



INSTRUCTION MANUAL

**ELECTROSTATIC DISCHARGE SIMULATOR
MODEL ESS-2000AX**

NOISE LABORATORY CO., LTD.

Edition 1.02
AEC00231-00E-0C

NOTICE

- The contents of this booklet are subject to change without prior notice.
- No part of this booklet may be reproduced or transferred, in any form, for any purpose, without the permission of Noise Laboratory Co., Ltd.
- The contents of this booklet have been thoroughly checked. However, if a doubtful point, an error in writing or a missing is found, please contact us.
- Noise Laboratory Co., Ltd. shall have no liability for any trouble resulting from the misuse or improper handling of this product regardless of the contents of this booklet or arising from the repair or remodeling of this product by a third party other than Noise Laboratory Co., Ltd. or its authorized person.
- Noise Laboratory Co., Ltd. shall have no liability for any trouble resulting from the remodeling or modification of this product.
- In no event shall Noise Laboratory Co., Ltd. be liable for any results arising from the use of this product.
- Trademarks, company names, and similar that appear in this document are trademarks or registered trademarks of their respective companies. This document does not use the TM and ® symbols.

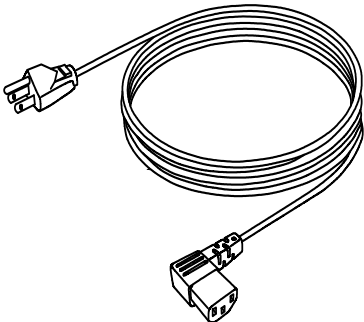
1. CHECK PACKAGE CONTENTS

Before using the instrument, please check that none of the associated items are missing.

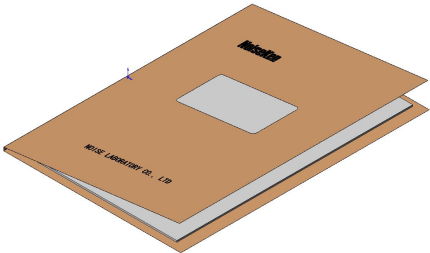
A



B



C



Item	Quantity
A: Main unit	1
B: AC power cable	1
C: Instruction Manual (this document)	1

2. IMPORTANT SAFETY PRECAUTIONS

The "Important Safety Precautions" explain rules that must be followed to prevent any risk of harm or injury to the user of the instrument or to other people.

- **The instrument may only be used by trained EMC technicians (electrical technicians)**

There is a risk of death or serious injury, and of the emission of electromagnetic noise that exceeds the stipulated limits. Please use the instrument in conjunction with appropriate measures for dealing with electromagnetic noise such as a Faraday cage or shielded room.

- **Do not use the instrument for any purposes other than the EMC testing purposes described in this instruction manual**

Failure to follow this rule risks death or serious injury.

- **The instrument may not be used by people fitted with electronic medical devices such as pacemakers and such people may not enter the testing site while the instrument is operating**

Failure to follow this rule risks death or serious injury.

- **The instrument may not be used in a location where fire is prohibited or there is a risk of explosion**

Failure to follow this rule risks igniting a fire due to an electrical discharge.

- **Use an AC power cable that is certified for use under the safety rules of the country in which the instrument is being used.**

Failure to follow this rule risks fire or electric shock. The supplied AC power cable is intended for Japan and North America. If the instrument is used in a country other than these, use a cable that is certified for use under the safety rules of that country.

Before setting up the test site, connecting the equipment, or starting testing, please read the Chapter entitled "Basic Safety Precautions for the Safe Use of the Simulator" which contains additional safety advice.

3. APPLICATION FORM FOR INSTRUCTION MANUAL

To: Noise Laboratory Co., Ltd. via sales agent

We place an order for an instruction manual.

Model Name

Serial No.

Applicant Address _____

Cut
Line

Company Name _____
Department _____
Contact Person _____
Phone No. _____
FAX No. _____

Cut off this page "**PURCHASE ORDER FOR INSTRUCTION MANUAL**" from this volume and **keep it for future use with care.**

When an INSTRUCTION MANUAL is required, fill in the above Application Form and mail or fax it to your nearest sales agent of Noise Laboratory or Noise Laboratory.

Cut
Line

The address, company name, individual's name, and other personal information (henceforth referred to as "personal information") entered in the application form will only be used for the purpose of sending the Instruction Manual and will not be shown or passed to any third party without a valid reason. Noise Laboratory Co., Ltd. will manage customer's personal information in an appropriate manner.

4. TABLE OF CONTENTS

1. CHECK PACKAGE CONTENTS	1
2. IMPORTANT SAFETY PRECAUTIONS	2
3. APPLICATION FORM FOR INSTRUCTION MANUAL	3
4. TABLE OF CONTENTS	5
5. PREFACE	7
6. BASIC SAFETY PRECAUTIONS FOR THE SAFE USE OF THE SIMULATOR	8
6-1. Meaning of Safety Symbols	8
6-2. DANGER Alerts	10
6-3. WARNING Alerts	10
6-4. CAUTION Alerts	12
7. POINTS TO NOTE REGARDING CONSUMABLES ITEMS	14
8. NAME AND FUNCTION OF EACH PART	16
8-1. Main Unit (Front Panel)	16
8-2. Main Unit (Rear Panel)	17
8-3. Discharge Gun	18
8-4. Operation Panel	19
9. RADIATION LEVEL MODE FUNCTION	21
9-1. Points to Note When Using the Radiation Level Mode Function	21
9-2. Differences Between Normal Mode (NORMAL) and Extra Mode (EXTRA)	21
9-3. How to Use the Radiation Level Modes	22
9-4. How to Select Extra Mode (EXTRA)	23
10. CONNECTIONS	24
10-1. Connecting the Discharge Gun	24
10-2. Connecting the AC Power Cable	25
11. OPERATION	27
11-1. Turning the Power On or Off	27
11-2. Menu Screen	27
11-3. IEC Standard Test Mode	29
11-4. Manual Test Mode	32
11-5. Sequence Mode	37
11-6. Utility Mode	41
12. BACKGROUND KNOWLEDGE ABOUT ELECTROSTATIC TESTING	44
13. AUXILIARY INTERFACE	46
13-1. AUX Connector	46
13-2. Optical Communication Connector	47
14. ERROR DISPLAY	48

15. SPECIFICATIONS	49
16. WARRANTY	50
17. MAINTENANCE	52
18. CONTACTING TECHNICAL SUPPORT	53

5. PREFACE

We thank you very much for your purchase of the Computer-controlled Electrostatic Discharge Simulator Model: ESS-2000AX.

It is recommended that the contents of this manual be thoroughly understood and used as a ready reference for operation.

- This Instruction Manual was prepared so that any person who can observe the prescribed instruction method and operating precautions may safely handle and fully utilize this computer-controlled electrostatic simulator (Model ESS-2000AX).
- Keep this Instruction Manual by your side or other proper location so that it may be readily available when using the ESS-2000AX.

The ESS-2000AX is an electrostatic simulator for performing electrostatic discharge immunity test in accordance with the IEC 61000-4-2 and ISO 10605 standards.

Electrostatic testing is performed by connecting an electrostatic discharge gun (TC-815R or TC-815ISO) which is sold separately.

Notice

The fonts, layout, and similar in the screens shown in this manual may differ from the actual screens and parts of actual screens may be omitted. Also, some screens have been changed to make them clearer to understand in the printed manual.

6. BASIC SAFETY PRECAUTIONS FOR THE SAFE USE OF THE SIMULATOR

- The "Basic Safety Precautions" explain rules that must be followed to prevent damage to property or injury to the user of the instrument or to other people.
- The symbols below are used to indicate the level of injury or damage that may result if the instrument is used in a way that ignores these precautions. Please take careful note of the meanings of these symbols before proceeding to read this manual.

6-1. Meaning of Safety Symbols






- ◆ The following symbols indicate the level of injury or damage that may result if the instrument is used incorrectly in a way that ignores the associated precautions.

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> DANGER</div> This symbol indicates that failure to comply with the associated precaution "is highly likely to result in the risk of death or serious injury".
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> WARNING</div> This symbol indicates that failure to comply with the associated precaution "may result in death or serious injury".
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> CAUTION</div> This symbol indicates that failure to comply with the associated precaution "may result in damage but that only physical damage is likely to occur".

- ◆ The following symbols indicate the nature of the associated precaution.

	Indicates a warning (a situation where caution is required).		
	Indicates a prohibition (an action that is not allowed to occur).	Prohibited	Disassembly Prohibited
	Indicates an instruction (an action that must always be taken).	Safety Rule	Always earth correctly
			Unplug from Mains Power

- ◆ The following symbols indicate the nature of the associated warnings or cautions that relate to the use of the instrument.

	Indicates a risk of electric shock.
	Indicates that caution is required and that you should refer to the instruction manual.
	Indicates a warning, a risk of electric shock, that caution is required, and that you should refer to the instruction manual.
 <p>WARNING</p> <p>WARNING TO REDUCE THE RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.</p>	<p>Indicates a warning, a risk of electric shock, that caution is required, and that you should refer to the instruction manual.</p> <p>Warning text Do not remove the cover because of the risk of electric shock.</p>
<p>NOISE LABORATORY CO.,LTD. IS EXCLUDED ALL THE LIABILITY OF ANY FORMS OF DAMAGE, OF EQUIPMENT OR HUMANS, CAUSED BY USER'S MISHANDLING DURING OPERATION.</p>	Warning relating to the use of the instrument Noise Laboratory Co., Ltd. accepts no liability for damage resulting from misuse of the instrument.
	Indicates that you should read the instruction manual.

6-2. DANGER Alerts



Disassembly
Prohibited

- **Do not disassemble or modify
Do not remove the cover**

Failure to comply with the precaution may result in death or serious injury and possible consequences include fire and electric shock.

For inspection or repair of internal components, please contact your sales agent or the Noise Laboratory repair and calibration center.

6-3. WARNING Alerts



Unplug from Mains Power

- **Stop using the instrument immediately if any of the following problems occur**
 - Unit emits smoke and an unusual smell
 - Water or other foreign material has got inside the unit
 - Unit is dropped or damaged
 - AC power cable is damaged (possibly exposing or disconnecting the wires, etc.)

Continuing to use the instrument in a faulty condition risks causing fire, electric shock, or similar.

Disconnect from the power supply immediately and unplug the AC plug from the socket.

After confirming that no more smoke is being emitted, send the instrument to your sales agent or the Noise Laboratory repair and calibration center for repair. Repairing the instrument yourself is dangerous and should never be attempted.



Safety Rule

- **Turn the power switch to "Off" on the instrument before connecting or changing any of the cables**

Failure to comply with this rule may result in electric shock or misoperation.



Safety Rule

- **Only use the instrument with a power supply voltage and frequency that is within the indicated range (AC 100V to 240V, 50Hz/60Hz)**
Using the instrument with a power supply voltage or frequency outside the indicated range may result in fire or electric shock.
- **Firmly insert the AC power cable plug into the socket**
Failing to fully insert the plug may result in heating or the build-up of dust leading to fire, electric shock, or similar.
Plugging too many cables into the same power outlet may also cause cables to overheat leading to fire, electric shock, or similar.



Always earth correctly

- **Plug the AC power cable into a socket that has a protective earth terminal**
The AC power cable provided with the instrument has a three-pin plug that connects to the power supply and protective earth terminal.
The protective earth on the three-pin plug connects via the AC power cable to the metal parts on the instrument.
Because this provides protection from electric shock, ensure that you plug the power supply cable into a socket that has a properly earthed protective earth terminal.
Using the instrument without a protective earth connection may result in electric shock.



