NoiseKen

INSTRUCTION MANUAL

ELECTROSTATIC DISCHARGE SIMULATOR FOR SEMICONDUCTORS

MODEL ESS-6002/6008

NOISE LABORATORY CO., LTD.

Edition1.06
AEC00206-00E-0G

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1. IMPORTANT SAFETY PRECAUTIONS

The following instructions are very important for safe handling of this product (hereinafter the “Unit”). They must be kept strictly to prevent users of the Unit from receiving harm or damage through using the Unit. Read them carefully before use.

- **Only well-trained EMC technicians (electric technicians) are allowed to use the Unit.**

  The simulator used with the Unit may cause a fatal wound. Carefully handle it. And it may radiate electromagnetic noise which exceeds the regulation value. Take applicable countermeasures such as faraday cage, shield room, etc. as the need arises.

- **The Unit should be used only for EMC testing described in this manual.**

  Using it for other purposes may result in a fatal or serious accident.

- **A person who has a pacemaker on should not operate the Unit and also should not enter the area where it is operating.**

  It may result in a fatal or serious accident.

- **The Unit cannot be used in an explosive area, fire prohibited area, etc.**

  Use of the Unit in such an area is liable to cause combustion or ignition.

A number of safety recommendations are listed in the later chapter "BASIC SAFETY PRECAUTIONS". Be sure to read them before test environment settings, connecting relating equipment and testing.

2. CONTENTS IN PACKAGE

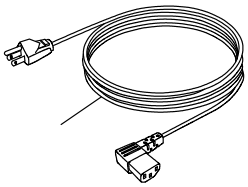
The following items are enclosed in the package.

A

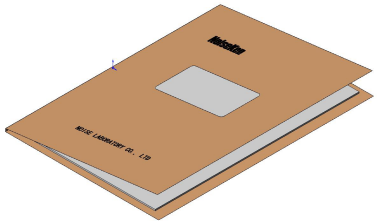
B

C

D



E



Description	Quantity
A : Main Unit (MODEL: ESS-6002 or 6008)	1
B : HBM Injection Probe (MODEL: 01-00054A)	1
C : MM Injection Probe (MODEL: 01-00055A)	1
D : AC Cord	1
E : Instruction manual (this book)	1

3. APPLICATION FORM FOR INSTRUCTION MANUAL

We place an order for an instruction manual.

Model: ESS-6002 / 6008

Serial No.:

Applicant:
Company name:
Address:

Department:
Person in charge:
Tel No.:
Fax No.

Cut off this page "APPLICATION FORM 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 the following sales department of our company.

To: Noise Laboratory Co., Ltd.
1-4-4 Chiyoda Sagamihara City,
Kanagawa Pref., 229-0037 Japan
Tel: +81-(0)42-712-2051 Fax: +81-(0)42-712-2050

Cut line

4. TABLE OF CONTENTS

5. PREFACE

5-1. Preface

Thank you very much for purchasing the electrostatic discharge simulator ESS-6002/6008 (the “Unit”). Please read this instruction manual (the “Manual”) thoroughly prior to use of the Unit in order to attain the maximum and safe use of the Unit.

- **The Manual will let you operate ESS-6002/6008 safely and make the most use of it if you strictly follow the operational procedures and the safety instructions.**
- **Keep the Manual handy whenever you operate ESS-6002/6008.**

5-2. Function of the Unit

1. Capable of conducting ESD (Electro Static Discharge) immunity test conforming to the standards as below with connecting the injection Probe.
2. Capable of injecting both polarity (+/-) of 10V~2kV (ESS-6002) or 100V~8kV (ESS-6008) electrostatic discharge.

Human body model test (HBM)	Machine model test (MM)
AEC-Q100-002-Rev.D Jul.2003 ESDA ANSI/EOS/ESD-STM5.1-2001 IEC 61340-3-1Ed.1.0 2002 IEC 60749-26 Ed.1.0 2003 JEDEC JESD22-A114C Jan.2005 JEITA EIAJ ED-4701/300 Aug.2001 Test Method304 MIL-STD-883F 3015.7 Mar.1989	AEC-Q100-003-REV-E Jul.2003 ESDA ANSI/ESD STM5.2-1999 IEC 61340-3-2 Ed.1.0-2002 IEC 60749-27 Ed.1.0 2003 JEDEC JESD22-A115A Oct.1997 JEITA EIAJ ED-4701/300 Aug.2001 Reference Test Method

(Waveform is assured across the pins.)

6. BASIC SAFETY PRECAUTIONS

- The following items are very important instructions which users must follow to take precautions against possible injury and harm.
- The indications are provided as an explanation of potential danger involved if the safety precautions are not observed correctly.

6-1. Symbols of Hazard

◆ The following display classifications describe degree, to which injury or harm might occur when the contents of the display are not followed or the Unit or related equipment is operated incorrectly.

⚠ DANGER 危険

The contents of this display indicate “the assumption that imminent danger might occur resulting in death or serious injury” if the Unit or related equipment is handled incorrectly.

⚠WARNING 警告

The contents of this display indicate “the assumption that there is a possibility of death or serious injury” if the Unit or related equipment is handled incorrectly.

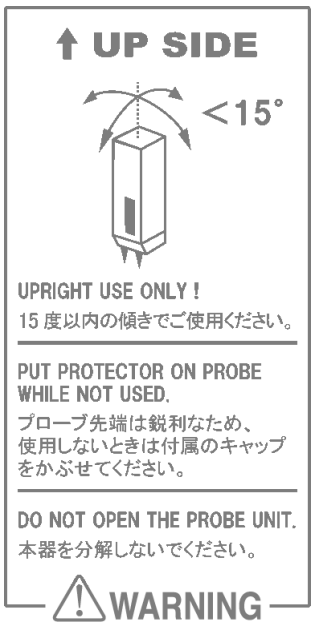
⚠ CAUTION 注意

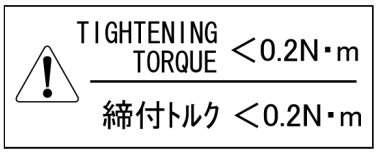
The contents of this display indicate “the assumption that there is a possibility of harm and the assumption that there is a possibility of physical damage” if the Unit or related equipment is handled incorrectly.

◆ The following display classifications describe details that should be followed.

 Prohibited	Indicates prohibition (an action that must not be taken)
 Compulsory	Indicates a compulsory action (an action that must be taken)

◆ The contents of following signs indicate warnings and cautions when using the Unit.

	It indicates that there is a possibility of electric shock.
	It indicates that there is a possibility of harm or physical damage if the Unit is or related equipment is handled incorrectly and that the Manual should be referred.
	It indicates warnings for electric shock etc. and the manual should be referred.
 WARNING TO REDUCE THE RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL. 感電の危険あり。カバーを外さないこと。	It is showed on the upper left of the rear panel, notifying danger of electric shock, especially in case of opening the cover.
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. 誤った操作による損害に対しては、一切責任を負いません。	It notifies the exemption from liability.
	It is showed on Probe notifying warnings and cautions in handling Probe, as follows.. ❍ Use it in upright status. ❍ it does not work when it is tilted more than 15°. ❍ As an acute tip of Probe may hurt you, put the protector on Probe while not used. ❍ Do not open the Probe unit.

	It indicates warning for receiving electric shock and getting injure and the Manual should be referred.
	It indicates warning for disposal of a mercury switch and that the Manual should be referred. The Unit employs a mercury switch. When you dispose of it, you should follow the local regulations.
	It indicates caution about tightening torque and that the Manual should be referred. The tightening torque for putting on protector.

6-2. Danger

⚠ DANGER 危険

- **Do not take the Unit apart or do not remodel the Unit.**

  Imminent danger might occur resulting in death or serious injury.
  Repair, internal adjustment, and inspection of the Unit should be performed by a qualified service engineer. Ask the Company or its sales agent.

6-3. Warning

⚠WARNING 警告

- **Stop operation if following unusual phenomena should occur.**

  - ❍ Emitting fumes, or smelling.
  - ❍ Water or an unusual substance being stuck
  - ❍ Being dropped or being damaged
  - ❍ AC cable being damaged (e.g. core lines being exposed etc.)

  Continuing to operate in the above status may result in a fire, electric shock, or injury. If an unusual phenomenon occurs, turn off power supply immediately, pull AC plug out of an outlet, and ask the Company or sales agent repair. As there is potential danger, any user must not repair the product.

- **When test is complete, leave all related equipment as is for more than 5 seconds.**

  During this period, charged electricity of DUT (Device Under Test) is eliminated with discharge pins or clips kept connected to DUT. As a necessary time for eliminating varies depending DUT, take DUT's characteristics into fully consideration. Otherwise you may receive an electric shock.

- **Turn off power supply of the Unit when setting or changing connection of related equipment.**

  The misuse may cause electric shock, injury, or malfunction.

- **Put protector on Probe in installing it and while it is not used.**

  The misuse may cause electric shock, injury, or damage.

- **Use Probe with right direction and right angle.**

  The misuse may cause electric shock or make operation of simulator impossible. Put the arrow sign (“ ↑ UP SIDE”) displayed on Probe upward and keep Probe upright (Tilt: within 15 degree).

- **Supply power within the indicated range (AC100V~240V)**

  The misuse may cause an electric shock or a fire. The attached AC cord in the accessory is for AC100~120V. Prepare a proper 3-line AC cord with a protective earth pin conforming to the local safety standard in using with AC220~240V power supply.

- **Connect the protective earth of AC cord.**

  Using the Unit without connecting it may cause an electric shock.

- **Insert AC plug securely to the end.**

  Insecure inserting generates heat and gathers dust. It may result in a fire or an electric shock. Avoid using a multiple outlet extension plug for the same reason.

Prohibited

- **Do not put any substance into the Unit or its connectors.**

  If some metal or flammable things are put into the Unit through a connector or a vent, it may result in a fire or an electric shock.

- **Do not touch the tip of Probe and discharged part.**

  The misuse may cause electric shock or injury.

