5. Plug in the power cord and turn the unit ON.
6. Verify the performance of the ionizer by using a charged plate monitor, or ionization test kit.

The emitter points should not require replacement during the life of the unit with normal handling. If necessary, item BC81EMTSS316K Replacement Emitter Points are available for order.

Adjustments and Compliance Verification

BALANCE OFFSET VOLTAGE ADJUSTMENT

The High Output Benchtop Ionizer is an auto-balancing unit. However, tuning or manual adjustment can be accomplished by inserting a small screwdriver or trimmer adjustment tool into the balance adjustment hole located at the rear of the unit (see Figure 2). To increase the output in a positive direction, turn the potentiometer clockwise. To increase the output in a negative direction, turn the potentiometer counter-clockwise.

MAINTENANCE / ALARMS

In the event of circuit failure, the unit will enter shutdown mode.

When the unit enters shutdown mode, ionization will be stopped, the LED on the front of the unit will illuminate a constant red, and the audible alarm will continuously sound. The user must then reset the unit by turning it OFF and back ON.

WARNING - RISK OF ELECTRIC SHOCK

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. DO NOT PERFORM ANY SERVICING OF INTERNAL PARTS UNLESS YOU ARE QUALIFIED TO DO SO.

NOTE: The AC power cord MUST always be disconnected before the unit is disassembled.

The input voltage may be verified or reset by removing the 3 screws located on the back of the unit then removing the back case.

The input voltage can be selected using the two internal jumpers shown in Figures 3 and 4.

If the supply voltage drops from 110 Volts to below 85 Volts or from 200 Volts to below 170 Volts, the unit will shut down, the audible alarm will beep and the LED will blink red. The unit will automatically reset when the minimum voltage is restored.

Compliance Verification should be per ESD TR53. Offset voltage (balance) and both polarity's discharge time should be checked on every ionizer periodically using an Ionization Test Kit or a Charged Plate Analyzer. Measure offset voltage (balance) and both polarity's discharge times. Clean the emitter points (with electrical power off), adjust offset voltage (balance) to zero and then re-test for offset voltage (balance) and discharge times recording the measurements.

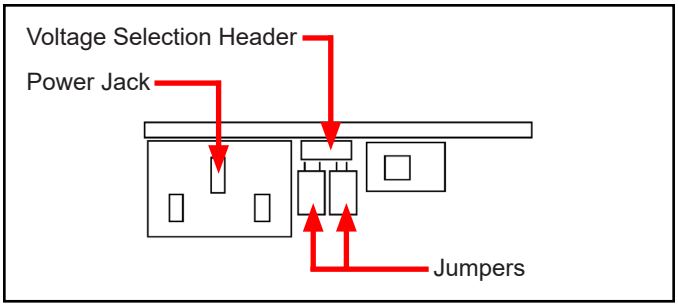

Figure 3. 110V jumper setting

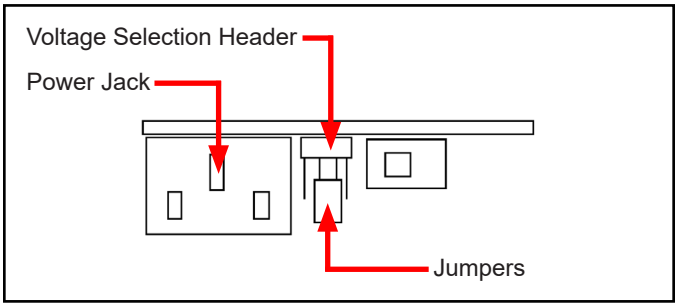

Figure 4. 220V jumper setting

Neutralization (Discharge) Times

All data was taken with the fan speed set to high. All time measurements are in seconds.
NOTE: Discharge times in seconds are representative only and are not a guarantee. Discharge times are actual measurements recorded in a factory ambient environment.

Per ANSI/ESD S20.20, the test method for Product Qualification test is ANSI/ESD STM3.1, and for Compliance Verification is ESD TR53 which advises “Measurements should be made at the location where ESD sensitive items are to be ionized.” A larger area may require additional ionizers. Per S20.20 the required limit for ionizer discharge time is user defined. Use Table to determine the number of ionizers to achieve ionization of area to be neutralized to meet your company’s ESD control plan specified discharge times.

The comparative efficiency of bench top ionizers is determined by a standard test published by the ESD Association: ANSI/ESD STM 3.1. Typical positive and negative decay times (1000V - 100V) measured using this standard are shown in the figures below. The performance of the ionizer was measured with the unit positioned as shown, with the fan speed on high and without a filter.