Prohibited

- **Do not insert objects into the instrument or its connectors**
Inserting metallic or flammable items into the ventilation slits, connectors, or other openings may result in fire, electric shock, or similar.
- **Do not touch the tip of the discharge gun while the instrument is operating**
Failure to comply with this rule may result in electric shock or injury.
- **Do not aim at a person during testing**
This is very dangerous and may result in unexpected injury so should never be attempted.
- **Do not install in a location that obstructs access to the power supply, STOP, and other switches**
Failure to comply with this rule may prevent you from reacting quickly when a problem occurs and may result in fire or electric shock.
- **Do not use the AC power cable for any purpose other than this instrument**
The supplied AC power cable is only intended for use with this instrument. Do not use it for any purpose than this instrument. Use on any other electrical equipment risks overheating leading to fire, electric shock, or similar. Similarly, using an AC power cable from another electrical device may prevent the instrument from operating at its intended level of performance and may result in overheating if the current carrying capacity of the cable is insufficient, leading to fire, electric shock, or similar.

- **Do not damage the AC power cable**

Damage to the AC power cable may result in fire, electric shock, or similar. Take particular care in relation to the following precautions.

- Do not manipulate the AC power cable
- Do not bend the AC power cable excessively
- Do not twist the AC power cable
- Do not pull the AC power cable
- Do not locate the AC power cable close to a heater
- Do not place heavy objects on the AC power cable

6-4. CAUTION Alerts



Safety Rule

- **If condensation appears after the instrument is moved from a cold to a warm location, allow to dry naturally before using**

Using the instrument while condensation is present may result in electric shock, faults, or fire.
- **Clean the AC plug periodically**

Allowing dust or dirt to accumulate between the AC plug and socket and absorb moisture may reduce the electrical insulation and result in fire. Periodically unplug the AC plug from the mains socket and clean off any dirt or dust using a dry cloth.
- **Clean the high-voltage input and output connectors periodically**

Allowing dust or dirt to accumulate between the high-voltage input connector and high-voltage output connector and absorb moisture may reduce the electrical insulation and result in fire.

Periodically unplug the AC plug from the mains socket, wait for five or more seconds, then unplug the high-voltage input connector from the high-voltage output connector and blow dehumidified air into the high-voltage output connector to clean out any dust or dirt.

Also clean off any dirt or dust on the high-voltage input connector using a dry cloth.
- **If the instrument becomes dirty, clean with a dry cloth**

Never use benzene, thinner or other solvents as these may degrade the exterior surface or printed text.

If the exterior, operation panel, or other parts of the instrument become dirty, wipe with a dry soft cloth. If the dirt is difficult to remove, moisten the cloth with water or apply a small quantity of a neutral detergent to the cloth. Wipe dry after using these to clean the instrument.
- **Ensure that the safety warning labels are always visible**

If the safety warning labels become dirty or start to peel off, please reattach them for safety.

If the labels are lost, please contact your sales agent or the Noise Laboratory repair and calibration center for replacements.



Prohibited

- **Do not use the instrument with other than a recommended discharge gun**
Using the instrument with other than a recommended discharge gun may result in poor operation and abnormal test results.
- **Do not apply static electricity to the instrument itself**
Failure to comply with this rule may cause the instrument to become faulty.
- **Do not install the instrument in any of the following locations**
Installing the instrument in any of the following locations may result in fire, electric shock, and similar.
 - Humid or dusty environments
 - Locations where the instrument is likely to become hot such as close to a heater or exposed to direct sunlight
 - Locations where the instrument is likely to get wet such as next to a window
- **Do not block the ventilation slits or use in a location with poor ventilation**
Do not block the ventilation slits on the instrument. Blocking the ventilation slits causes heat to build up inside the unit which may lead to fire. Take particular note of the following precautions.
 - Do not lie the unit face up, on its side, or upside down
 - Do not position in cramped locations with poor ventilation
 - Allow a gap of at least 10cm from walls and similar when installing
- **Do not unplug the high-voltage input connector by pulling on the cable**
Failure to comply with this rule may damage the cable, resulting in faults or fire. Hold by the high-voltage connector when unplugging.
- **Do not operate the instrument or insert or remove the AC plug or high-voltage input connector if you have wet hands**
Failure to comply with this rule may result in electric shock or faults.
- **Do not place water-filled containers on the instrument**
If the water is spilt and gets inside the instrument it may result in fire or electric shock.
- **Do not drop or subject to strong physical shocks**
Failure to comply with this rule may result in faults.
- **Do not knock or scratch with hard objects**
Such actions may damage the exterior coating or LCD panel.

* If this instrument becomes faulty during normal use, it will be repaired in accordance with the terms of the warranty. However, please note that Noise Laboratory Co., Ltd. and its sales agents accept no liability for any compensation for losses or similar, or damage to the EUT (Equipment Under Test) or other peripheral equipment, caused by faults in the instrument, deterioration of consumables, or other external causes.

7. POINTS TO NOTE REGARDING CONSUMABLES ITEMS

● Secondary Battery for Memory Backup

- The instrument contains a secondary battery used to maintain memory data while the power is turned off.
- The secondary battery is a consumable item. The secondary battery deteriorates with repeated charging and discharging and the charging capacity steadily falls with normal use.
- If the memory backup fails to function even when the battery is charged, the cause may be deterioration of the secondary battery. In this case, please contact your sales agent or the Noise Laboratory repair and calibration center to arrange replacement. Do not attempt to repair the instrument yourself as this is very dangerous.
- The secondary battery may go flat resulting in loss of memory backup if the instrument remains unused for two months or more. If the memory backup fails to function, the stored settings and display settings when the power is turned on revert to their defaults.
- If you want to maintain a memory backup over a long period, please leave the power to the instrument turned on for approximately 24 hours once every two months. (The actual recharging time may vary depending on the operation conditions and environment.)
 - * Please note that Noise Laboratory Co. Ltd. accepts no liability for loss of backup data due to battery wear, fault, misoperation, or other reason.
Please make a note of important settings information beforehand.

● High-Voltage Relay

- The main unit and discharge gun contain high-voltage relays.
- The high-voltage relays are consumable items. The electrical contacts in the high-voltage relays deteriorate with use and this can result in poor electrical connections, contact welding, or insulation failure occurring during normal use.
- If you experience problems such as being unable to apply a static discharge after starting a test or a static discharge occurs as soon as a high voltage is output, the cause may be deterioration of a high-voltage relay. In this case, please contact your sales agent or the Noise Laboratory repair and calibration center. Do not attempt to repair the instrument yourself as this is very dangerous.

- **LCD Display**

- The instrument contains a CFL (cathode fluorescent lamp) backlit LCD display.
- The CFL is a consumable item. The amount of light produced will reduce with normal use, although the rate of deterioration may vary depending on the operating conditions and environment.
- If the display becomes dark and difficult to view, the cause may be deterioration of the CFL. In this case, please contact your sales agent or the Noise Laboratory repair and calibration center to arrange replacement. Do not attempt to repair the instrument yourself as this is very dangerous.

- **Fuse**

- The instrument contains fuses.
- A fuse holder is located in the AC inlet on the rear panel (See Chapter 8-2) and the fuse can be replaced by the user.
Please replace with a fuse of the following type.
Rated voltage 250V/Rated current 2A Slow-blow fuse
Recommended fuse: Littelfuse 218.002P
Quantity: 2
- If unable to obtain the correct fuse, please contact your sales agent or the Noise Laboratory repair and calibration center.

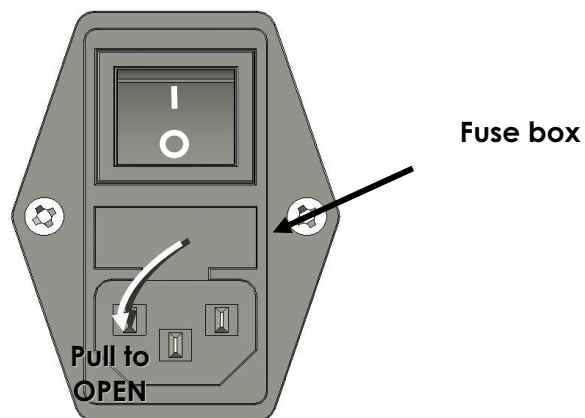


Figure 7-1 Fuse Box

8. NAME AND FUNCTION OF EACH PART

8-1. Main Unit (Front Panel)

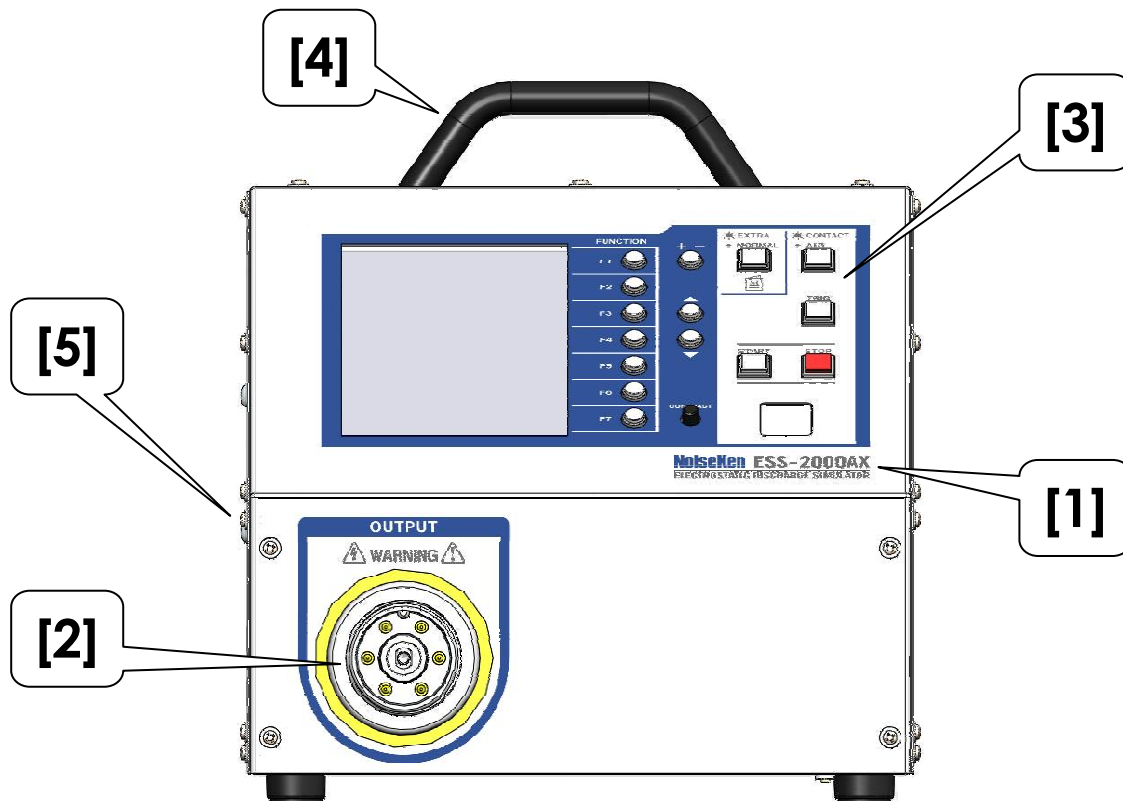


Figure 8-1 Main Unit (Front Panel)

- [1] Model name
The product name and model name of the instrument and the company logo.
- [2] High-voltage output connector
Connector with a maximum output voltage of 30.5kV. The discharge gun connects to this connector.
- [3] Operation panel
LCD display and operating switches. See Chapter 8-4 for details.
- [4] Carrying handle
Use this to carry or transport the instrument.
- [5] Gun holder attachment holes (side)
Used to attach the gun holder (sold separately).