- **Do not set up the simulator on the spot where quick operation of power key or STOP key is difficult.**

  If the simulator is set up on such a spot, difficulty in taking action in emergency may result in a fire or an electric shock.

- **Do not use the attached AC cord for any other purpose.**

  The misuse may cause a fire or an electric shock.

- **Do not damage AC cord.**

  A damaged AC cord may cause a fire or an electric shock.
  For HV cable, be sure to take notice following points.

  - ❍ Do not work it.
  - ❍ Do not bend it forcibly.
  - ❍ Do not twist it.
  - ❍ Do not pull it.
  - ❍ Do not move it close to heat.
  - ❍ Do not put heavy things on it.

6-4. Caution

⚠ CAUTION 注意

- **Leave Probe ageing for 1 minute before starting test.**
  Malfunction may occur without a mercury switch ageing.
  Fix Probe (with protector on it) on to Probe stand, set interval 0.3s on control panel, and press START key. The relay operating sound is heard from Probe. Leave Probe as is for 1 minute for ageing. Be sure to put the protector on Probe to avoid an electric shock.
- **Install Probe on to Probe stand securely.**
  If Probe falls off from Probe stand, it will be damaged.
- **Protect measurement instruments from back surge from BNC terminal.**
  A back surge, which value is approximately 1.3% of the injection voltage, generates from BNC terminal for measurement of Probe on every injection. If the value of the back surge exceeds the maximum input voltage value of a measurement instrument connected to the Unit, take proper countermeasures to reduce influence of the back surge for protecting the instrument.
- **If dewing occurs, fully dry up the room before use the Unit.**
  Dews may cause an electric shock, a trouble, a fire.
- **Clean up the AC plug periodically.**
  If dust gets damp between the AC plug and outlet, insulation capability deteriorates. It may result in a fire. Pull the AC plug out from an outlet periodically and wipe it with a dry cloth.
- **Clean up the HV connectors periodically.**
  If dust gets damp between the HV input connector and the HV output connector, insulation capability deteriorates. It may result in a fire.
  Pull the HV input connector out from the HV output connector periodically 5 seconds after pulling the AC plug out from an outlet, and blow dehumidified air to the HV output connector to blow off dust. For the HV input connector, wipe it with a dry cloth to remove dust.
- **When the body is dirty, wipe the body with a dry cloth.**
  Do not wipe the Unit and Probe with thinner, alcohol or other solvent.
  When the body is very dirty, soak a cloth into neutral detergent, squeeze out the detergent from the cloth and wipe the body with the cloth.
- **Make hazardous labels always noticeable.**
  When the caution or warning label is peeled off, missing or dirty, attach a new one for securing safety. When the caution or warning label is missing, ask the sales department or maintenance section of our company to send a new label.
- **Tighten a screw with less than 0.2N･m torque in installing the protector.**
  Tightening too tight may damage Probe.

- **Do not set up on following places.**

  Setting up on wrong places as follows may result in a fire, electric shock, or injury or damage caused by the drop of equipment.

  - ❍ A very humid or dusty place
  - ❍ A hot place, e.g. a place exposed to direct rays of the sun, a place close to a heater.
  - ❍ A place easy to bedew, e.g. a place close to a window.
  - ❍ An uneven or slanted place

- **Do not block a vent or do not use in a place poorly ventilated.**

  If a vent is blocked, the internal heat is close. It may cause a fire. For ventilation, be sure to take notice following points.

  - ❍ Do not lay the Unit on its back, sideways, or upside down.
  - ❍ Do not put the Unit into a small, poorly ventilated place.
  - ❍ Keep the Unit at least 10cm away from a wall or some substance.

- **Do not pull the HV connector off with holding its cord.**

  A damaged cord may cause a trouble or a fire.
  Pull it off wit holding connector part.

- **Do not handle the AC plug or the high voltage input connector with your hand wet.**

  The misuse may cause electric shock or trouble.

- **Do not put any container containing water on the Unit.**

  If water is spilled or gets into the Unit, it may result in a fire or an electric shock.

- **Do not drop or shock the Unit excessively.**

  The misuse may cause trouble or damage.

- **Do not bump or rub the Unit against something hard.**

  The misuse may damage a surface of the Unit.

- ◆ **In the event of failure in normal usage, repair shall be performed under the condition of the warranty rule. However, NOISE LABORATORY and its sales agents shall not be liable for any accident resulting in damage of DUT or peripheral equipment caused by deterioration of performance of expendable parts or any other external factors.**
- ◆ **NOISE LABORATORY and its sales agents shall not be liable for any accident resulting in injury or any physical damage due to abuse or mishandling of the Unit, and also shall not assume the responsibility for any resultant damages.**

7. CAUTION ABOUT EXPENDABLE SUPPLYS

- **About a mercury relay in Probe**

  - ❍ A mercury relay used in Probe is an expendable component.
  - ❍ The lifetime of it is dependent on using conditions and environment.
  - ❍ If a symptom which seems to be caused by an exhausted mercury relay, e.g. unstable current value, unstable repetition cycle or so on, is found, contact Noise Laboratory or your closest sales agent of Noise Laboratory. Repair by a user is impossible.

- **Rechargeable battery for backing up memory**

  - ❍ A battery for backing up memory is expendable.
  - ❍ Without being turned on for more than 2 months, a rechargeable battery will discharge and memory backup function will not work.
  - ❍ If a rechargeable battery discharges, previously memorized contents, e.g. settings of “CALL” and indication in power OFF time, will return to the default values.
  - ❍ For maintaining memory backup function, turn on the Unit for approximate 24 hours once every 2 months. (Recharging time is dependent on using condition and environment.)
  - ❍ If memory backup function does not work even after charging the battery, the battery seems to be exhausted. Contact Noise Laboratory or your closest sales agent of Noise Laboratory. As repair by a user is very dangerous, do not repair unconditionally.

    ※ Noise Laboratory and its sales agent are not liable to loss of backup data caused by an exhausted battery, malfunction, malfunction, or so on.
    As for important information, write down beforehand.

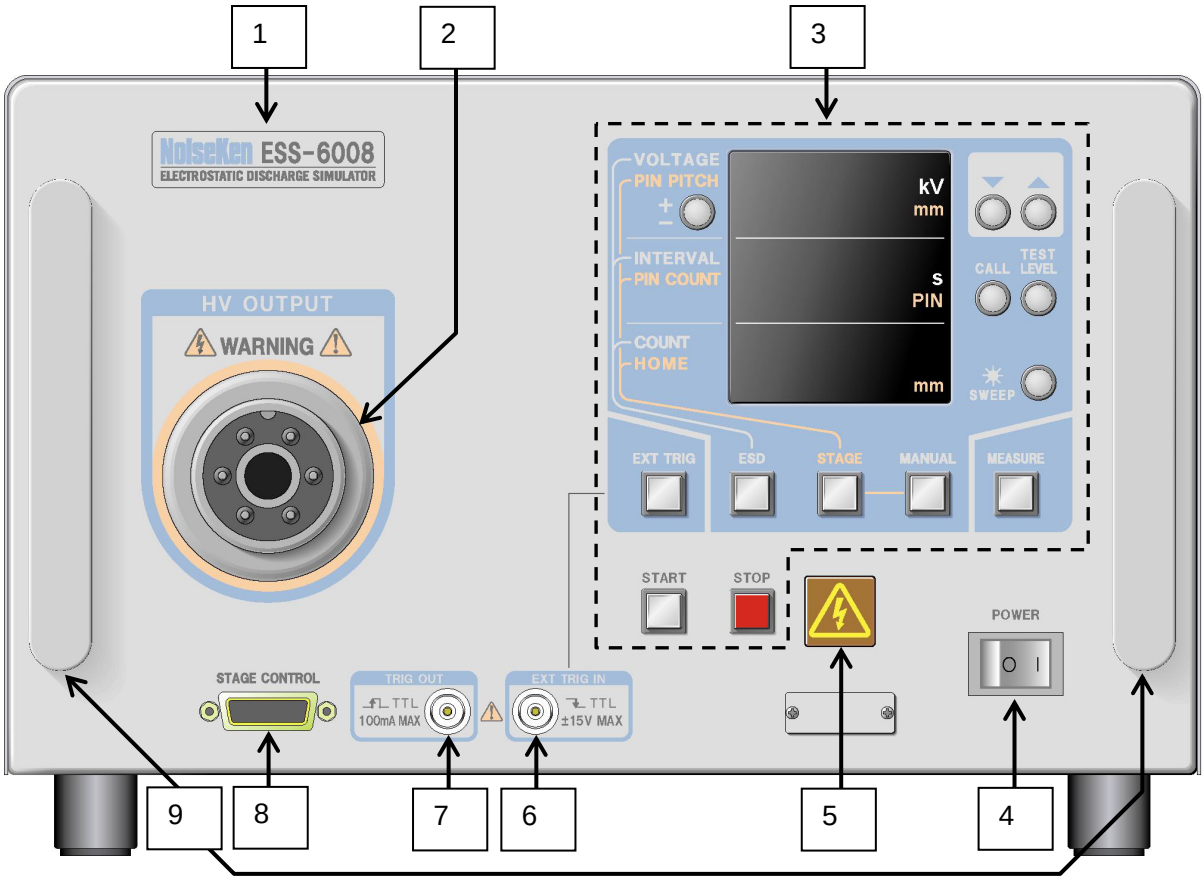
8. CAUTION ABOUT DISPOSAL

- **The Unit should be disposed of as industrial waste.**

  Probe incorporates a component employing mercury.
  In disposal of it, follow the local regulations or request Noise Laboratory or your closest sales agent of Noise Laboratory to dispose of it.