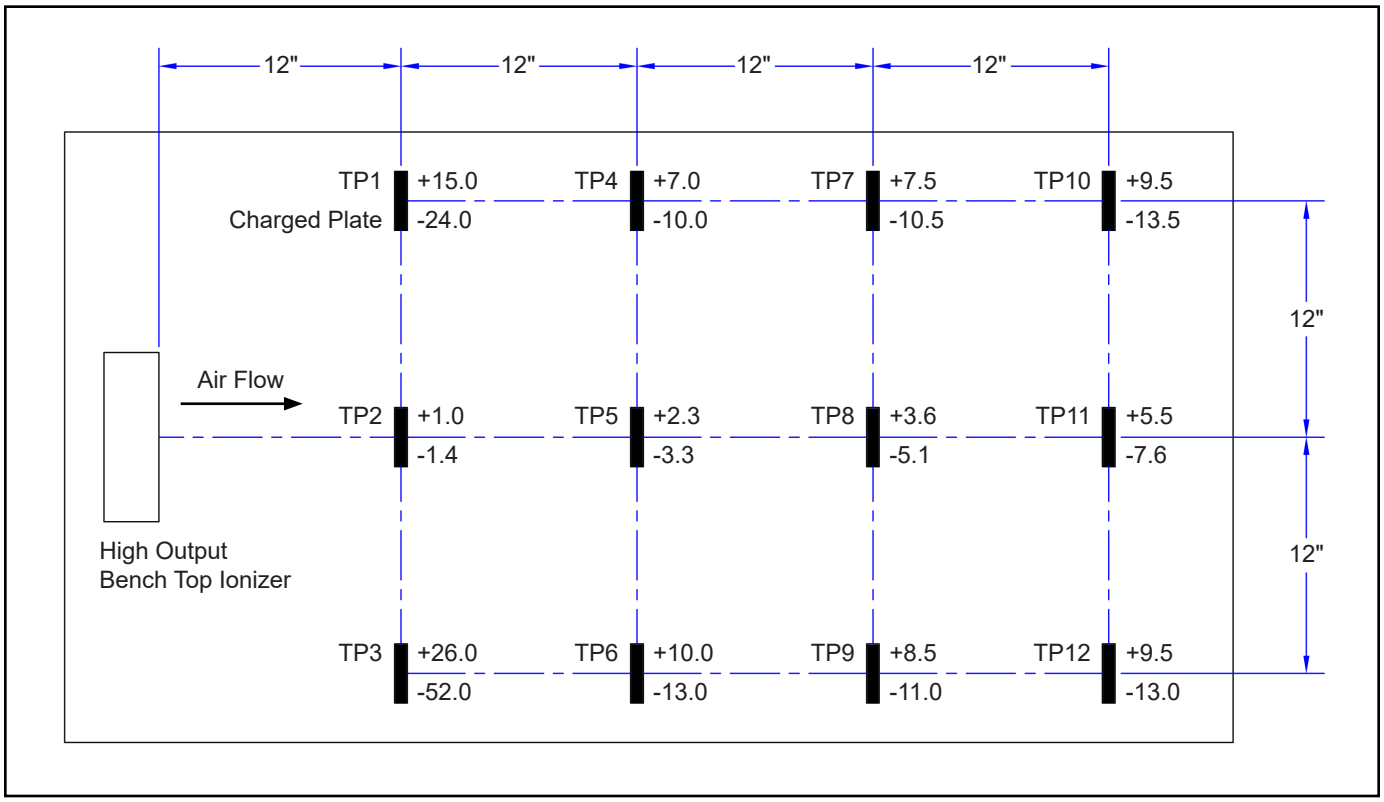

Figure 5. Neutralization (Discharge) Times at 120VAC / 220VAC, 60Hz input

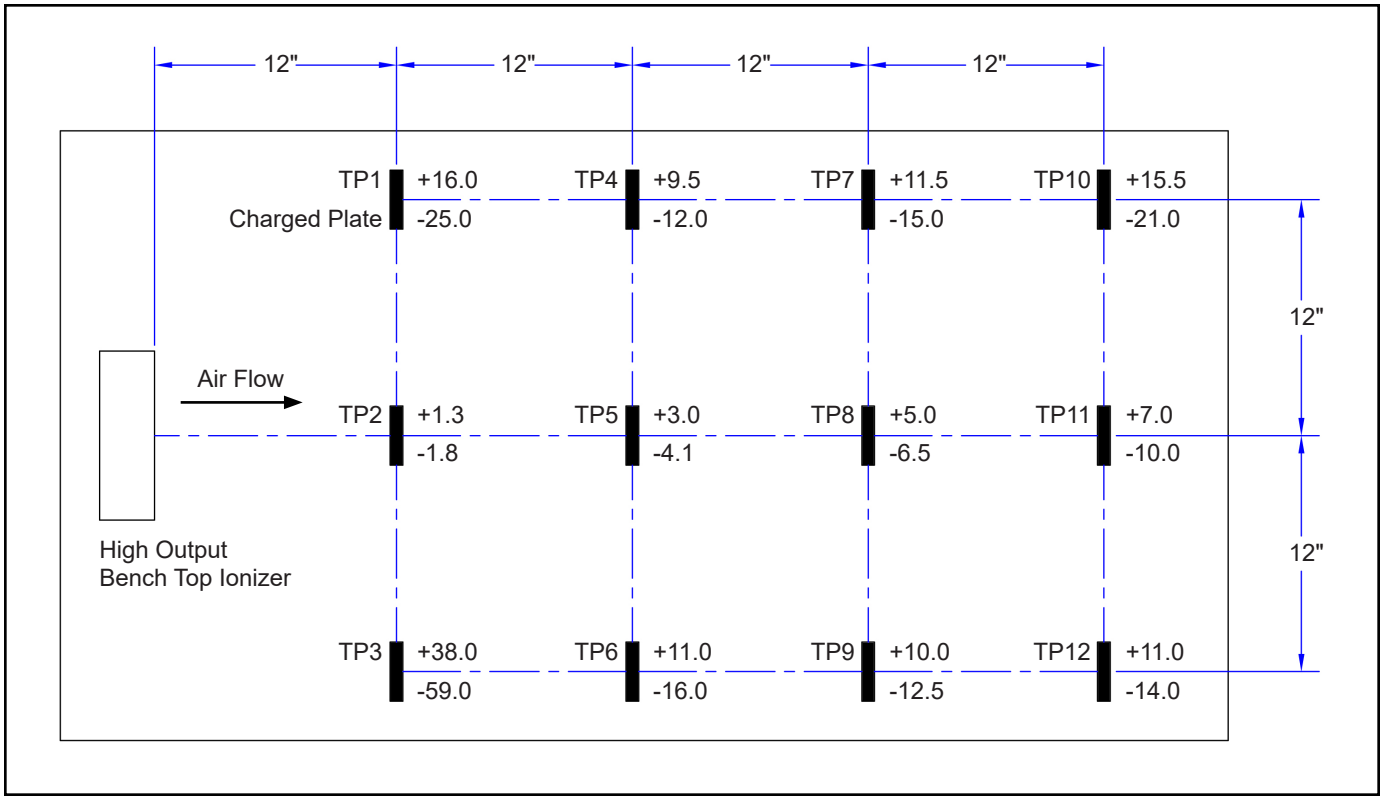

Figure 6. Neutralization (Discharge) Times at 100VAC, 50Hz input

Calibration

On a regular interval, most users will clean emitter pins and calibrate the ionizer. Per ESD TR 53 section 5.3.6.7.1 "The best practice is to measure the offset voltage and discharge times, clean the unit, including emitter points and air filters if present, offset voltage to zero (if adjustable), and then repeat offset voltage and discharge time testing. If the unit does not meet offset voltage specifications or minimum established discharge time limits, further service is indicated. Manufacturers should provide details on service procedures and typical service intervals."

Most companies will assign a number or otherwise identify each ionizer and setup a compliance Verification / Maintenance / Calibration schedule. If the ionizers all test good, the data can justify lengthening the calibration period. If ionizers require adjustment, the calibration period should be shortened. Although ESD TR53 does not advise a test frequency, JESDD625-A (Revision of EIA-625) recommends ionizers be tested semiannually, noting to use "S3.1 except the number of measurement points and locations may be selected based on the application."

NOTE: A charged plate analyzer or monitor should be used in order to properly calibrate the Static Clean High Output Benchtop Ionizer. Static Clean offers the D-50571 Charged Plate Analyzer.

1. Properly setup the ionizer as described in the installation procedure.
2. Turn the unit ON and set the fan speed to High.
3. Position the charged plate analyzer 12 inches directly in front of the ionizer.