8-2. Main Unit (Rear Panel)

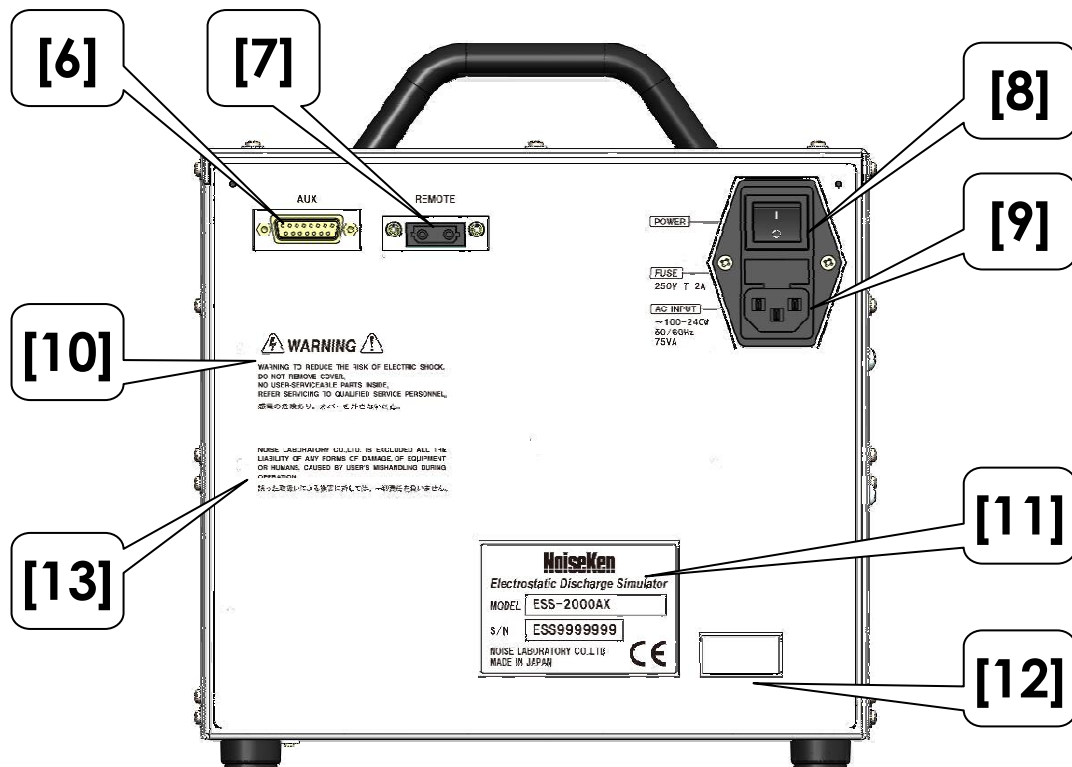


Figure 8-2 Main Unit (Rear Panel)

- [6] AUX connector
A D-SUB 15-pin connector. Used to connect to external devices.
See Chapter 13-1 for details.
- [7] Optical communications connector
The instrument can communicate with a PC via optical fiber. Please contact the marketing department at Noise Laboratory Co. Ltd. for details.
- [8] Power switch
Used to turn the power on and off.
- [9] AC inlet (with internal fuse box)
Inlet used to plug in the supplied AC power cable. Includes an internal fuse.
If replacing the fuse, please replace with a fuse of the following type.
Rated voltage 250V/Rated current 2A Slow-blow fuse
Recommended fuse: Littelfuse 218.002P
- [10] Warning text
Indicates a warning, a risk of electric shock, that caution is required, and that you should refer to the instruction manual. Also includes a warning not to open the cover due to the risk of electric shock.

[11] Serial number label

Contains the model name, serial number, and other information.

[12] Inspection certification

Label certifying that the instrument passed the Noise Laboratory delivery inspection.

[13] User warning

Noise Laboratory Co., Ltd. accepts no liability for damages resulting from incorrect operation.

8-3. Discharge Gun

Please refer to the instruction manual for the discharge gun for more details.

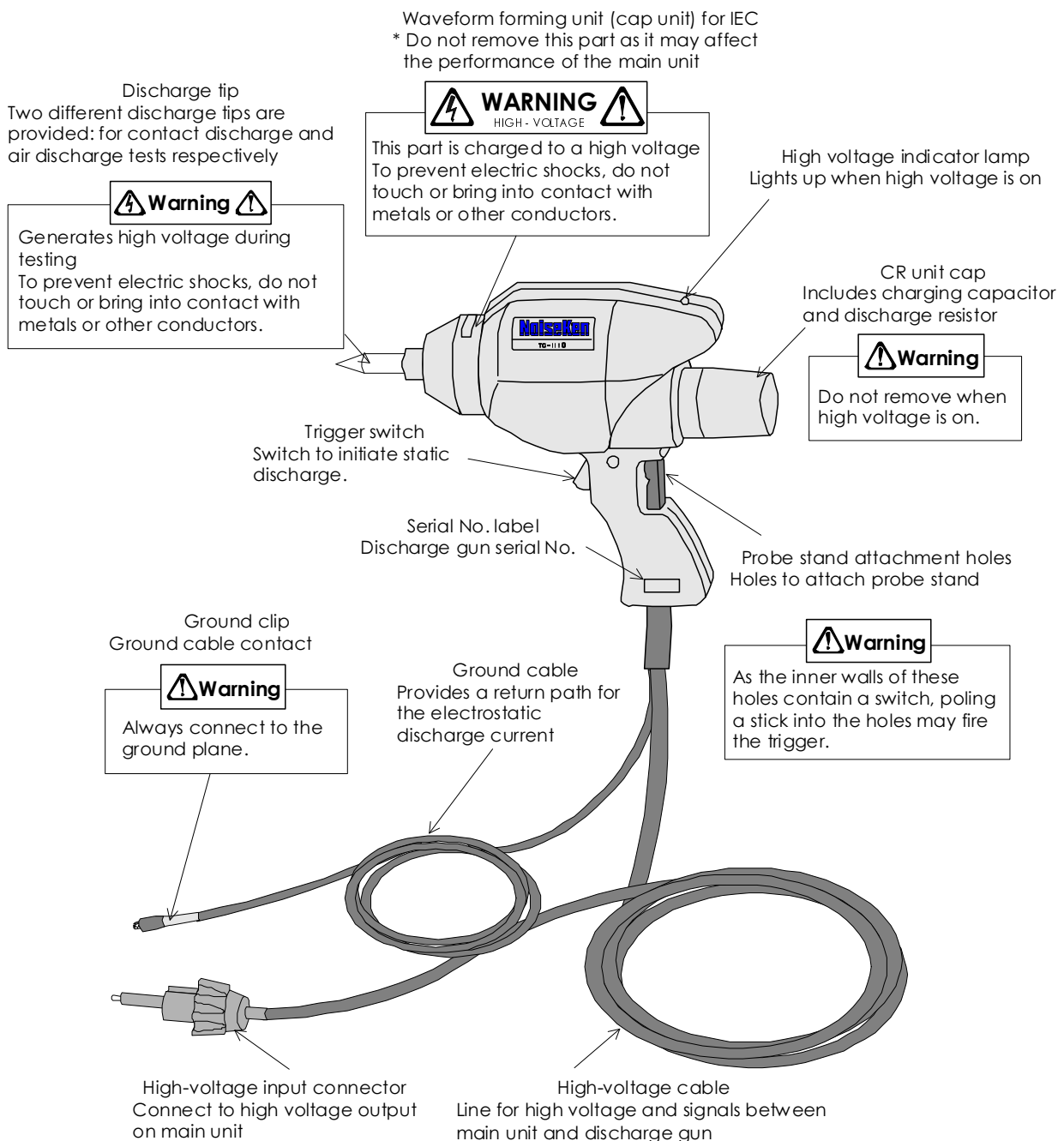


Figure 8-3 Discharge Gun

8-4. Operation Panel

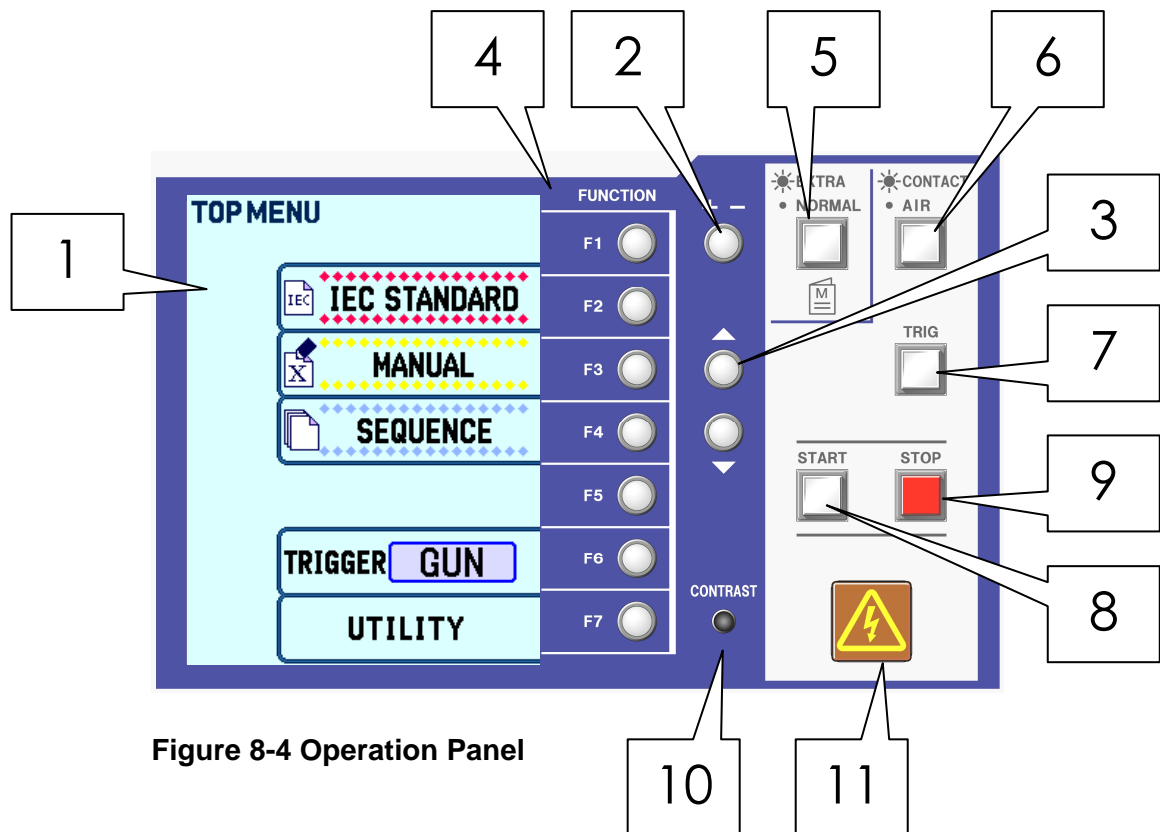



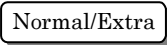


Figure 8-4 Operation Panel

- 1) LCD display
Displays status information.
- 2) Output polarity selection switch 
Selects the polarity of the applied voltage.
- 3) Up/down switches 
Adjusts the selected value up or down. If you hold down a switch, the value changes faster.
- 4) Function switches 
Selects setting items.
- 5) Radiation level mode selection switch 
A special operation for selecting either normal mode (NORMAL) [Switch LED turns on] or extra mode (EXTRA) [Switch LED turns off] for the radiation from the discharge gun. Normal mode (NORMAL) is selected in the default settings. Selecting extra mode (EXTRA) reduces the radiation from the discharge gun.
A special operation is required to select the mode. See "RADIATION LEVEL MODE FUNCTION " for details.

6) Static discharge mode selection switch **CONTACT/AIR**

Selects either contact discharge mode (CONTACT) or air discharge mode (AIR).

7) TRIG switch **TRIG**

Used to fire the trigger from the main unit.

8) START switch **START**

Pressing the **START** switch starts high voltage output.

9) STOP switch **STOP**

Stops the test. This shuts down the high-voltage power supply and turns off the voltage output from the main unit.

10) Contrast adjustment control **CONTRAST**

Turn the knob to adjust the contrast level on the LCD display. Adjust to the level that gives the best viewing when performing testing.

11) Warning lamp

Turns on when a voltage is output from the high-voltage output connector and blinks when electrostatic discharging starts.

9. RADIATION LEVEL MODE FUNCTION

To improve the reliability of its electrostatic discharge simulators, Noise Laboratory released the new TC-815R discharge gun in 2004. The new discharge gun was an upgrade of the TC-815P model and featured reduced ringing in the output current waveform and lower radiated noise from the discharge gun.