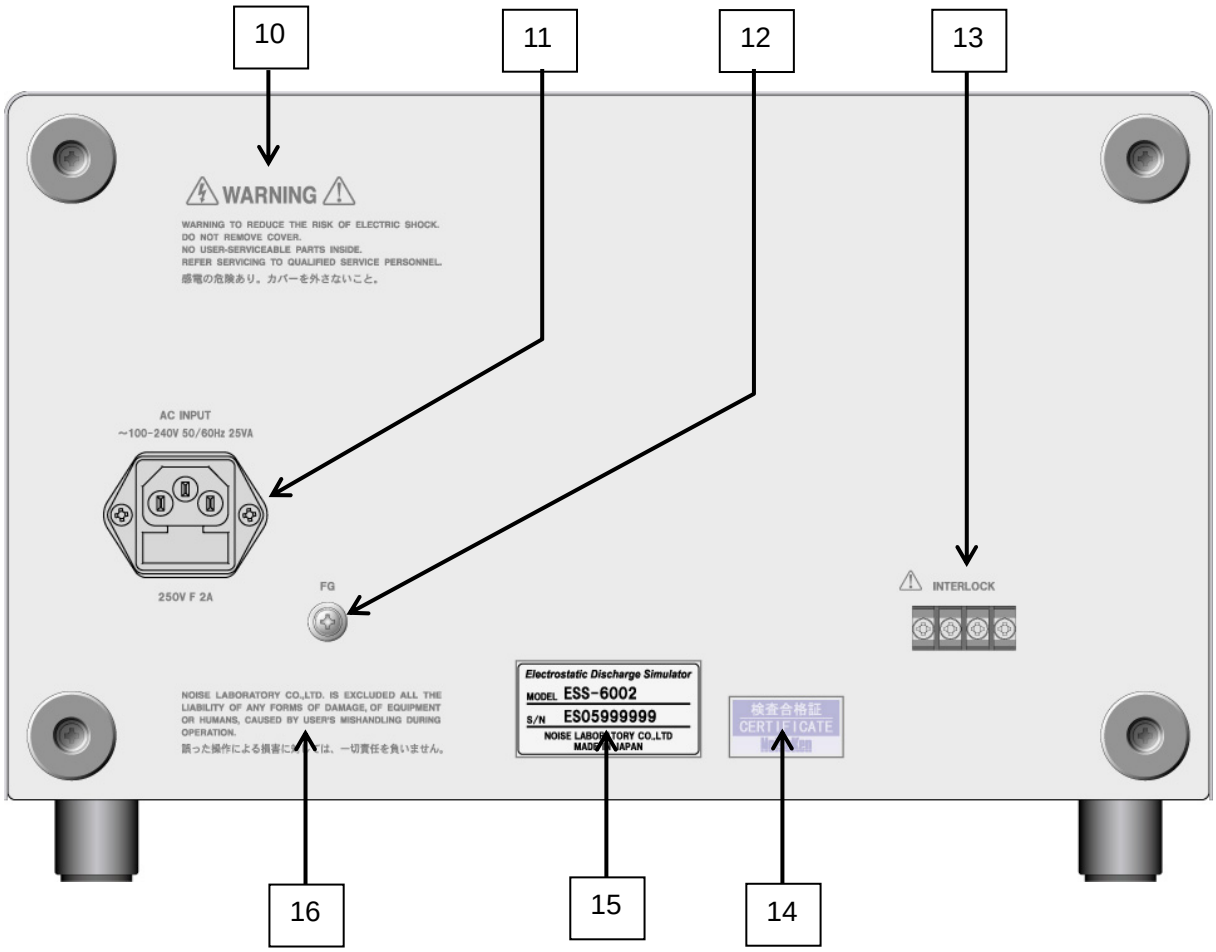
9. APPEARANCE OF THE UNIT

9-1. Front Panel



1. MODEL name label
   Shows model number etc.
2. HV output connector
   Outputs high voltage, 8kVmax (ESS-6008) or 2kVmax (ESS-6002). HV input connector of Probe to be connected.
3. Control panel
   Used for setting parameters of test condition.
4. Power switch
   Used for turning on and off the power.
5. Warning lamp
   Blinks when high voltage is output.
6. EXT TRIG IN terminal
   BNC coaxial connector used for outputting electrostatic discharge synchronizing with external signal.
7. TRIG OUT terminal
   BNC coaxial connector for outputting synchronized signal of mercury relay driving signal.
8. STAGE CONTROL terminal
   Connects to the optional Probe stand (precision stage type) MODEL: 18-00076A.
9. Handle
   Used for carrying.

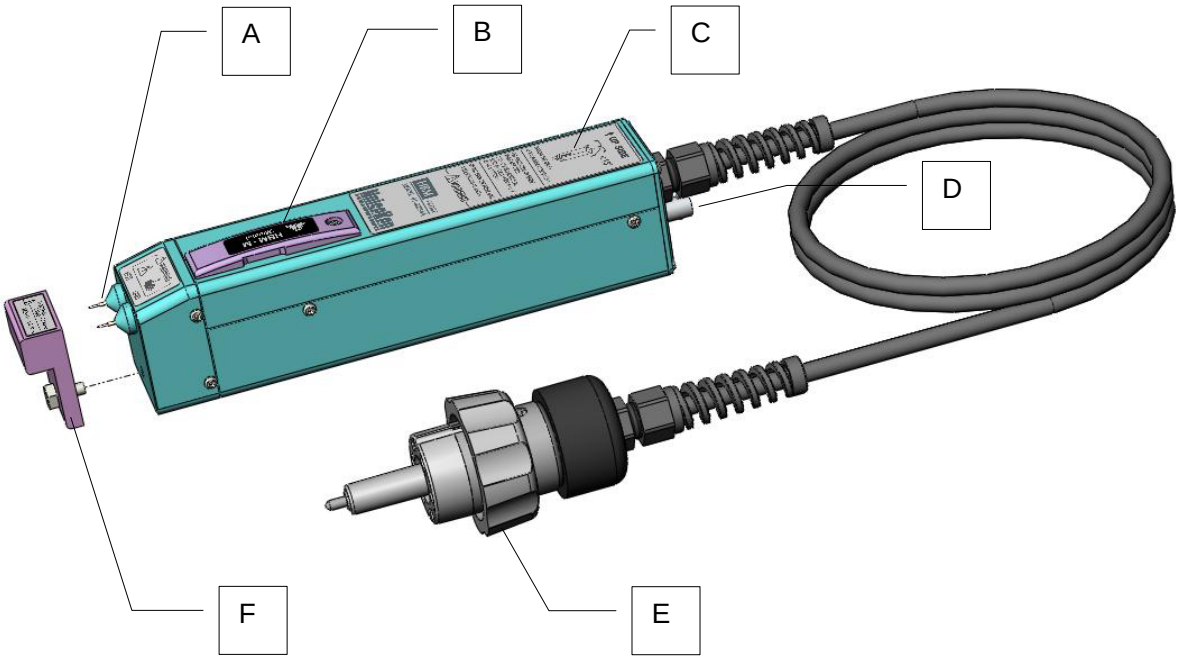
9-2. Rear Panel



10. WARNING
    Warns risk of electric shock, etc.
11. AC inlet (fuse incorporated)
    For connecting AC cord. For exchanging fuses, use the rated 250V F 2A type..
12. FG terminal
    Frame ground of the Unit. Connect to the optional Probe stand (precision stage type) MODEL: 18-00076A. Used in other cases, if necessary.
13. INTERLOCK terminal
    Short bar is connected on shipment. Whenever the terminal is open, the Unit is in STOP status. Used for safety, if necessary.
14. Certificate label
    Certifies that the Unit passes inspection on shipment.
15. Serial number label
    Shows Model number and serial number.
16. Notice
    About exemption from liability.

9-3. Injection Probe

Two types of Injection Probes, Human Body Model (HBM, MODEL: 01-00054A) and Machine Model (MM, MODEL: 01-00055A), are attached to the Unit. As their shape are similar, distinguish them by model name label.



A Receptacle
Inserts Injection pin or injection clip (according to the type of Probe stand). Has polarity (HOT, GND)

B Waveform adjusting card
HBM-M（Middle）type is installed into HBM Probe on shipment, and MM-MF（Middle Frequency）type into MM Probe. The waveform adjustment card set (option) enables to change parameters of waveform (e.g. rise time, cycle). Waveforms made with the optional set are not guaranteed in any test standard.

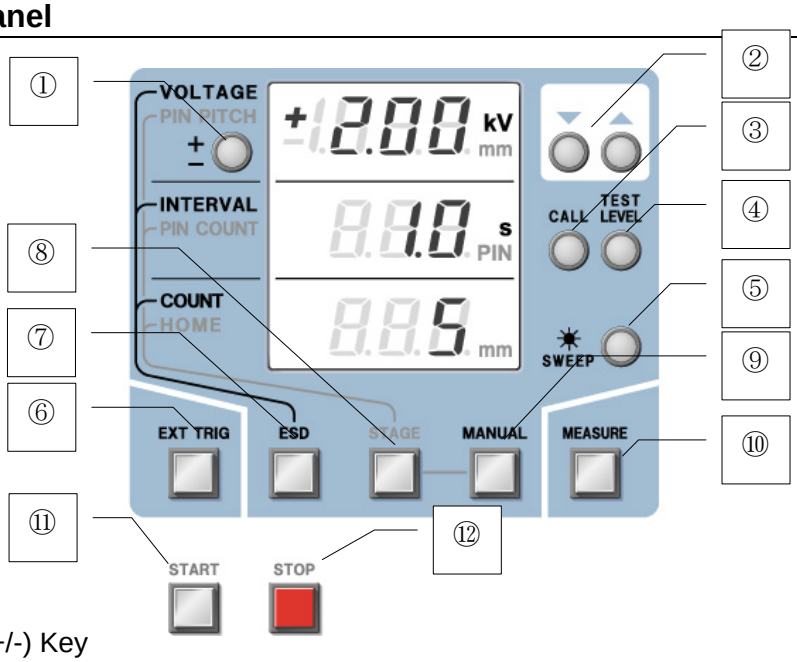
C Model name label
Indicates model name, the test standard the model applys to (HBM or MM), warning, caution, etc.