4. The balance (offset voltage) should be within 0 and ±2 volts. To increase the output in a positive direction, turn the Balance potentiometer in a clockwise direction. To increase the output in a negative direction, turn the Balance potentiometer in a counter-clockwise direction.
5. Test the neutralization (discharge) time by applying a ±1,000 volt charge on the charged plate analyzer. The neutralization (discharge) time should be less than 2 seconds. See figures 5 and 6 for typical discharge times. The required limit per ANSI/ESD S20.20 is "user defined".
6. Test the ionizer's alarm by shorting its two fan grills located on the front (see Figure 7). The alarm should sound, and the STATUS LED should illuminate red.

Figure 7. Shorting the ionizer's fan grill with a metal probe to test the alarm

Specifications

The comparative efficiency of benchtop ionizers is determined by a standard test published by the ESD Association: ANSI/ESD STM 3.1. Typical positive and negative discharge times (1000V - 100V) measured using this standard are shown in Figures 5 and 6. The performance of the ionizer was measured with the unit positioned as shown, with the fan speed on high and without a filter.

Input Voltage and Frequency	Internally selectable for 100-120 VAC, 50/60 Hz or 220-230 VAC, 50/60 Hz
Power Consumption	12 W
Dimensions (including stand)	9.5" H x 6.0" W x 3.1" D (241 mm x 152 mm x 79 mm)
Weight	4.5 lbs (2.0 kg)
Balance (Offset Voltage) at 12"	±3 V typical ±25 V maximum
Neutralization (Discharge) Time at 12"	< 2 seconds
Airflow	Three-speed fan 50-100 CFM
Emitter Points	.050" diameter tungsten
Ion Emission	Steady-state DC with sense feedback
Fuse	250 mA slow blow
High Voltage Power Supply	5.5 kVDC nominal
Ozone	<0.05 ppm
Enclosure	Powder coated aluminum
Country of Origin	United States of America