Whereas there is a trend towards lower operating voltages and faster CPU clock speeds in modern electronic components and equipment, and also a switch to plastic cases that are increasingly being adopted as devices become smaller, this has also been accompanied by a deterioration in immunity to noise, including poorer shielding performance and greater sensitivity to radiated noise. A consequence of this is that there have been reports of EUTs malfunctioning due to radiated noise from the discharge gun.

There is a limit to how much radiated noise can be reduced by improvements to the discharge gun and accordingly a new function called the "Radiation Level Mode Selection Function" has been developed and incorporated into the electrostatic discharge simulator to reduce radiated noise.

The new Radiation Level Mode Selection Function effectively combines two types of electrostatic discharge simulator in the same unit, being able to select between its default setting of normal mode (NORMAL), which provides the same conditions as electrostatic discharge simulators that comply with the IEC 61000-4-2 and ISO 10605 standards (referred to below as previous simulators), and extra mode (EXTRA), which produces a lower level of radiation.

9-1. Points to Note When Using the Radiation Level Mode Function

Regardless of the radiation level mode, the simulator performs electrostatic discharge immunity tests that comply with the IEC 61000-4-2 and ISO 10605 standards. However, because the level of radiated noise from the discharge gun in extra mode (EXTRA) is lower than in the normal mode (NORMAL) used by previous simulators, results may differ from past tests. When using extra mode (EXTRA), please verify consistency with past test results.

Also, if performing tests using both radiation level modes, please record whether you used normal mode (NORMAL) or extra mode (EXTRA) in the test report or similar to ensure that you have sufficient information to reproduce the test.

9-2. Differences Between Normal Mode (NORMAL) and Extra Mode (EXTRA)

Although the simulator performs electrostatic discharge immunity tests that comply with the IEC 61000-4-2 and ISO 10605 standards regardless of the radiation level mode, there are differences between normal mode (NORMAL) and extra mode (EXTRA).

[1] Different level of radiated noise

The radiated noise in normal mode (NORMAL) is at a similar level to previous simulators.
The radiated noise in extra mode (EXTRA) is lower.

[2] Different voltage waveform

With IEC 61000-4-2 and ISO 10605 standards, there is the difference in the voltage waveform which does not have stipulation.

Conditions under which differences in waveform appear.

- Electrostatic discharge mode: Contact discharge
- The electrostatic discharge is applied to a point at which the impedance between the discharge tip and discharge gun GND is $2M\Omega$ or more.

The figures below show the voltage waveforms when a 1000:1 high-voltage probe is connected to an oscilloscope, and where the impedance between the discharge tip and discharge gun GND is approximately $100M\Omega$.

ESS setting: +2kV, contact discharge, TC-815R discharge gun

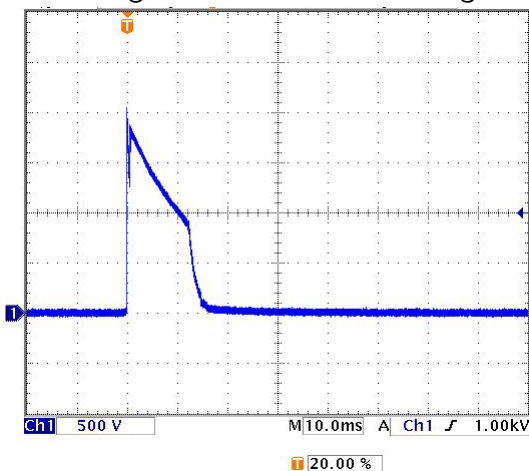


Figure 9-1 Normal Mode Voltage Waveform

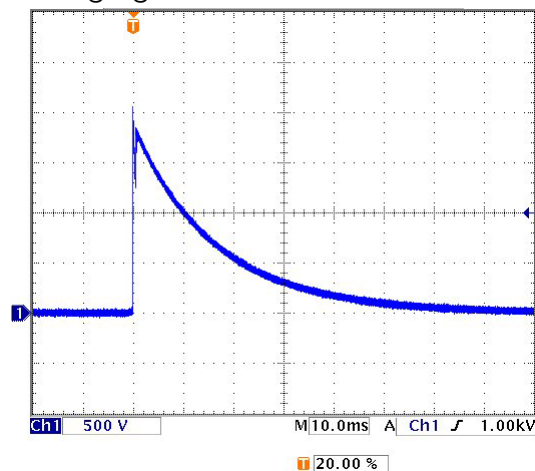


Figure 9-2 Extra Mode Voltage Waveform

9-3. How to Use the Radiation Level Modes

The radiation level modes are normal mode (NORMAL) [Switch LED turns on] and extra mode (EXTRA) [Switch LED turns off].

The simulator always starts up with the radiation level mode set to normal mode (NORMAL) when the POWER switch is turned on (except when utility mode is used to specify settings). Also, the radiation level mode selection cannot be changed while the simulator is running (except when utility mode is used to specify settings). The LED in the radiation level mode selection switch turns off to indicate that the simulator is in normal mode (NORMAL).

Normal mode (NORMAL) can be used to perform testing in the same way as previous simulators.

Note: The above does not guarantee that test results will be identical to those obtained from previous simulators.

Individual variability of the simulator and discharge gun will cause differences in the results.

9-4. How to Select Extra Mode (EXTRA)

If the radiation level mode selection switch is held down when the POWER switch is turned on, the simulator starts up in extra mode (EXTRA).

The radiation level mode selection cannot be changed while the simulator is running (except when utility mode is used to specify settings).

The LED in the radiation level mode selection switch turns on to indicate that the simulator is in extra mode (EXTRA).

Selecting extra mode (EXTRA) reduces the radiation from the discharge gun.

The minimum repeat cycle in extra mode (EXTRA) is restricted to 1.0s.

Radiation Level Mode	LED in Radiation Level Mode Selection Switch	Minimum Repeat Cycle
Normal mode (NORMAL)	Off	0.05s min
Extra mode (EXTRA)	On	1.00s min

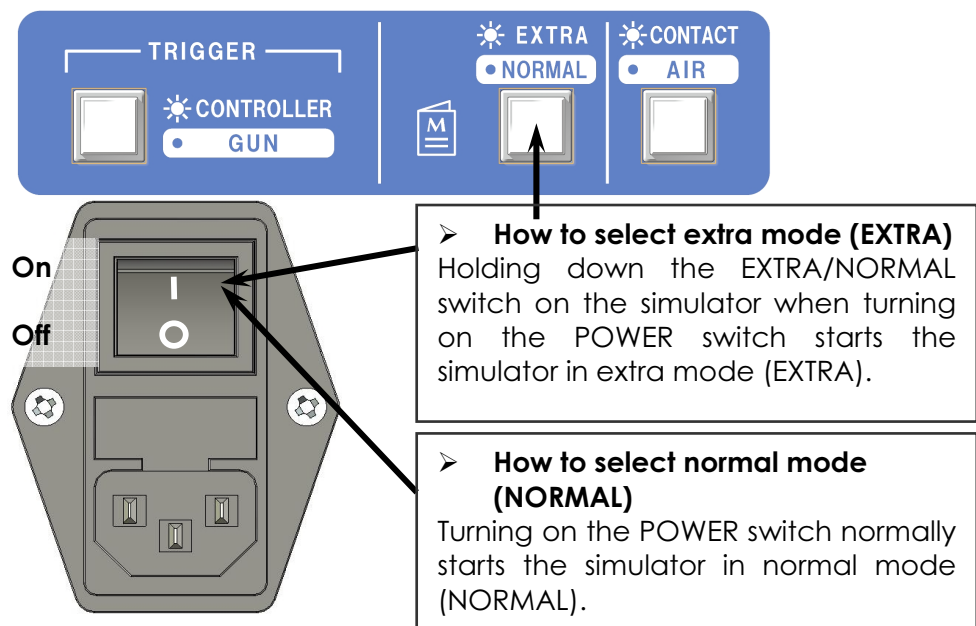


Figure 9-3 Power Switch (Rear Panel)

10. CONNECTIONS

⚠ WARNING

- **Turn the power switch to "Off" on the instrument before connecting or changing any of the cables**
Failure to comply with this rule may result in electric shock, injury, or misoperation.
- **Do not insert objects into the instrument and its connectors**
Inserting metallic or flammable items into the ventilation slits, connectors, or other openings may result in fire, electric shock, or similar.

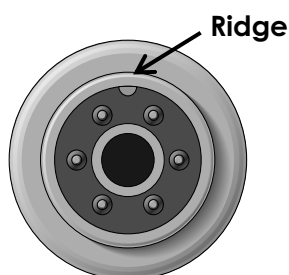
⚠ CAUTION

- **Do not use the instrument with other than a recommended discharge gun**
Using the instrument with other than a recommended discharge gun may result in poor operation and abnormal test results.
- **Clean the high-voltage input and output connectors periodically**
Allowing dust or dirt to accumulate between the high-voltage input connector and high-voltage output connector and absorb moisture may reduce the electrical insulation and result in fire.
Periodically unplug the AC plug from the mains socket, wait for five or more seconds, then unplug the high-voltage input connector from the high-voltage output connector and blow dehumidified air into the high-voltage output connector to clean out any dust or dirt.
Also clean off any dirt or dust on the high-voltage input connector using a dry cloth.
- **Do not unplug the high-voltage input connector by pulling on the cable**
Failure to comply with this rule may damage the cable, resulting in faults or fire.
Hold by the high-voltage connector when unplugging.
- **Do not operate the instrument or insert or remove the AC plug or high-voltage input connector if you have wet hands.**
Failure to comply with this rule may result in electric shock or faults.

10-1. Connecting the Discharge Gun

Align the groove on the high-voltage input connector from the discharge gun with the ridge on the high-voltage output connector on the main unit and insert. Rotate the securing ring on the high-voltage input connector from the discharge gun clockwise to secure in place.

High-voltage output connector
on main unit



High-voltage input connector
on discharge gun

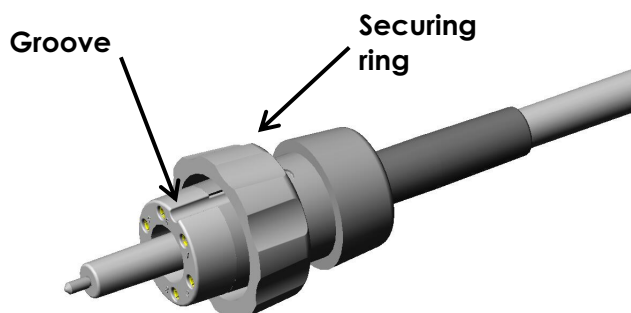


Figure 10-1 High-Voltage Input/Output Connector

10-2. Connecting the AC Power Cable

WARNING

- **Plug the AC power cable into a socket that has a protective earth terminal**
The AC power cable provided with the instrument has a three-pin plug that connects to the power supply and protective earth terminal.
The protective earth on the three-pin plug connects via the AC power cable to the metal parts on the instrument.
Because this provides protection from electric shock, ensure that you plug the power supply cable into a socket that has a properly earthed protective earth terminal.
Using the instrument without a protective earth connection may result in electric shock.
- **Firmly insert the AC power cable plug into the socket**
Failing to fully insert the plug may result in heating or the build-up of dust leading to fire, electric shock, or similar.
Failing to fully insert the plug or plugging too many cables into the same power outlet may cause cables to overheat leading to fire, electric shock, or similar.
- **Do not use the AC power cable for any other purpose**
The supplied AC power cable is only intended for use with this instrument. Do not use it for any purpose other than this instrument. Use on any other electrical equipment risks overheating leading to fire, electric shock, or similar. Similarly, using an AC power cable from another electrical device may prevent the instrument from operating at its intended level of performance and may result in overheating if the current carrying capacity of the cable is insufficient, leading to fire, electric shock, or similar.