D BNC terminal for measurement
Terminal for connecting an instrument mesuring characteristics of DUT. Select the terminal status (active or inactive) with MEASURE key on the control panel.
**Notice: Protect measurement instruments from back surge from BNC terminal.
A back surge, which value is approximately 1.3% of the injection voltage, generates from BNC terminal for measurement of Probe on every injection. If the value of the back surge exceeds the maximum input voltage value of a measurement instrument connected to the Unit, take proper countermeasures to reduce influence of the back surge for protecting the instrument.

E High voltage input connector
Connects Probe to Main Unit.

F Protector
Protects receptacle to prevent injury, electric shock and so on. Install it while Probe is not used or when installing Probe.

9-4. Control Panel



① Polarity (+/-) Key

Selects polarity of electrostatic discharge.

② Up Down Key (▼▲ Key)

Changes value of selected colum. Value varies fast when you keep pushing the key.

③ CALL Key

Calls the stored setting (No.1~5).

④ TEST LEVEL Key

Changes to test level mode and calles prescribed values.

⑤ SWEEP Key

Long pressing makes the Unit into sweep mode status. Blinking while in seep mode.

⑥ EXT TRIG Key

Selects external trigger mode.

⑦ ESD Key

Selects setting items for testing (Voltage, Interval, Count).

⑧ STAGE Key **(***)**

Effective only when the optional probe stand (precision stage type) is connected.

Selects setting items of precision stage (Pin pitch, Pin count, Home position).

⑨ MANUAL Key **(***)**

Selects manual mode of precision stage.

⑩ MEASURE Key

Effective in stop status. Press the key to make it alight and make BNC terminal for measuremnet active.

⑪ START Key

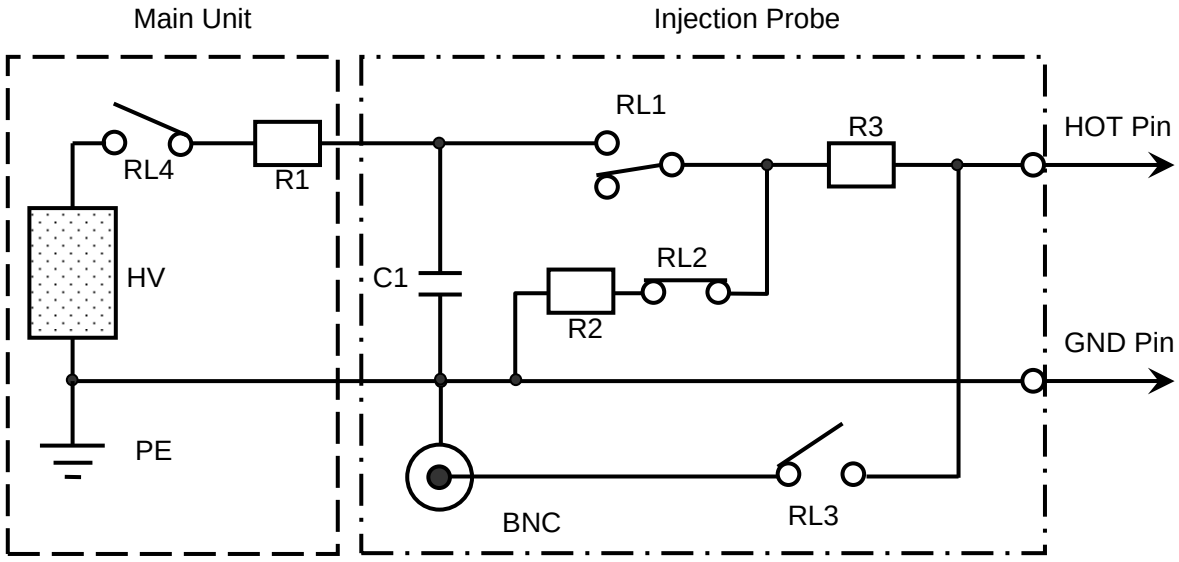
Starts electrostatic discharge.

⑫ STOP Key

Stops electrostatic discharge.

(***) Effective when the optional Probe stand (precision stage type) MODEL: 18-00076A is connected.

9-5. Block Diagram



Main Unit		Injection Probe	
HV	High Voltage power supply	C1	Charge capacitor HBM : 100pF MM : 200pF
R1	Charge resistor 10MΩ	R2	Elimination resistor 1MΩ
RL4	Charge relay	R3	Injection resistor HBM : 1.5kΩ MM : 0Ω
		RL1	Mercury Relay
		RL2	Elimination Relay
		RL3	Relay for MEASURE
		BNC	Terminal for MEASURE

10. CONNECTION

⚠WARNING 警告

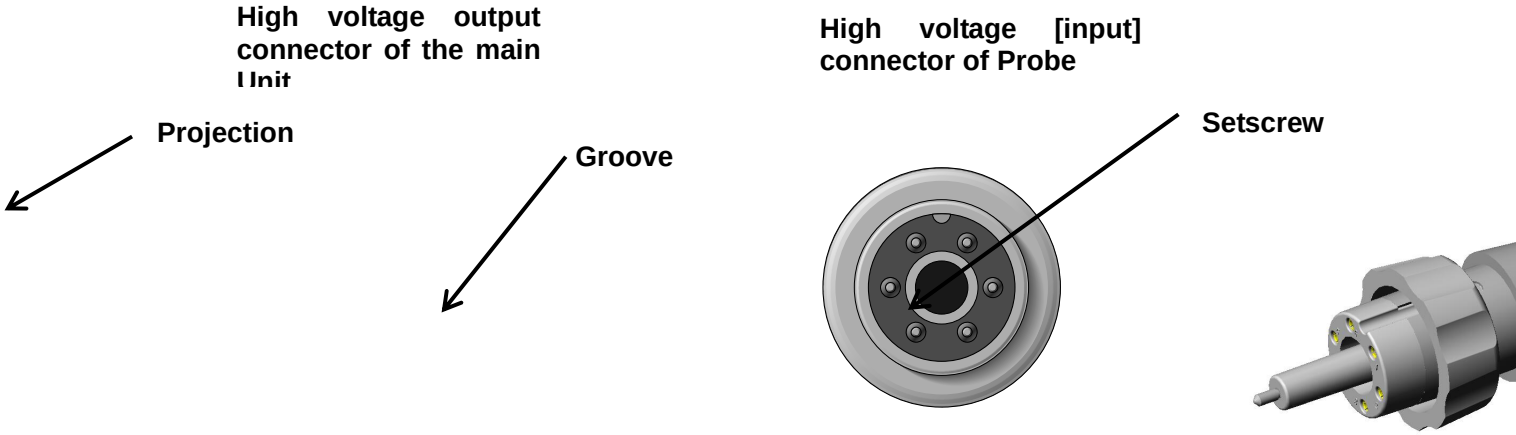
- **Be sure to turn OFF the Unit when connecting when setting or changing connection of related equipment (Probe, cables etc.).**
  The misuse may cause an electric shock, injury, or malfunction.
- **Do not put any substance into the Unit and connectors.**
  If metal or something flammable gets into the Unit through a vent or a connector, it may cause a fire or an electric shock.

⚠ CAUTION 注意

- **Use this test equipment only in combination of the Unit and Probe.**
  Do not use the Unit with some equipment except Probe.
- **Clean up the HV connectors periodically.**
  If dust gets damp between the HV input connector and the HV output connector, insulation capability deteriorates. It may result in a fire.
  Pull the HV input connector out from the HV output connector periodically 5 seconds after pulling the AC plug out from an outlet, and blow dehumidified air to the HV output connector to blow off dust. For the HV input connector, wipe it with a dry cloth to remove dust.
- **Do not pull the HV connector off with holding its cord.**
  A damaged cord may cause a trouble or a fire.
  Pull it off wit holding connector part.
- **Do not handle the AC plug or the high voltage input connector with your hand wet.**
  The misuse may cause electric shock or trouble.

10-1. Connecting Injection Probe

For injection probe, two types of probes, human body model (HBM) and machine model (MM) are prepared. Use the proper probe according to your test purpose. Be sure to turn OFF the Unit when you change Probe. When Probe is changed from HBM type to MM type, the voltage value of the Unit is designed to become to less than 0.8kV (maximum value in the machine model standard) to prevent destruction of DUT from happening.
Mate the groove of the high voltage (input) connector of Probe with the projection of the high voltage output connector of the main Unit and insert the former. Fix the joint by rotating the setscrew of the high voltage (input) connector of Probe clockwise.



⚠WARNING 警告

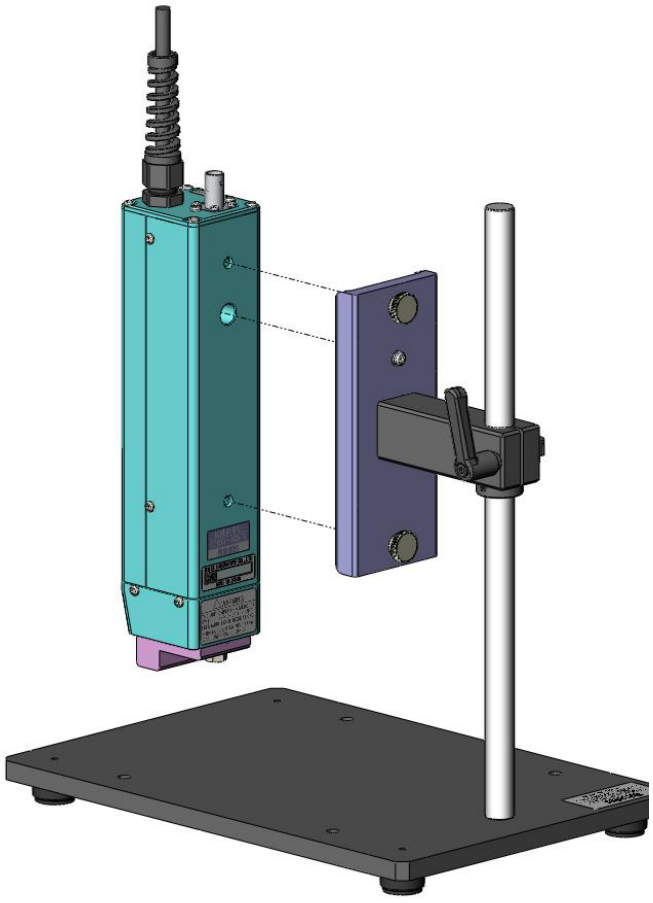
- **Put protector on Probe when it is installed and while it is not used.**
  Handling it without protector may cause an electric shock, injury, or damage.
- **Use Probe with right direction and right angle.**
  The misuse may cause electric shock or make operation of simulator impossible. Put the arrow sign (“↑UP SIDE”) displayed on Probe upward and keep Probe upright (Tilt: within 15 degree).

⚠ CAUTION 注意

- **Install Probe on to Probe stand securely.**
  If Probe falls off from Probe stand, it will be damaged.

10-2. Fixing Injection Probe

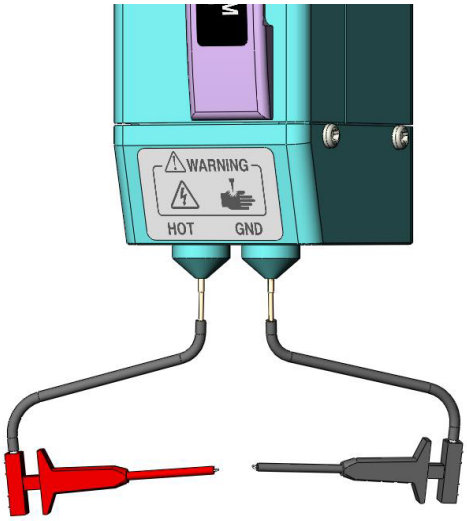
1) With protector putting on Probe’s receptacle, mate a hole at the center of rear side of Probe with a pin at the center of Probe holding part of Probe stand and fit the latter into the former calmly (A rubber ring is wound on the pin for preventing Probe from falling down). Tighten screws, an upper one and a lower one alternately, to fix Probe.
   (The figure as below shows free type Probe stand MODEL: 18-00075A.)



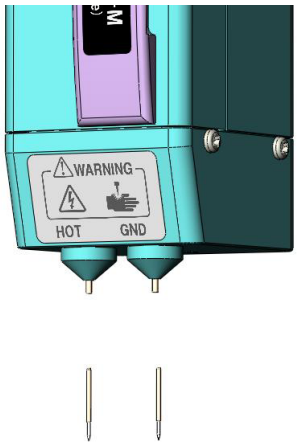
⚠ CAUTION 注意

- **Install the injection clip or injection pin straightly.**
  If not so, it may cause damage of it.

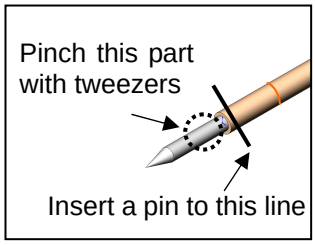
2) Take off protector from Probe and put the attached discharge clips or discharge pins on to HOT and GND of Probe. Discharge clips are attached to free type (18-00075A), and discharge pins to precision stage type (18-00076A). For inserting a discharge pin, pick up a pin with tweezers and insert it into receptacle until gold-plated plug part of the pin is hidden completely.



[Free type Probe stand]
MODEL: 18-00075A



[**Precision stage type Probe stand]**
MODEL: 18-00076A



10-3. Waveform Adjusting Card

⚠WARNING 警告

- **Be sure to turn OFF power supply of the Unit when exchanging waveform adjusting card.**
  The misuse may cause an electric shock.
- **Fix the card by screw after exchanging.**
  If the card is going about to fall off or if it falls off during test, it may cause an electric shock.

10-3-1. Standard Waveform Adjusting Card

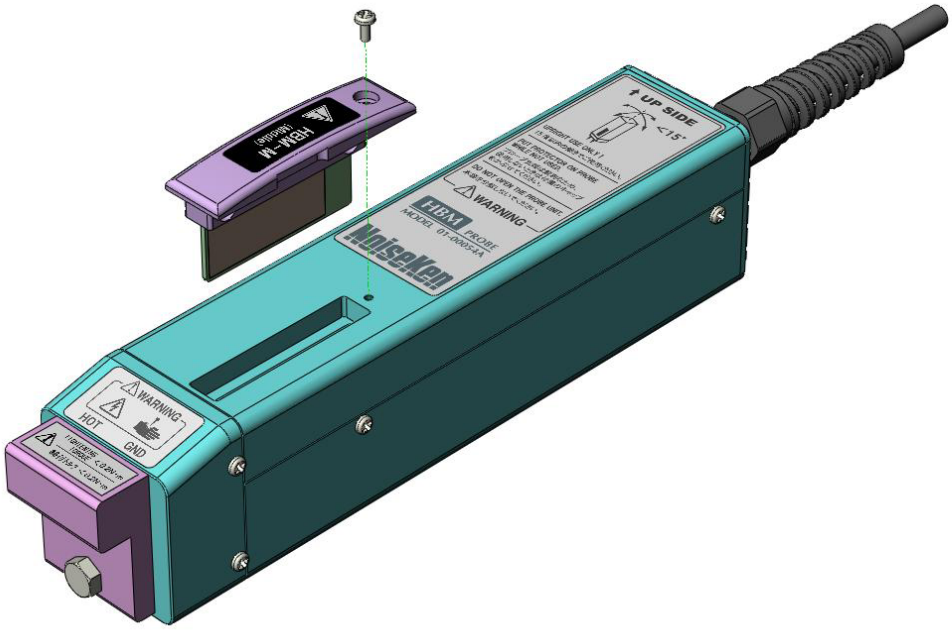
The standard waveform adjusting card is installed in shipment.

HBM Card	MM Card
HBM－M（Middle） Rise time: 4~6ns (Reference value)	MM－MF（Middle Frequency） Cycle: 75~83ns (Reference value)

10-3-2. Optional Card　MODEL：06-00064A

The waveform adjustment card set (option) enables to change parameters of waveform (e.g. rise time, cycle). Waveforms made with the optional set are not guaranteed in any test standard.

HBM Card	MM Card
HBM－F（Fast） Rise time: 2~4ns (Reference value)	MM－HF（High Frequency） Cycle: 69~75ns (Reference value)
HBM－S（Slow） Rise time: 6~8ns (Reference value)	MM－LF（Low Frequency） Cycle: 83~89ns (Reference value)



10-4. Connecting AC Cord

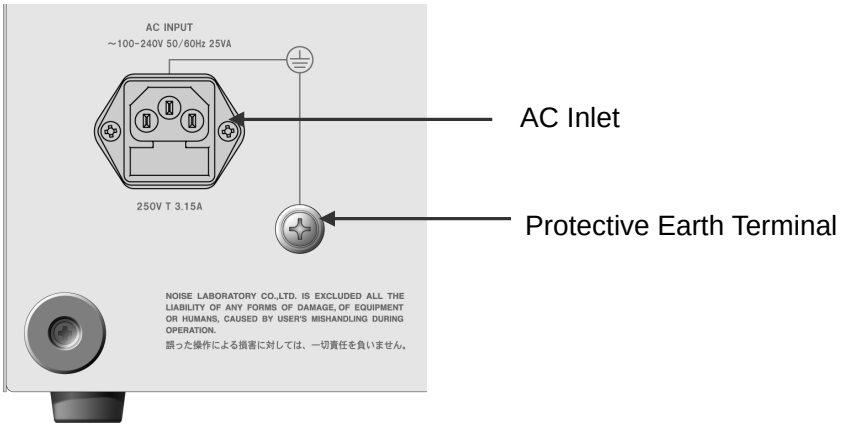
⚠WARNING 警告

- **Connect the protective earth of AC cord.**
  Using the Unit without connecting it may cause an electric shock.
- **Insert AC plug securely to the end.**
  Insecure inserting generates heat and gathers dust. It may result in a fire or an electric shock. Avoid using a multiple outlet extension plug for the same reason.
- **Do not use the attached AC cord for any other purpose.**
  The misuse may cause a fire or an electric shock.

⚠ CAUTION 注意

- **Clean up the AC plug periodically.**
  If dust gets damp between the AC plug and outlet, insulation capability deteriorates. It may result in a fire. Pull the AC plug out from an outlet periodically and wipe it with a dry cloth.
- **Do not handle the AC plug or the high voltage input connector with your hand wet.**
  The misuse may cause electric shock or trouble.

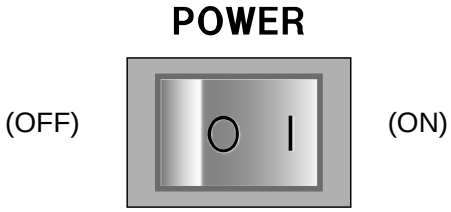
Insert an appropriate AC cord into the AC inlet on rear panel of the Unit. If the Unit can be grounded with AC cord, be sure to ground it with using protective earth terminal. Without grounding, high voltage might be generated internal of the Unit and cause an electric shock.



11.OPERATION

11-1. Power ON / OFF

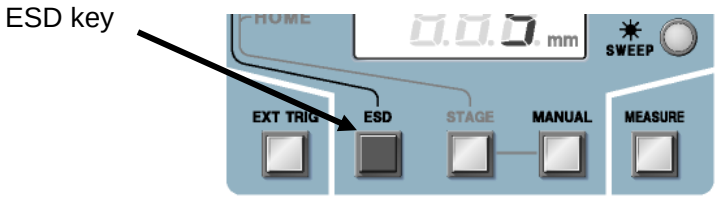
Turn on the Unit using power key on front panel and the previous setting is displayed on control panel (When the Unit is first used, the default setting is displayed). While power is ON, settings are displayed on front panel and LEDs are alight according to the setting. When the Unit is turned OFF, all of lights and displays on front panel will be turned off.



11-2. Setting Up Test Condition

11-2-1. Setting ESD Key

Set VOLTAGE, INTERVAL, COUNT when ESD key is alight.