CAUTION

- **Clean the AC plug periodically**
Allowing dust or dirt to accumulate between the AC plug and socket and absorb moisture may reduce the electrical insulation and result in fire. Periodically unplug the AC plug from the mains socket and clean off any dirt or dust using a dry cloth.
- **Do not operate the instrument or insert or remove the AC plug if you have wet hands**
Failure to comply with this rule may result in electric shock or faults.

An AC power cable with a three-pin plug is provided with the simulator to connect to the mains power supply and protective earth.

The protective earth on the three-pin plug connects via the AC power cable to the metal parts on the simulator.

Because this provides protection from electric shock, ensure that you plug the power supply cable into a socket that has a properly earthed protective earth terminal.

Using the instrument without a protective earth connection may result in electric shock.

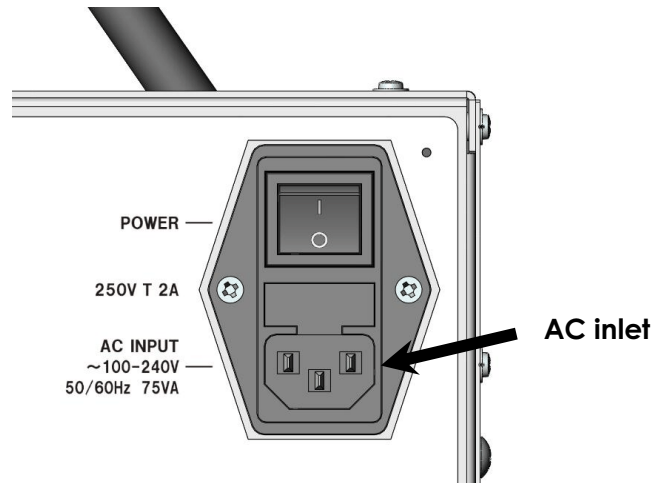


Figure 10-2 AC Inlet on Rear of Unit

11. OPERATION

11-1. Turning the Power On or Off

Press the "I" side of the power switch on the rear of the simulator to turn on the power. This lights up the operation panel display. Press the "O" side of the power switch to turn off the power and the operation panel display.

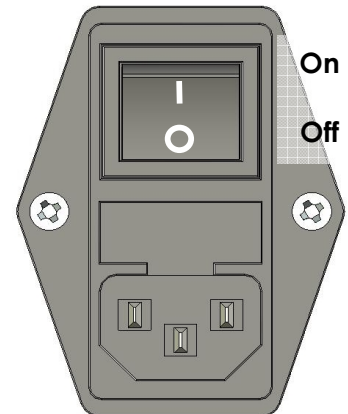


Figure 11-1 Power Switch

11-2. Menu Screen

The display changes from the startup screen to the initial screen after two seconds. However, if any switch is pressed while the startup screen is displayed, the display changes immediately to the menu screen instead.

The modes available from the initial menu screen are selected by pressing the function switches.

F2 IEC standard test mode [IEC STANDARD]
Changes to IEC standard test mode.
⇒ See Chapter 11-3.
This sets the output voltages to the severity levels specified in the IEC standard so that you can perform the test simply by specifying a level.

F3 Manual test mode [MANUAL]
Changes to manual test mode
⇒ See Chapter 11-4.
This allows the output voltage of the simulator to be set manually so that you can perform different tests as required.

You can also change the applied voltage automatically if you turn on voltage sweep mode.

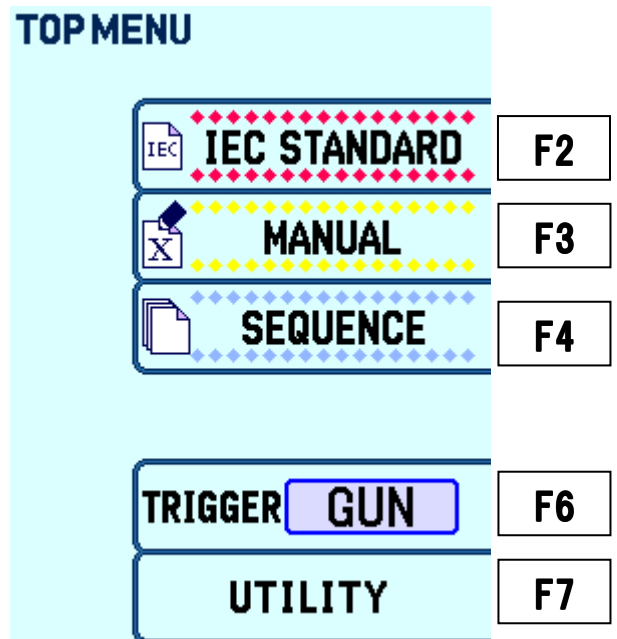


Figure 11-2 Initial Menu Screen

F4 Sequence mode [SEQUENCE]

Changes to sequence mode. ⇒ See Chapter 11-5.

Sequence mode works by performing a series of operations by combining units created in manual test mode. You can create up to 20 programs.

F6 Trigger selection [TRIGGER]

The available trigger input methods are GUN, ESS, and EXTERNAL.

This specifies how to trigger electrostatic discharges. The available options are to use the gun trigger, the trigger on the main unit of the simulator, or an external trigger. The selection switches between these options in the following sequence each time you press the **F6** switch.



Figure 11-3 Trigger Selection Menu

- GUN: Gun trigger

This uses the trigger switch on the discharge gun to start and stop discharging.

As the trigger switch on the discharge gun remains in the pressed state when the discharge gun is inserted in the probe stand, the trigger on the simulator needs to be used to start and stop discharging in this case. When the GUN trigger is selected, discharging cannot be performed with the gun inserted in the probe stand.

- ESS: Trigger switch on the main unit of the simulator

This uses the **TRIG** trigger switch on the simulator operation panel to start and stop discharging (this disables the trigger on the discharge gun).

The **TRIG** switch on the simulator operation panel blinks after you start discharging to indicate that a test is in progress.

- EXTERNAL: External trigger

An electrical signal input from the AUX connector on the rear of the simulator is used to start and stop discharging (this disables the trigger on the discharge gun). See Chapter 13-1 for details.

F7 Utility mode

Changes to the various setup modes. ⇒ See Chapter 11-6.

11-3. IEC Standard Test Mode

This automatically sets the output voltages to the severity levels specified in the IEC standard.

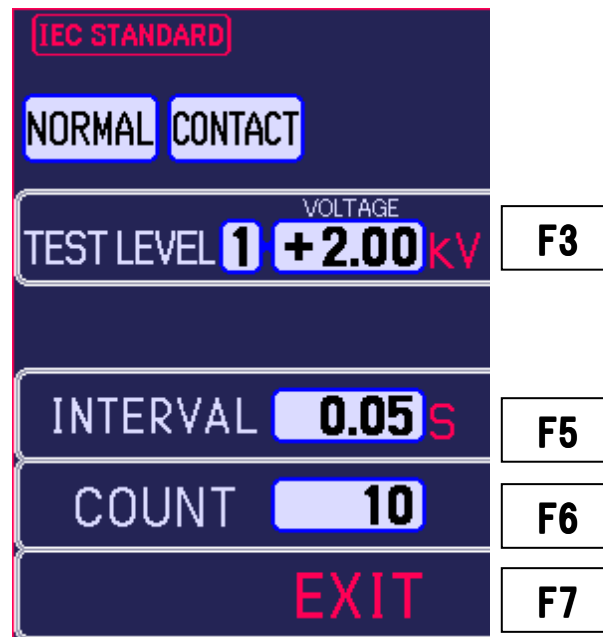


Figure 11-4 IEC Mode Setting

1) Electrostatic Discharge Mode Selection

Pressing the electrostatic discharge mode selection switch toggles between contact discharge mode [CONTACT] and air discharge mode [AIR].

Contact discharge mode [CONTACT]: ☼ Lamp on

The lamp in the switch turns on when in contact discharge mode [CONTACT].



If the lamp is turned off, press the electrostatic discharge mode selection switch to turn on the lamp and set contact discharge mode. Pressing the trigger switch in this mode causes the discharge relay to turn on and off in accordance with the INTERVAL and COUNT settings.

Air discharge mode [AIR]: ○ Lamp off

The lamp in the switch turns off when in air discharge mode [AIR].

If the lamp is turned on, press the electrostatic discharge mode selection switch to turn off the lamp and set air discharge mode. In this mode, the discharge relay turns on while the trigger switch is pressed and the discharge tip becomes charged. Releasing the trigger switch turns off the discharge relay.

2) Test Level Settings

Pressing the **F3** switch enables the test level to be selected using the   switches.


The test level can also be selected by holding down the **F3** switch.

Table 11-1 IEC Test Levels lists the output voltage settings.

Table 11-1 IEC Test Levels

Test Level	Output Voltage (kV)	
	Contact discharge (CONTACT)	Air discharge (AIR)
1	2	2
2	4	4
3	6	8
4	8	15



3) Output Polarity Setting

Press the  output polarity selection switch to select the polarity of the applied voltage.

4) Discharge Interval Setting [INTERVAL]

Press the **F5** switch and then use the   switches to set the discharge interval time. Pressing the **F5** switch again changes the digit being modified.

5) Number of Discharges to Perform [COUNT]

Press the **F6** switch and then use the   switches to specify the number of discharges to perform. Pressing the **F6** switch again changes the digit being modified.

6) Starting a Test



**Warning**

- Before you start, check that the discharge gun is connected.
- Starting a test will generate the indicated voltage in the high-voltage output connector and discharge gun. Take adequate precautions.
- Take care to ensure there are no other people close to the discharge gun, and that all necessary preparation for the discharge test has been carried out.

Pressing the **START** switch outputs a high voltage from the simulator. (The START switch and warning lamp illuminate and the display changes from READY to TRIG WAIT.)

Inputting the specified trigger starts electrostatic testing.

(The warning lamp blinks and the display changes to RUNNING.)

The test level can be changed while the electrostatic test is in progress by using the   switches.

Also, inputting the discharge trigger again during electrostatic testing temporarily pauses the test. (The START switch blinks and the display changes to PAUSE.)

Inputting the discharge trigger again restarts the test.

The simulator goes to the standby state after the specified number of discharges have completed. (Warning lamp on, display changes to TRIG WAIT.)

Inputting the discharge trigger again starts a new test.



Figure 11-5 Screen During an IEC Mode Test

7) Stopping a Test

**Warning**

As the simulator waits for the next trigger input after the specified number of discharges have been performed, the high-voltage power supply in the simulator does not turn off. Always press the STOP switch to end the test.

Pressing the **STOP** switch stops the test, turns off the internal high-voltage power supply, and turns off the warning lamp.

8) Return to Menu

Pressing the **F7** switch returns to the initial menu screen.

11-4. Manual Test Mode

Manual test mode is used to perform tests in which all of the settings are specified by the user. Manually specified test conditions can be stored in units numbered 1 to 99.

Saving the settings to units 1 to 99 is performed automatically.

The unit numbers are used to setup tests in sequence test mode.

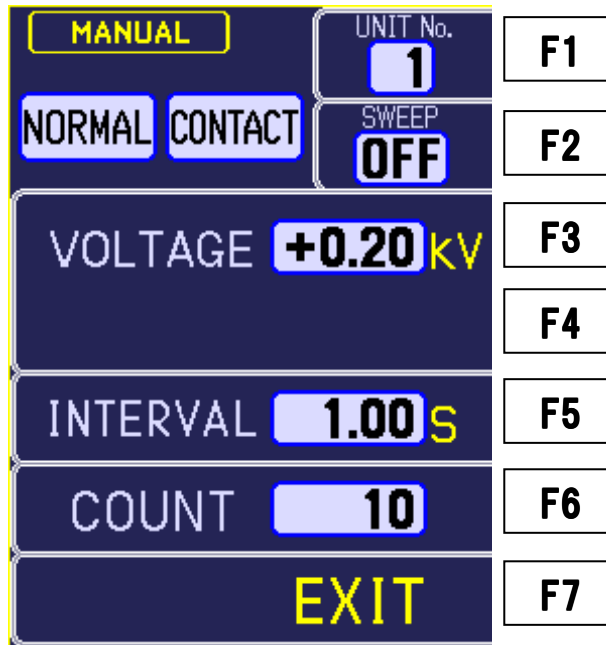


Figure 11-6 Manual Test Mode Setting Screen

1) Electrostatic Discharge Mode Selection

Pressing the electrostatic discharge mode selection switch toggles between contact discharge mode [CONTACT] and air discharge mode [AIR].