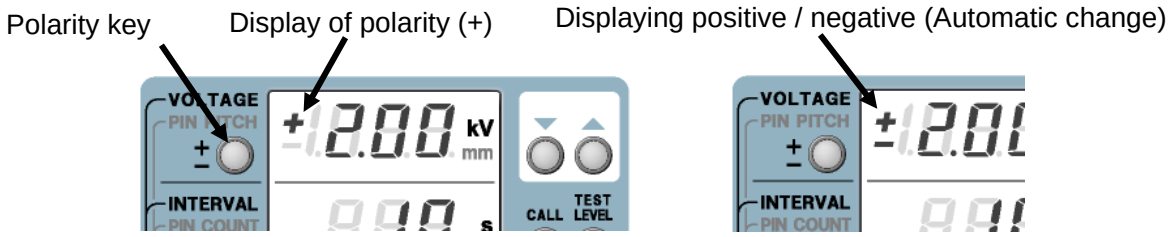


Press ESD key in STOP status and make ESD key alight. Values of VOLTAGE, INTERVAL, COUNT will appear in dispalys on control panel. The blinking value can be changed with Up Down key (▼▲). Each pressing of ESD key can change the blinking item in turn.

11-2-2. Setting Polarity

Select polarity of discharge with polarity key. Press it to make polarity + (positive) → - (negative) → ± (positive / negative automatic change).

Setting of polarity cannot be changed in START status.

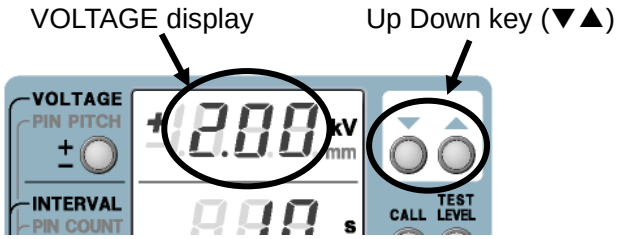


In case of positive / negative automatic change, both + and – are alight. In this mode, after pressing start key, positive discharges will be performed at first as many times as previously set, and then negative discharges will be performed as many also. Polarity will be switched automatically.

11-2-3. Setting VOLTAGE

11-2-3-1. Using Up Down Key

Press ESD key and make VOLTAGE display blinking. Set output voltage with Up Down key (▼▲). Continuous pressing of Up Down key makes cahnging faster. Setting of VOLTAGE can be changed in START status.



Available discharge voltages are as follows.

Model	Output Voltage (Max.)	Output Voltage (Min.)	Step
ESS-6002	2000V	10V	1V
ESS-6008	8000V	100V	10V

11-2-3-2. Using TEST LEVEL Key

The following output voltage can be set in turn with TEST LEVEL key. The Unit can recognize the type of Probe (HBM or MM) automatically.

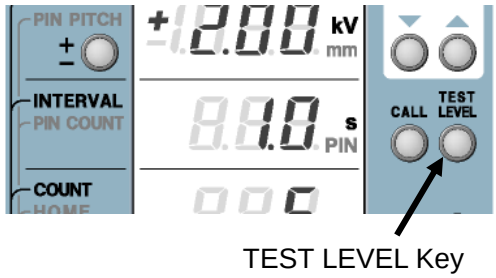
ESS-6002

Test Level	Human Body Model (HBM)	Machine Model (MM)
Level 1	250V	100V
Level 2	500V	200V
Level 3	1000V	400V
Level 4	2000V	800V

ESS-6008

Test Level	Human Body Model (HBM)	Machine Model (MM)
Level 1	250V	100V
Level 2	500V	200V
Level 3	1000V	400V
Level 4	2000V	800V
Level 5	4000V	---
Level 6	8000V	---

Every pressing of TEST LEVEL key calls a level higher voltage (toggle type).

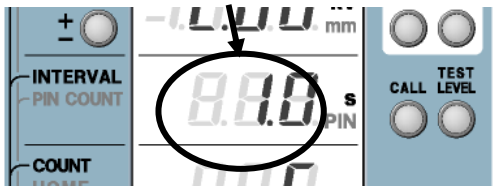


11-2-4. Setting INTERVAL

Press ESD key and make INTERVAL display blinking. Set INTERVAL value with Up Down key (▼▲). Continuous pressing of Up Down key makes changing faster. Set INTERVAL value is displayed in STOP status. In START status, the displayed value is decreasing step by step to show an approximate rest time to the next discharge. When test is complete or stopped with STOP key, buzzer beeps and the Unit returns to STOP status with the set INTERVAL value displayed again.

Set INTERVAL value cannot be changed in START status.

Value of INTERVAL



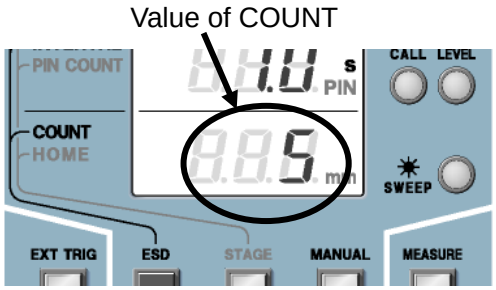
INTERVAL value can be set with 0.1s step to 10s, and with 1s step in more than 10s range.

11-2-5. Setting COUNT

Press ESD key and make COUNT display blinking. Set COUNT value with Up Down key (▼▲). Continuous pressing of Up Down key makes changing faster. Set COUNT value is displayed in STOP status. In START status, the displayed value counts down every discharge. When test is complete or stopped with STOP key, buzzer beeps and the Unit returns to STOP status with the set COUNT value displayed again.

Set COUNT value cannot be changed in START status.

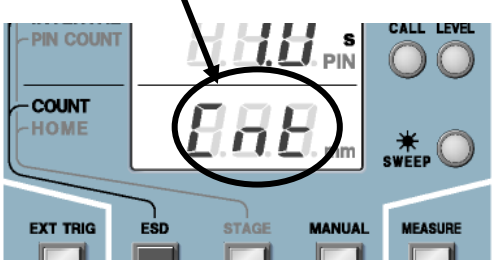
Value of COUNT



COUNT value can be set from 1 to 99 or continuous (“Cnt” on display).

For setting “Cnt”, press Down key (▼) when “1” is displayed.

Displaying “Cnt” (continuous discharge)



11-2-6. Setting EXT TRIG

EXT TRIG IN is an input terminal for external trigger signals.
A fall of TTL signal makes a trigger.

⚠ CAUTION 注意

- **Input voltage value should not exceed ±15V, because such high voltage may break internal circuits.**

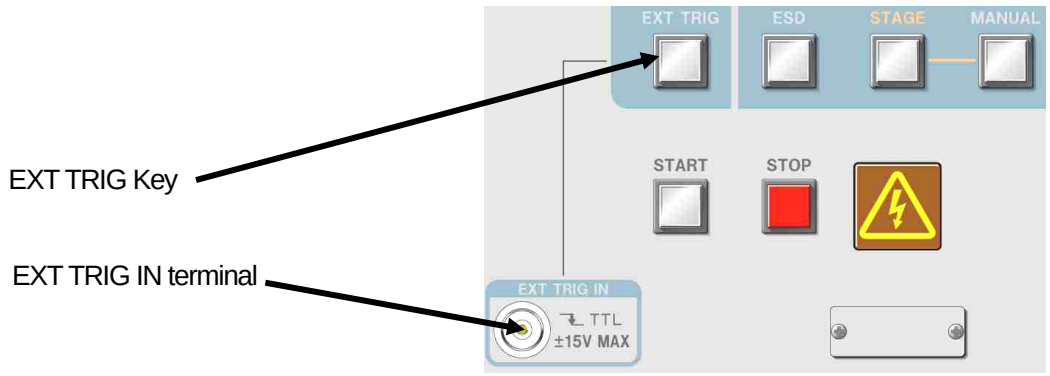
EXT TRIG is function that a fall of TTL signal input to EXT TRIG IN (coaxial connector) makes discharge start. When EXT TRIG key is pressed, the key is alight and shows EXT TRIG mode is selected. In this mode, after START key is pressed, discharge will start with a fall trigger.

When you do not use EXT TRIG mode, press EXT TRIG key and make its light off.

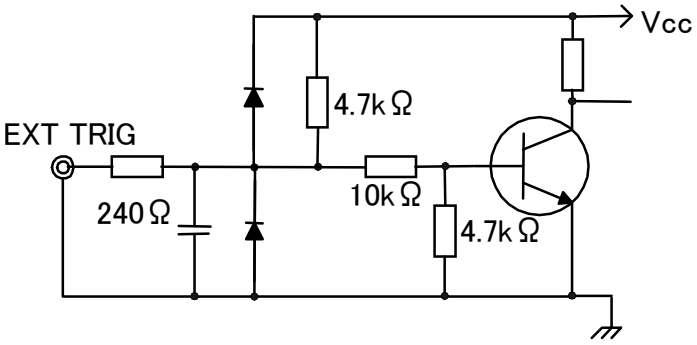
Setting cannot be changed in START status.

Specification of EXT TRIG IN Terminal

Function / Performance	
Connector	BNC Connector (female)
Input signal	TTL signal: A fall from HI to LOW 【LOW more than 100μs】or short-circuit between terminals
Rated Input	±15V Max



[EXT TRIG IN Circuit]



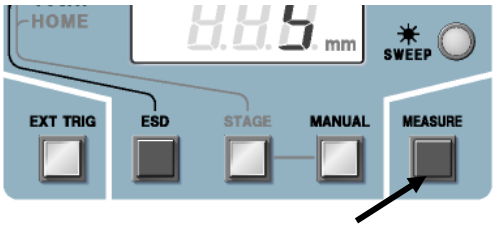
11-3. Setting Other Functions

11-3-1. Setting MEASURE

⚠WARNING 警告

- **When test is completed, leave the Unit in STOP status for more than 5 seconds.**
  Charged electricity is eliminated during the interval with discharge pin or clip connecting to DUT. As eliminating time varies according to characteristics of DUT, fully pay attention to safety with understanding characteristics of DUT. The mishandling may cause an electric shock or damage of peripheral equipment.

Press MEASURE key and make it alight. When the key is alight and the Unit is in STOP status, BNC terminal for measurement of Probe is effective. As the center contact of BNC is connected to HOT side of a receptacle, and outer metal of BNC to GND side, characteristic of DUT can be monitored with suitable measurement equipment connecting to BNC terminal for measurement.

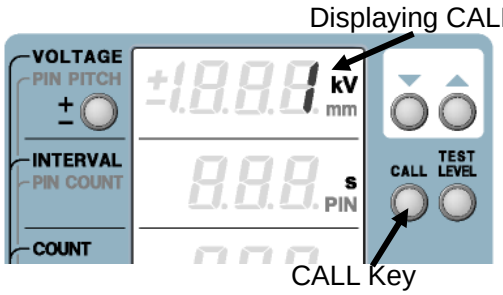


MEASURE Key

If START key is pressed in MEASURE ON status, the mode changes automatically to MEASURE OFF

11-3-2. Setting CALL

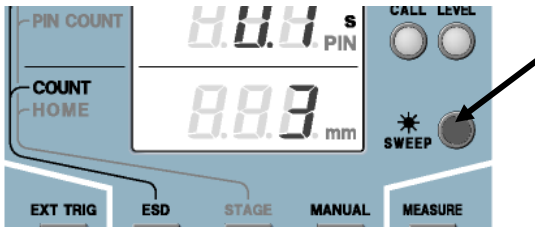
The Unit can save 5 kinds of settings (ESD settings and STAGE settings). Each setting can be called up in turn with displaying call number (1~5) and the setting is fixed after 1 second.
If ESD setting or STAGE setting of a specific call number is changed after call number is fixed, settings will be overwritten automatically.



CALL Key

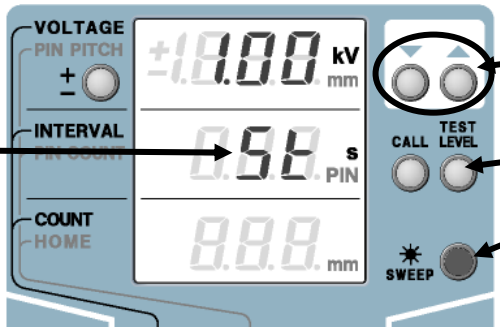
11-3-3. Setting SWEEP

"SWEEP" is function that when St (Starting voltage), End (End voltage), StP (step voltage) are set, the Unit performs a series of discharges automatically with varying discharge voltage varying from St to End at StP step. Long pressing of SWEEP key (approximate 2 seconds) makes the Unit into SWEEP setting mode. SWEEP key blinks in SWEEP setting mode.



SWEEP Key (Blinking in SWEEP setting mode)

Set St at first. Set starting voltage with Up Down key (▼▲) or TEST LEVEL key and press SWEEP key.



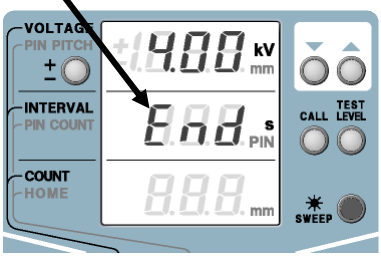
Displaying St (Starting voltage) setting mode selected

Up Down Key (▼▲)

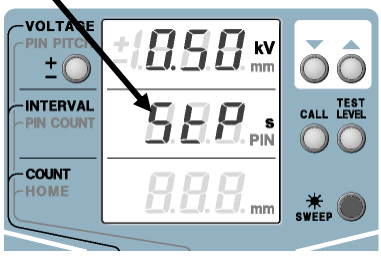
TEST LEVEL Key

SWEEP key

Displaying End (End voltage)



Displaying StP (Step voltage)



Set End and StP as the above procedure. Press SWEEP key after each setting.

In the above example shown by 3 screens, the Unit performs a series of discharges from 1.00kV to 4.00kV at 0.50kV step. (The above example is of ESS-6008.)

To suspend SWEEP setting, press any key except Up Down key, SWEEP key, and TEST LEVEL key..

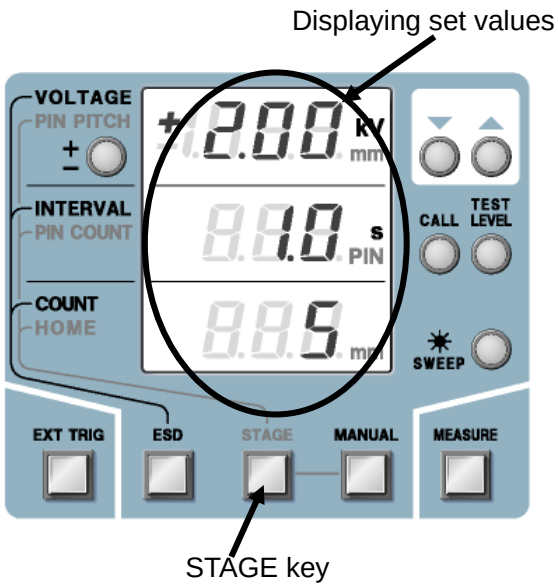
Polarity (positive/negative) automatic change is available in this function. In the above example, the Unit discharges 1.00kV at positive at first, then discharges –1.00kV and varies discharge voltage, performs positive and negative discharge in turn at 0.50kV step to 4.00kV.

SWEEP setting is saved automatically under each CALL number.

11-3-4. Setting STAGE

STAGE key is used for selecting setting items of Probe stand (precision stage type) MODEL: 18-00076A. The key is effective only when 18-00076A is connected to the Unit.

Press STAGE key in STOP status to make it alight. Values of STAGE setting items, PIN PITCH (interval between pins), PIN COUNT (the number of pins), HOME (home position), are displayed. Pressing STAGE key changes the item to be set. A blinking value can be changed using Up Down key (▼▲).



11-4. TRIG OUT

⚠ CAUTION 注意

- **Do not input voltage to TRIG OUT terminal.**
  The misuse may cause failure.

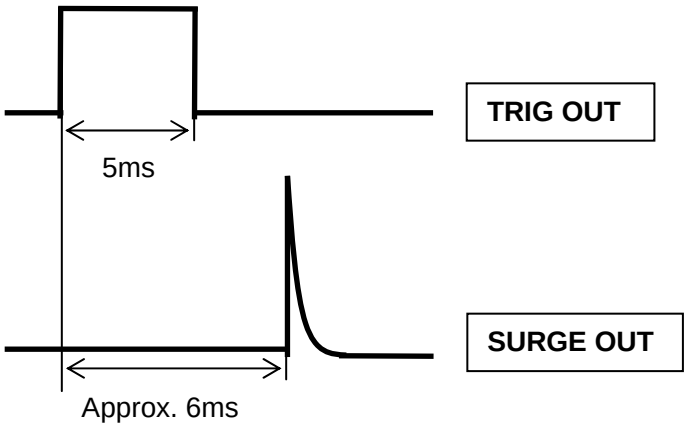
From TRIG OUT coaxial connector, TTL signal is output synchronized with driving moment of the mercury relay (timing of discharge).

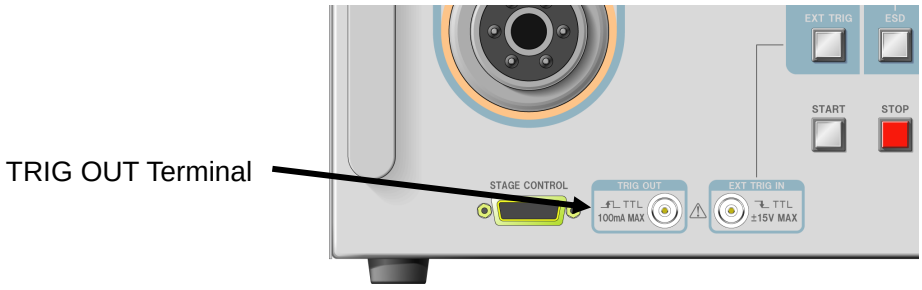
Specifications of TRIG OUT terminal

Function / Performance	
Connector	BNC Connector (female)
Output signal	TTL signal HI 5ms
Output impedance	50Ω

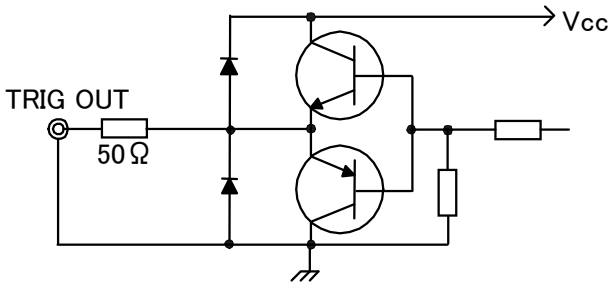
As the relay is mechanical type, the electrostatic discharge is output approximate 6ms(*) after the rise edge of TRIG OUT output..

(*) The length of the period slightly varies according to difference of performance among relays.





[EXT TRIG OUT Circuit]

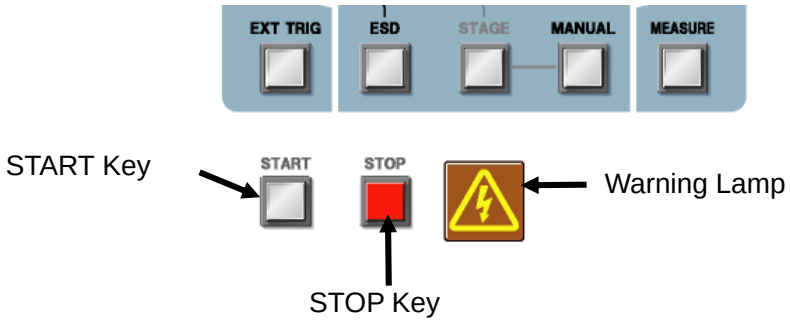


11-5. Finishing Test

⚠WARNING 警告

- **When test is complete, leave all related equipment as is for more than 5 seconds.**
  During this period, charged electricity of DUT is eliminated with discharge pins or clips kept connected to DUT. As a necessary time for eliminating varies depending DUT, take DUT's characteristics into fully consideration. Insufficient aging time may cause an electric shock or damage of peripheral equipment.