Contact discharge mode [CONTACT]: ☼ Lamp on

The lamp in the switch turns on when in contact discharge mode [CONTACT].

If the lamp is turned off, press the electrostatic discharge mode selection switch to turn on the lamp and set contact discharge mode. Pressing the trigger switch in this mode causes the discharge relay to turn on and off in accordance with the INTERVAL and COUNT settings.

Air discharge mode [AIR]: ○ Lamp off

The lamp in the switch turns off when in air discharge mode [AIR].

If the lamp is turned on, press the electrostatic discharge mode selection switch to turn off the lamp and set air discharge mode. In this mode, the discharge relay turns on while the trigger switch is pressed and the discharge tip becomes charged. Releasing the trigger switch turns off the discharge relay.

2) Setting Unit Selection

Use the (F1) switch to select the unit in which to save the settings. By changing the unit number, you can save different settings in each unit. The unit numbers are also used in sequence mode.

3) Test Voltage Setting

Pressing the (F3) switch enables the test voltage to be modified using the (▲) (▼) switches. The setting range is from 0.20kV to 30.5kV. Pressing the (F3) switch again changes the digit being modified.

4) Output Polarity Setting

Press the (+-) switch to select the polarity of the applied voltage. If voltage sweep mode is set, the same polarity is used for both the START and END voltages.

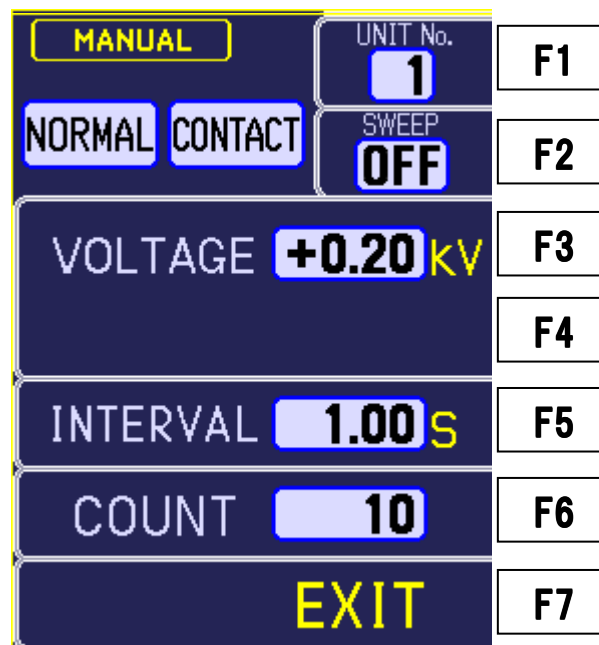


Figure 11-7 Manual Test Mode Setting Screen

5) Voltage Sweep Setting

Pressing the (F2) switch allows you to specify the voltage sweep settings. Press the (F3) switch to enter the start voltage (START) and press the (F4) switch to enter the step voltage (STEP) and end voltage (END). When voltage sweep mode is specified, the voltage is incremented automatically by the specified STEP voltage after the specified number of discharges have completed and the test continues until the entire range from the START to the END voltage has been covered. Figure 11-8 shows a flowchart of the operation when voltage sweep mode is selected.

6) Discharge Interval Setting [INTERVAL]

Press the (F5) switch and then use the (▲) (▼) switches to set the discharge interval time.

Pressing the (F5) switch again changes the digit being modified.

7) Number of Discharges to Perform [COUNT]

Press the (F6) switch and then use the (▲) (▼) switches to specify the number of discharges to perform. Pressing the (F6) switch again changes the digit being modified.

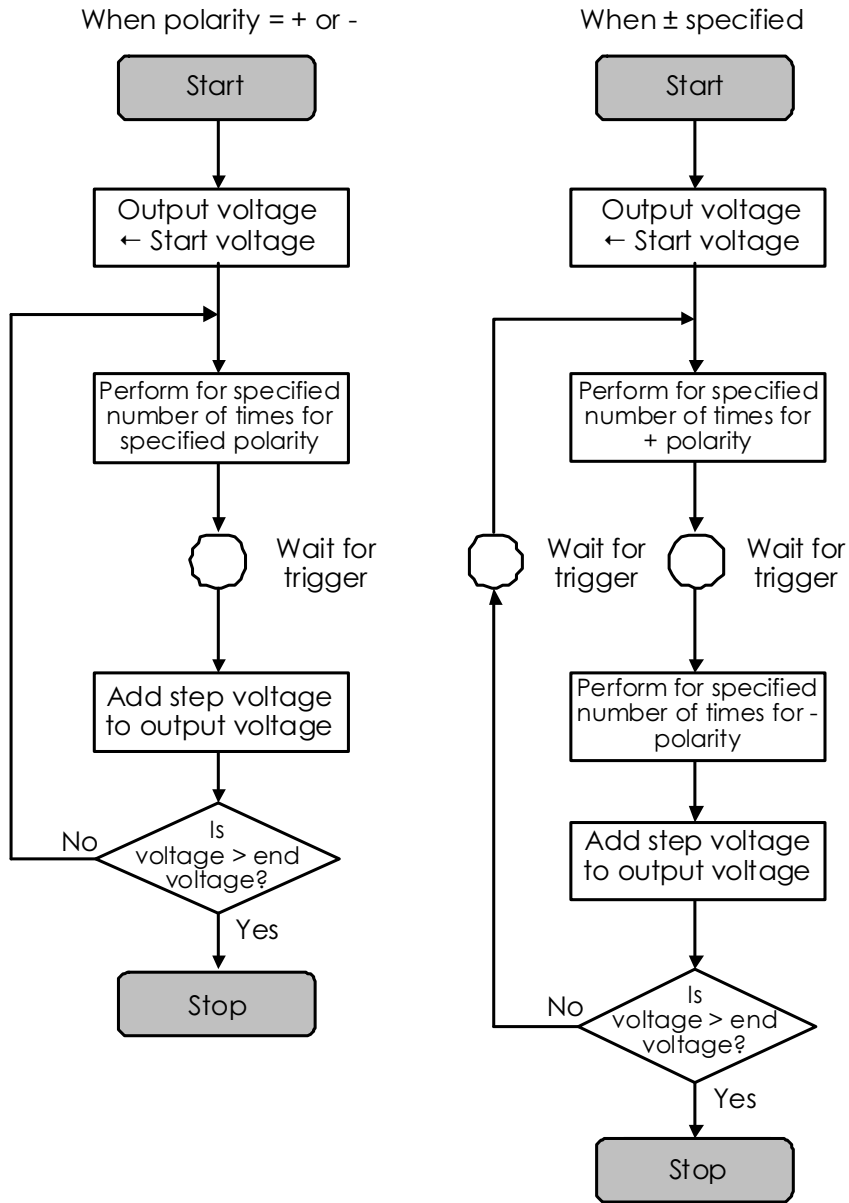


Figure 11-8 Flowchart of Voltage Sweep Mode

- : Manual operation
- : Automatic operation

8) Starting a Test

⚠ Warning

- Before you start, check that the discharge gun is connected.
- Starting a test will generate the indicated voltage in the high-voltage output connector and discharge gun. Take adequate precautions.
- Take care to ensure there are no other people close to the discharge gun, and that all necessary preparation for the discharge test has been carried out.

Pressing the **START** switch outputs a high voltage from the simulator. (The START switch and warning lamp illuminate and the display changes from READY to TRIG WAIT.)

Inputting the specified trigger starts electrostatic testing.

(The warning lamp blinks and the display changes to RUNNING.)

The applied voltage can be changed by using the **▲▼** switches. However, the voltage cannot be changed if using voltage sweep mode.

Also, inputting the discharge trigger again during electrostatic testing temporarily pauses the test.

(The START switch blinks and the display changes to PAUSE.) Inputting the discharge trigger again restarts the test.

If using contact discharge or voltage sweep mode, a long press of the discharge trigger input enables continuous mode (CONTINUE). This continues testing indefinitely rather than waiting for input at the end of the sweep.

Give another long press of the trigger to clear continuous mode.

The simulator goes to the standby state after the specified number of discharges have completed. (Warning lamp on, display changes to TRIG WAIT.)

Inputting the discharge trigger again starts a new test.

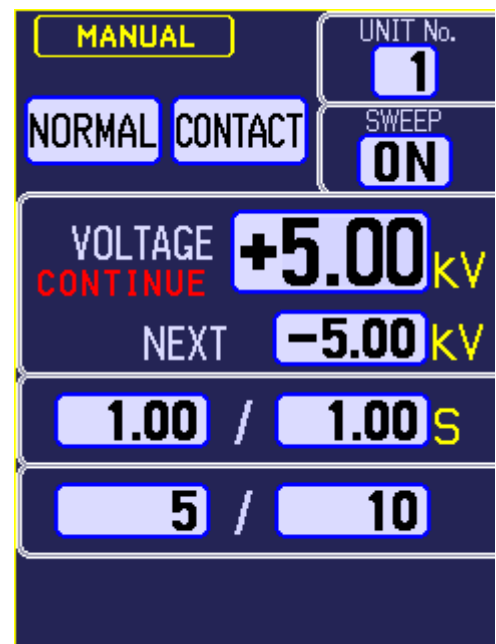



Figure 11-9 Screen During Manual Test Mode

9) Stopping a Test



Warning

As the simulator waits for the next trigger input after the specified number of discharges have been performed, the high-voltage power supply in the simulator does not turn off. Always press the STOP switch to end the test.

Pressing the  switch stops the test, turns off the internal high-voltage power supply, and turns off the warning lamp.

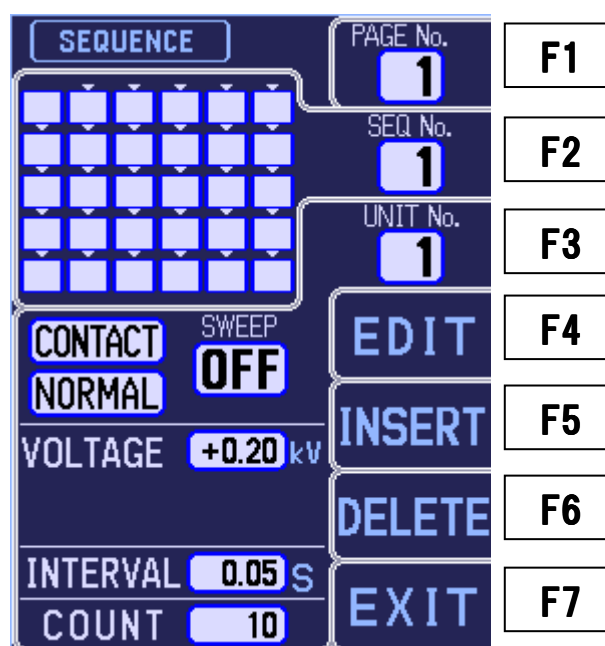
10) Return to Menu

Pressing the  switch returns to the initial menu screen.

11-5. Sequence Mode

Sequence mode works by performing a series of operations which consist of a combination of units created in manual test mode. You can define up to 20 programs in sequence mode by switching between pages.

Each sequence can consist of a combination of units up to 30 steps.



**Figure 11-10 Sequence Mode
(With no sequence set)**

- 1) Creating a Test Sequence
 - [1] Specifying the page
Press the (F1) switch and then use the (▲) (▼) switches to specify the page.
 - [2] Specifying the position in sequence
Press the (F2) switch and then use the (▲) (▼) switches to select the position in the sequence to modify.
 - [3] Specifying the unit
Press the (F3) switch and then use the (▲) (▼) switches to select a unit.
 - [4] Editing a unit
Press the (F4) switch to enter edit mode for the displayed unit. This temporarily changes the display to the manual test mode screen. See the explanation of manual test mode for an explanation of the operation in this mode. ⇒ See 11-4.
Press the (F7) switch to return to the sequence mode screen.

[5] Adding a unit

Press the **(F5)** switch to insert the displayed unit at the specified location in the sequence. Any units after the insertion position are shifted downwards.

[6] Deleting a unit

Press the **(F6)** switch to delete the unit at the specified location in the sequence. Any units after the deletion position are shifted upwards.



Figure 11-11 Sequence Mode
(After sequence input)

2) Starting a Test

Warning

- Before you start, check that the discharge gun is connected.
- Starting a test will generate the indicated voltage in the high-voltage output connector and discharge gun. Take adequate precautions.
- Take care to ensure there are no other people close to the discharge gun, and that all necessary preparation for the discharge test has been carried out.

Pressing the **START** switch outputs a high voltage from the simulator. (The START switch and warning lamp illuminate and the display changes from READY to TRIG WAIT.)

Inputting the specified trigger starts electrostatic testing.

(The warning lamp blinks and the display changes to RUNNING.)

Inputting the discharge trigger again during electrostatic testing temporarily pauses the test. (The START switch blinks and the display changes to PAUSE.) Inputting the discharge trigger again restarts the test.

The simulator goes to the standby state after the specified number of discharges have completed for the current unit. (Warning lamp on, display changes to TRIG WAIT.) Inputting the discharge trigger again continues the test from the next step.

If using contact discharge mode, a long press of the discharge trigger input enables continuous mode (CONTINUE). This continues testing rather than waiting for input at the end of each step or when the sweep finishes. Give another long press of the trigger to clear continuous mode. However, continuous mode is cancelled if the next step uses air discharge mode.

The simulator goes to the standby state after all the units have finished. (Warning lamp on, display changes to TRIG WAIT.)

Inputting the discharge trigger again starts a new test.

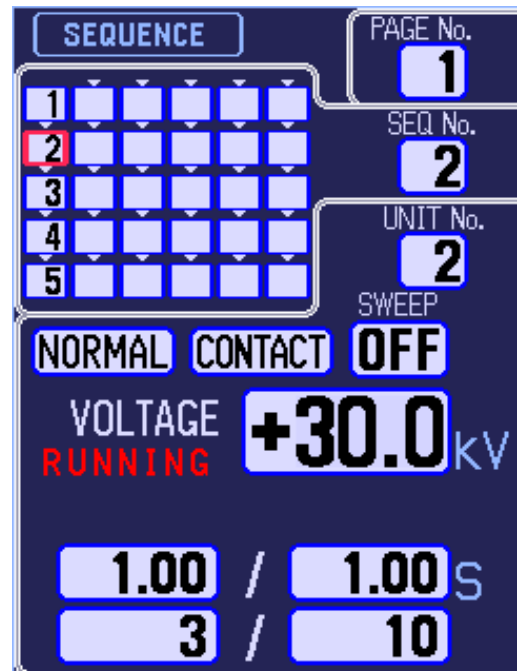



Figure 11-12 Screen During Sequence Test Mode

3) Stopping a Test




Warning

As the simulator waits for the next trigger input after the specified number of discharges have been performed, the high-voltage power supply in the simulator does not turn off. Always press the STOP switch to end the test.

Pressing the  switch stops the test, turns off the internal high-voltage power supply, and turns off the warning lamp.

4) Return to Menu

Pressing the  switch returns to the initial menu screen.

11-6. Utility Mode

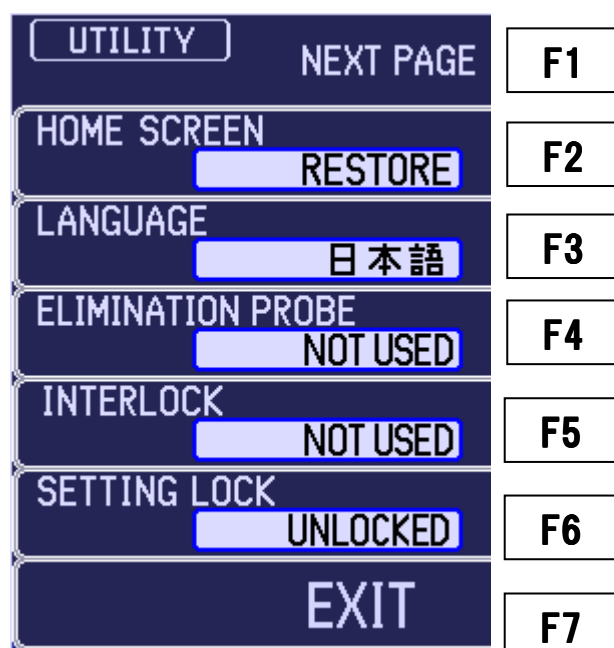


Figure 11-14 Utility Mode Screen 1

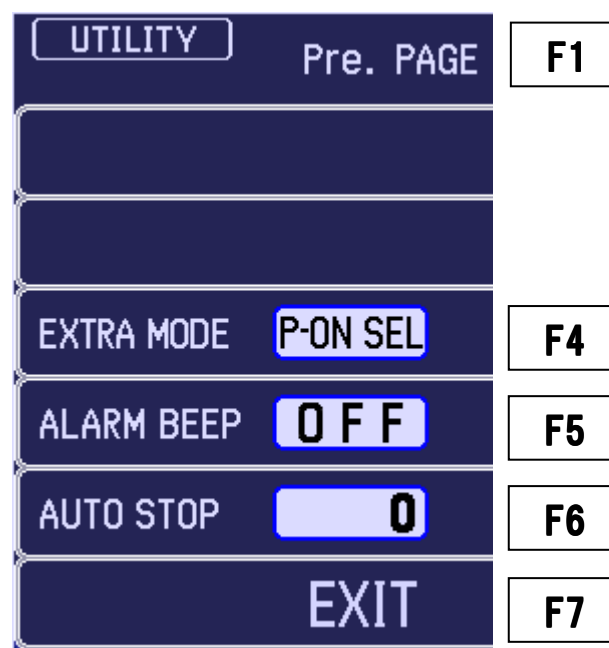


Figure 11-13 Utility Mode Screen 2

- F1** Switch between setting screens [Next Page/Pre.PAGE]
This switches the utility mode setting screen between screen 1 and screen 2 shown above.

Utility mode screen 1

- F2** Initial screen to display when power turned on [Home Screen]
Specify the screen to display when the power is turned on.
Home: After the power is turned on, display the initial menu screen.
Restore: After the power is turned on, display the screen displayed the last time the power was turned off.
- F3** Display language setting [Language]
Specify the language to use in the display screens. **English**: English **日本語**: Japanese
- F4** Elimination probe setting [Elimination Probe]
If an elimination (neutralization) probe is connected to the external connection terminal on the rear panel (AUX terminal), specify whether or not to use the probe and the timing for neutralizing.
Not Used: Disables use the elimination probe. Even if an elimination probe is attached, it remains disconnected.

Every Discharge : Performs neutralization after each discharge operation. However, this setting defaults to the "Count Up" operation if the discharge interval is less than 1 second.

Count Up : Performs neutralization after the number of discharges specified by the Count setting have been performed.

F5 Enable/disable interlock input [Interlock]

This setting enables or disables the external interlock input connected to the external connection terminal on the rear panel (AUX terminal).

Not Used : Do not use the external interlock input

Enabled : Enable the external interlock input. In this case, the START switch is disabled and no voltage is output unless the interlock input is "High".

F6 Prohibit or allow settings changes [Setting Lock]

You can prohibit or allow changes to the settings in manual test mode and sequence mode.

This setting is ignored for the IEC standard tests, in which case the settings can be changes at any time.

Unlocked : Allow settings changes.

Locked : Prohibit settings changes.

F7 Return to initial menu.

Utility mode screen 2

F4 Extra mode setting [Extra Mode]

This setting enables or disables use of extra mode.

P-ON SEL : Use the operation when turning on the power to select the mode. If the EXTRA/NORMAL switch is pressed when the power is turned on, the simulator is set permanently to extra mode. If not pressed, the simulator is set permanently to normal mode.

FIXED : Set permanently to extra mode. The extra mode setting is fixed and normal mode cannot be used.

FREE : Allow the mode to be set for each test. The EXTRA/NORMAL switch can be used to set extra mode or normal mode.



F5 Whether to sound a buzzer when discharging [Alarm Beep]

This specifies whether to sound a warning buzzer when discharging.

ON : Sound a warning buzzer when discharging.

However, the buzzer only sounds once per second if the discharge interval is 1 second or less.

OFF : Do not sound a warning buzzer when discharging.

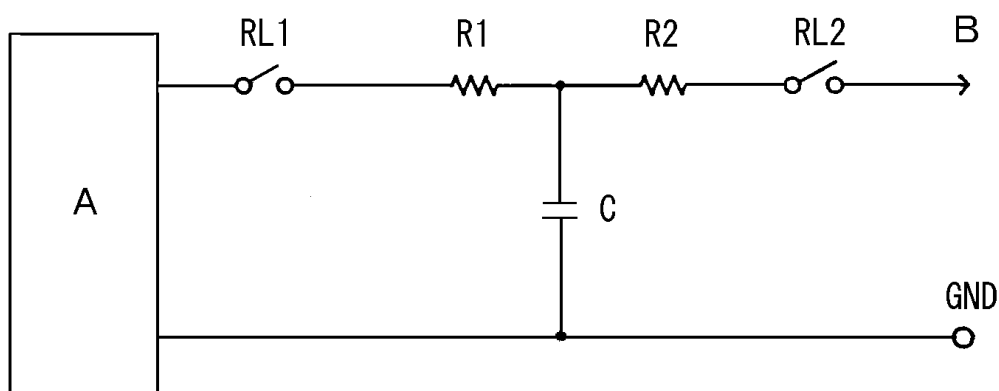
- F6** Turn off high-voltage output if idle [Auto Stop]
This specifies the time after which the high voltage is turned off if the high voltage is left on but no operation is performed. Use the   switches to set the time.
0 : Do not use the auto stop function.
1~60 : Turn of the high voltage if the simulator is idle for between 1 and 60 minutes.
- F7** Return to initial menu.

12. BACKGROUND KNOWLEDGE ABOUT ELECTROSTATIC TESTING

1) Principle of electrostatic tester

The basic circuit of an electrostatic is shown below.

The high voltage generated in the high voltage power supply is charged in the charging capacitor through the charging relay and charging resistance. When the charging relay is turned off and the discharging relay is turned on, the high voltage (electric charge) accumulated in the charging capacitor is applied to EUT through the discharging resistance.



RL1 : Charging relay

RL2 : Discharging relay

R1 : Charging resistor

R2 : Discharging resistor

C : Charge/discharge capacitor

A : High-voltage power supply

B : Discharge tip

Figure 12-1 Basic Circuit for an Electrostatic Discharge Simulator

2) Electrostatic test by IEC standards

The international Electrotechnical Commission (IEC) issued the Standards for Electrostatic Discharge Requirements Pub. 61000-4-2, which defined tester circuits and constants, discharge current waveforms, test voltage levels, test environments, etc. A combination of the ESS-2000 and discharge gun can be used for electrostatic discharge tests conforming to IEC pub. 61000-4-2.

3) Contact Discharge and Air Discharge

The electrostatic discharge can be applied either by direct contact (CONTACT) or via the air (AIR). The test procedure and electrostatic simulator operation are different in each case, as described below. The effect on the EUT is also different.

- Contact discharge (CONTACT)

The electrostatic discharge is applied by placing the discharge tip in direct contact with the case of the EUT (if the case is painted, the paint is peeled off to allow contact).

Coupling between the internal circuits and the discharge current that flows through the case of the EUT causes the EUT to malfunction. Because the discharge contacts the EUT directly, this method of testing has a comparatively good level of repeatability.