Test finishes when the Unit performs as many discharges as set previously using COUNT function. If continuous mode is selected ("Cnt" displayed on COUNT), test never stops as long as STOP key is not pressed. Pressing STOP key can stop test forcibly. Internal high voltage power supply is turned off and warning lamp is put out. START key is unavailable for 2 seconds after stopping.



11-6. Starting Test

⚠ CAUTION 注意

- **Leave Probe ageing for 1 minute before starting test.**
  Malfunction may occur without a mercury switch ageing.
  Fix Probe (with protector on it) on to Probe stand, set interval 0.3s on control panel, and press START key. The relay operating sound is heard from Probe. Leave Probe as is for 1 minute for ageing. Be sure to put the protector on Probe to avoid an electric shock.
- **Do not inject electrostatic discharge to the Unit itself.**
  The misuse may cause trouble.

Press START key and test will start with warning lamp blinking.

If EXT TRIG key is alight (external trigger mode is selected), an external trigger signal after pressing START key will make test start.

12. SPECIFICATIONS

12-1. Main Unit

ITEMS	SPECIFICTIONS
Output voltage	10～2000V±10%（ESS-6002）1V step 0.10～8.0kV±10%（ESS-6008）10V step
Polarity	Positive / Negative
Repetition cycle	0.3～99s±10% ~10s: 0.1s step, 10s~: 1s step
Injection time	1～99 times / Continuous
EXT TRIG IN	±15V Max, BNC coaxial connector TTL signal: A fall from HI to LOW 【LOW more than 100μs】or short-circuit between terminals
TRIG OUT	Output impedance 50Ω, TTL HI pulse 5ms BNC coaxial connector
Stage control	Controlling with optional Probe stand, precision stage type, MODEL: 18-00076A connecting D sub connector
Interlock	Test is stopped when the connection between terminals is open (Short bar is attached in shipment.).
Power supply	AC100～240V, 50Hz／60Hz ±10%
Fuse	250V F 2A 2 pieces (incorporated in the inlet part)
Power consumption	25VA
Operating temperature	15～35℃
Storing temperature	-10～50℃
Operating humidity	25～75%RH（without dewing）
Storing humidity	0～85%RH（without dewing）
Dimensions	(W)340×(H)199×(D)300mm (without projections)
Weight	Approx. 6kg

12-2. Injection Probe (Common)

ITEMS	SPECIFICTIONS
Waveform adjusting card	Standard type is installed in shipment. For details, refer to “10-3. Waveform Adjusting Card”. Waveforms made with the optional set are not guaranteed in any test standard.
MEASURE terminal (BNC terminal for measurement)	Enables to measure DUT status before/after testing with connecting measurement instrument. BNC coaxial connector
Protector	Protects receptacle to prevent injury, electric shock, damage of Probe, etc, Installed in shipment.

Notice: As the mercury relay incorporated in Probe is a mechanical relay, the output waveform around 100V~250V may sometimes become unstable.

12-3. Human Body Model (HBM) Injection Probe MODEL:01-00054A

ITEMS	SPECIFICTIONS
Operating temperature	15～35℃
Storing temperature	-10～50℃
Operating humidity	25～75%RH（without dewing）
Storing humidity	0～85%RH（without dewing）
Dimensions	(W)50×(H)242×(D)54mm (without projection)
Weight	Approx. 760g
CR	C: 100pF±10%, R: 1.5kΩ±1%
Load for calibration	Short ：18AWG tin-gilded wire 500Ω ：±1% Non-inductive resistance

CONDITIONS	ITEMS	CALIBRATION VOLTAGE / SPECIFICATIONS					
		250V	500V	1000V	2000V	4000V	8000V
Short	Peak current (Ips)	0.17A ±10%	0.33A ±10%	0.67A ±10%	1.33A ±10%	2.67A ±10%	5.33A ±10%
	Rise time (Trs)	2～10ns					
	Decay time (Tds)	130～170ns					
	Ringing Current (Irs)	Less than 15% of Ips					
500Ω	Peak current (Ipr)		0.25A +10%/-25%	0.5A +10%/-25%	1.0A +10%/-25%	2.0A +10%/-25%	
	Ipr / Ips **※1**	≧63%					
	Rise time (Trr)	5～25ns					
	Decay time (Tdr)	200ns±40ns					
	Ringing Current (Irr)	Less than 15% of Ipr					

※1: Conforming to ESDA ANSI/EOS/ESD-STM5.1-2001
Waveform is assured at the tip of an injection clip or an injection pin.
Conforming Standard

Human body model (HBM) test
MIL-STD-883F 3015.7 Mar.1989
ESDA ANSI/EOS/ESD-STM5.1-2001
JEITA EIAJ ED-4701/300 Aug.2001
Test Method304
IEC 61340-3-1Ed.1.0 2002
IEC 60749-26 Ed.1.0 2003
AEC-Q100-002-Rev.D Jul.2003
JEDEC JESD22-A114D Mar.2006

Notice: As the mercury relay incorporated in Probe is a mechanical relay, the output waveform around 100V~250V may sometimes become unstable.
The mercury relay incorporated in Probe is an expendable component. Lifetime of it is dependent on conditions and environment.

12-4. Machine Model (MM) Injection Probe MODEL:01-00055A

ITEMS	SPECIFICTIONS
Operating temperature	15～35℃
Storing temperature	-10～50℃
Operating humidity	25～75%RH（without dewing）
Storing humidity	0～85%RH（without dewing）
Dimensions	(W)50×(H)242×(D)54mm (without projection)
Weight	Approx. 760g
CR	C: 200pF±10%, R: 0Ω
Load for calibration	Short ：18AWG tin-gilded wire 500Ω ：±1% Non-inductive resistance

CONDITIONS	ITEMS	CALIBRATION VOLTAGE / SPECIFICATIONS			
		100V	200V	400V	800V
Short	1st Peak current (Ip1)	1.75A ±10%	3.15～3.80A	7.0A ±10%	14.0A ±10%
	2nd Peak current (Ip2)	67～90% of Ip1			
	Cycle (tpm)	66～90ns			
	Ringing current (Irs)	Less than 30% of Ip1			
500Ω	Peak current (Ipr)			0.85～1.1745A	
	Current after 100ns (I100ns)			0.29A ±10%	
	Current after 100ns (I200ns)			35～45% of I100ns	

Waveform is assured at the tip of an injection clip or an injection pin.

Conforming Standard

Machine model (MM) test
JEDEC JESD22-A115A Oct.1997
ESDA ANSI/ESD STM5.2-1999
JEITA EIAJ ED-4701/300 Aug.2001
Reference Test Method
IEC 61340-3-2 Ed.1.0-2002
IEC 60749-27 Ed.1.0 2003
AEC-Q100-003-REV-E Jul.2003

Notice: As the mercury relay incorporated in Probe is a mechanical relay, the output waveform around 100V~250V may sometimes become unstable.

The mercury relay incorporated in Probe is an expendable component. Lifetime of it is dependent on conditions and environment.

13. WARRANTY

Services

The following terms are applicable to the services provided by the Company to maintain and repair the Unit.

1. Scope

   The Unit and accessories and options provided by the Company are covered under this section.

2. Technical Service Fee

   Any repairs provided by the Company during the warranty period will be free of charge in accordance with the Limited Warranty. After expiration of the warranty period, actual cost for the repair will be charged to the user.

3. Ownership of Defective Parts

   All the defective parts replaced during the warranty period become the property of the Company. For paid repairs, they also become the property of the Company unless otherwise directed by the user.

4. Maximum Compensation

   In the event the user incurs damage due to malfunction of the Unit arising solely from the negligence and/or improper repair on the part of the Company, the Company will compensate for the damage. The maximum compensation amount shall be limited to the amount paid by the user at the time of purchase of the Unit. In no event, shall the company be liable or in any way responsible for incidental or consequential damages such as loss of profit or third party's claims to the user.

5. Wrong Parts, Missing Parts and Damage

   The company shall not be liable for loss of profit, business interruption, other incidental damage, special loss, punitive damage or third party's claims to the user directly or indirectly arising from suspension of testing activities due to wrong parts, missing parts, or damage of the Unit.

6. Service Refusal

   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

In the event of failure during the warranty period, the Unit will be repaired or replaced free of charge. Decision of the repair method shall be left at the discretion of the Company. This limited warranty is applicable in Japan only.

1. Scope

   This warranty is applicable only to the Unit and its accessories.

2. Warranty Period

   One year from the date of delivery.

   For a location once repaired, the warranty period for same parts / same problems is 6 months from the time of repair completion.

3. Exceptions

   Regardless of the above, following will be excluded from the warranty.

   - ✧ Consumable parts replacement, including High Voltage Relay (if used)
   - ✧ Failure caused by negligence, or damage to the Unit.
   - ✧ Failure due to modifications made without the Company's authorization.
   - ✧ Failure due to repairs made by personnel not authorized by the Company.
   - ✧ Failure directly or indirectly arising from force majeure including but not limited to, acts of god, fire, war, rebellion and others.
   - ✧ Failure due to shipping, vibration, falling, or impact shock after delivery
   - ✧ Failures due to use of the Unit under the improper environment.
   - ✧ When the Unit is taken out of the country

14. 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 the 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 the Unit and Probe.

15. NOISE LABORATORY SUPPORT NETWORK

- If a symptom which seems a trouble is found, inform the model name and serial number of the product together with the symptom to Noise Laboratory or your nearest sales agent of Noise Laboratory.
- When the product is returned to Noise Laboratory, write the state of the trouble, contents of your request, model name and serial number in a repair order, and pack the product and repair order sheet in the former package of equivalent suitable for transit and send them back.

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