The test uses a cone-shaped discharge tip that extends out from the end of the discharge gun.

After bringing the discharge tip into contact with the measurement point on the EUT, the trigger is input to apply the specified number of discharges to the EUT at the specified time intervals. Discharging can be paused by inputting another trigger while discharge is in progress.

- Air discharge (AIR)

In the IEC standard, this method is used in situations when contact discharge is not practical (when it is stipulated that an insulating coating is applied or the EUT case is made of an insulator).

In this method, the discharge gun uses a discharge tip with circular shape.

Turn on the trigger with the discharge gun held away from the EUT and then as rapidly as possible bring the discharge tip closer until it comes into contact with the EUT. After the discharge occurs, pull the discharge tip (discharge gun) back away from the EUT and turn off the trigger. Repeat this the specified number of times.

Also, the discharge interval setting is not applicable when using air discharge mode.

4) Test Procedure for Electrostatic Testing

Electrostatic testing must be performed under specific conditions including factors such as the ground plane and coupling plane. Refer to the "IEC61000-4-2" standard published by the IEC for details.

13. AUXILIARY INTERFACE

13-1. AUX Connector

This is a DSUB15 female connector used for the warning light (Model: 11-00014A), automatic elimination probe (Model: 01-00013A), and control signal input and output.

If using both the warning light and automatic elimination probe (both of which are available as options), please use the AUX connector junction box (Model: 05-00052A).

Table 13-1 AUX Connector Pin Layout

Pin No.	Signal Name	Pin No.	Signal Name
1	Warning light output +	9	External interlock power supply (+24V)
2	Warning light output -	10	External interlock input
3	Auto. elimination probe output +	11	+24V
4	Auto. elimination probe output -	12	No connection
5	+24V	13	+24V
6	Reserved	14	No connection
7	External trigger input power supply (+24V)	15	GND
8	External trigger input		

- Warning light (Model: 11-00014A) connection

You can connect an optional warning light (Model: 11-00014A).

If connected, the warning light illuminates to indicate when the start switch has been pressed and the high-voltage power supply is operating.

- Automatic elimination probe (Model: 01-00013A) connection

You can connect an optional automatic elimination (neutralization) probe (Model: 01-00013A).

You can use utility mode to setup how to perform neutralization. ⇒ See 11-6.

Table 13-2 Electrical Specifications of AUX Connector Input Pins

Electrical Specifications of External Input Pins (Same for all input pins)	
H level input voltage	5V to 24V
L level input voltage	0V to 0.5V
Input impedance	7kΩ min. 10kΩ typ.
Minimum pulse time	100ms

Note: Do not apply voltages greater than 24V to the external input pins as this may cause a fault.

- External trigger input

The external trigger can be used to input the trigger from an external source.

To use this function, select [EXTERNAL] in the trigger selection setting in the initial menu screen. ⇒ See 11-2.

To input an external trigger, input a high level (5V to 24V) with a pulse time of 100ms or longer. Table 13-2 lists the specifications for the input terminal.

The following types of signal can be used as the external trigger input.

- Relay output
- PNP open collector output
- Voltage output

If using a relay output or PNP open collector output, use [Pin No.7 External Trigger Input Power Supply].

- External interlock input

You can install an interlock mechanism by connecting an external emergency stop switch or similar to the external interlock input.

Use utility mode to enable or disable the external interlock. ⇒ See 11-6.

If the external interlock is enabled via utility mode, [Err External Interlock Error] appears and the test is unable to proceed unless either [Pin No.9 External Interlock Power Supply] or a high level (5V to 24V) is input to [Pin No.10 External Interlock Input]. Table 13-2 lists the specifications for the input terminal.

The following types of signal can be used as the external interlock input.

- Relay output
- PNP open collector output
- Voltage output

If using a relay output or PNP open collector output, use [Pin No.9 External Interlock Power Supply].

13-2. Optical Communication Connector

The instrument can communicate with a PC via the optical communication connector (interface).

For the protocol and other details, please contact your sales agent or the Noise Laboratory service office.

14. ERROR DISPLAY

Table 14-1 Error List

ERROR 1	
Description of error	Gun interlock error An interlock is present.
How to clear error	Push the STOP switch.
How to prevent error	Attach the high-voltage input connector of the discharge gun correctly.
ERROR 2	
Description of error	External interlock error An external interlock is present.
How to clear error	Push the STOP switch.
How to prevent error	Attach the AUX connector or external interlock correctly. Disable the external interlock.
ERROR 3	
Description of error	Trigger error The trigger switch is stuck in the input position.
How to clear error	Push the STOP switch.
How to prevent error	Stop the trigger switch from remaining in the input position. Change the trigger selection.
ERROR 4	
Description of error	PC control error Unable to communicate with PC.
How to clear error	Push the STOP switch.
How to prevent error	Check the communications connector, optical fiber cable, and PC software.
ERROR 5	
Description of error	Automatic stop No operation was performed within the specified time period.
How to clear error	Push the STOP switch.
How to prevent error	Lengthen the time period or disable the automatic stop function. Operate the simulator within the required time.

15. SPECIFICATIONS

Simulator (ESS-2000AX)

Parameters	Function/Performance
Output polarity	Positive or negative
Output voltage	0.20kV to 30.0kV (30.5kVmax) 0.20kV to 10.0kV: 0.01V step setting 10.0kV to 30.0kV: 0.1V step setting
Tolerance	0.20kV to 1.9kV $\pm 10\%$ 2.0kV to 30.0kV $\pm 5\%$
Repeat cycle [INTERVAL]	Normal mode: 0.05s to 600.0s $\pm 10\%$ Extra mode: 1.00s to 600.0s $\pm 10\%$ 0.05s to 9.99s: 0.01s step setting 10.0s to 600.0s: 0.1s step setting
No. of discharges [COUNT]	1 to 60,000 times set in increments of 1, or continuous discharge
Electrostatic discharge mode	Contact discharge or air discharge
Radiation level mode	Normal mode (NORMAL) or extra mode (EXTRA)
Trigger mode	Gun trigger, controller trigger, or external trigger
IEC standard test mode	Contact discharge mode: 2.0kV, 4.0kV, 6.0kV, and 8.0kV step settings Air discharge mode: 2.0kV, 4.0kV, 8.0kV, and 15.0kV step settings
Manual test mode	Contact or air discharge mode: User specified from 0.20kV to 30.0kV A sweep function is available and a nine unit memory
Sequence test mode	Continuous operation using the units set in manual mode 20 programs can be stored with up to 30 steps per program
Warning lamp	Turns on when a voltage is output from the high-voltage output connector Blinks when electrostatic discharging starts
Recommended discharge guns	TC-815R or TC-815ISO
Charging resistor in simulator	10M Ω (Combined with the 43M Ω resistor in the discharge gun, this gives a total of 53M Ω)
AUX connectors	Used to connect a warning light (MODEL: 11-00014A) or automatic neutralization probe (MODEL: 01-00013A), and as the interlock input or external trigger input terminal
Optical communications connector	Optical connector for communications with a PC (serial interface) Please contact your sales agent or the Noise Laboratory service office for details

Mains power supply	AC100V to AC240V $\pm 10\%$, 50Hz/60Hz
Power consumption	75VA
Operating temperature range	+15°C to +35°C
Operating humidity range	25%RH to 75%RH (no condensation)
Storage temperature range	-10°C to +50°C
Storage humidity range	0%RH to 85%RH (no condensation)
External dimensions	(W)266mm x (H)294mm x (D)317mm
Weight	5.3kg (approx.)

16. WARRANTY

Servicing terms

The following terms are applicable to servicing by Noise Laboratory Co., Ltd., (hereafter referred to as the Company) provided to maintain the intended performance of its products.

1. Scope

The following terms shall apply only to products made by the Company.

2. Technical servicing fee

In the event of a failure of a product within the warranty period (see warranty section), the Company will repair a product without charge. After the warranty expires, repairs will be billed at a nominal cost.

3. Ownership of replacement parts

Any faulty parts replaced in the course of repair services shall belong to the Company. In the case when repairs are billed to the customer, replaced faulty parts will be retained by the Company unless other arrangements are made.

4. Limited liability

In the event that damages resulting from servicing by the Company are intentional or caused by negligence, the Company will pay the cost but at the purchase value of the relevant product maximum. But, notwithstanding the foregoing, the Company shall not be responsible for any incidental or consequential damages of any nature, including without limitation thereof loss of would-be profit or compensation demanded from a third party.

5. Incorrect parts, missing parts, and damage

In the event that the Company's product purchased by the customer has incorrect parts, missing parts, or is damaged, such that the product is not able to be used, the Company accepts no liability for any losses incurred by the customer that relate to lost earnings, commercial losses, other secondary losses, special losses, or indirect or punitive losses. Nor is any liability accepted for any losses resulting from a responsibility of the customer to compensate any third party.

6. Refusal to provide repair services

The company may not accept a repair order in the following cases:

- More than 5 years have passed since the product discontinued
- More than 8 years have passed after delivery
- Required component for servicing already discontinued and no alternative is available.
- Product changed, repaired or remodeled without obtaining a prior permission from the Company.
- Product severely damaged to the extent it has lost its original form

Limited Warranty

Noise Laboratory Co., Ltd. (hereafter referred to as the Company) warrants its products to be free from defects in materials and workmanship under normal use and service for a period of one year from date of delivery. In the event of failure of a product covered by this warranty, the Company will repair the product or may, at its option, replace it in lieu of repair without charge.

Notwithstanding the foregoing, the Company shall not be responsible for any incidental or consequential damages of any nature, including without limitation thereof loss of would-be profit or compensation demanded from a third party. This warranty is valid only in Japan.

1. Scope

This warranty shall only apply to products made by the Company.

2. Period

One year from date of delivery.

The warranty may be valid in 6 months after servicing if the same failure on the same component has repeated.

3. Exclusions

The followings are exclusions from this warranty:

- ✧ Consumable parts (including mercury relay, HV relay, coaxial cable, coaxial connector, automatic switch, and contactor)
- ✧ Consumable parts (including mercury relay, HV relay, coaxial cable, coaxial connector, automatic switch, and contactor)
- ✧ Failure caused by misuse, neglect, accident or abnormal conditions of operation
- ✧ Failure caused by remodeling on the user side without prior permission from the Company
- ✧ Failure caused by servicing by unauthorized personnel by the Company
- ✧ Failure due to force majeure including but not limited to, acts of God, fire, war, riot, rebellion and others
- ✧ Failure due to shock or drop in or after transit
- ✧ Failure due to operation in environment being out of ambient specifications.
- ✧ A unit shipped to overseas

17. MAINTENANCE

1. When repair, maintenance or internal adjustment of the unit is required, a qualified service engineer takes charge of such work.
2. Maintenance on the user side is restricted to the outside cleaning and functional check of the unit.
3. When checking or replacing the fuse, turn off the switch of the unit and disconnect the plug socket beforehand.
4. When cleaning the unit, turn off the switch of this unit and the connected equipment and disconnect the plug socket beforehand.
5. Avoid using chemicals for cleaning. Otherwise, the coating of the unit may peel off or the sight glass may be broken.
6. Do not open the cover of this unit.

18. CONTACTING TECHNICAL SUPPORT

- If you experience a malfunction, please have available both the model and serial number of your unit and contact the nearest distributor/agent or Noise Laboratory Technical Support.
- When it is necessary to send your unit back to Noise Laboratory, fill in the repair order form completely, pack the unit in the original package or equivalent one suitable for transit, and send the package.

Repair and Calibration Center

TEL (0088)25-3939 (toll free) / (042)712-2021
FAX (042)712-2020

NOISE LABORATORY CO., LTD.

Produced by: Noise Laboratory Co., Ltd.

1-4-4, Chiyoda, Chuo-ku, Sagamihara City, Kanagawa Pref., 252-0237, Japan

TEL: +81-(0)42-712-2051 FAX: +81-(0)42-712-2050

URL: <http://www.noiseken.co.jp>

Printed in Japan