

NoiseKen

INSTRUCTION MANUAL

IMPULSE NOISE SIMULATOR

MODEL INS-S420

NOISE LABORATORY CO., LTD.

Edition 1.00
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1. IMPORTANT SAFETY PRECAUTIONS

This manual contains important information pertaining to the operation and maintenance of your Impulse Noise Simulator Model: INS-S420 (hereinafter "the Simulator"). In order to obtain the highest performance from the Simulator, it is recommended that the contents of this manual be thoroughly understood and used as ready reference for operation and maintenance.

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.

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

It may result in a fatal or serious accident.

- **The supplied AC power cable of the instrument is intended only for Japan and North America.**

In case of using the instrument in other countries than the above, use an AC power cable that is certified for use under the safety rules of the country in which the instrument is being used.

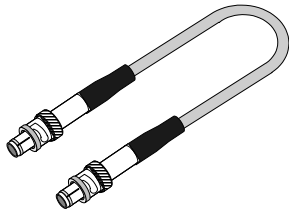
- **The simulator cannot be used in an explosive area, fire prohibited area, etc.**

Use of the simulator 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

2. INCLUDED ACCESSORIES

The following items are enclosed in the package. Check them when opening the package.



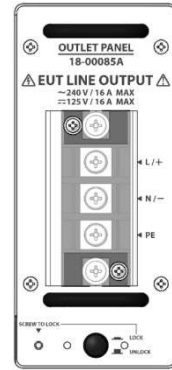
A



B



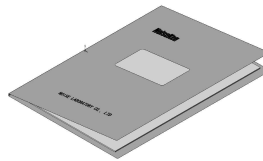
C



D



E



F



G

Description		Quantity	Note
A	Coaxial cable	2	30cm length 02-00155A
B	SG short plug	1	02-00106A
C	SG cable	1	05-00103A
D	Outlet panel (Terminal block type)	1	18-00085A
E	AC cable	1	AC100-115V 3-p, 2.5m
F	Instruction manual	1	
G	Bag	1	

3. APPLICATION FORM FOR INSTRUCTION MANUAL

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

We place an order for an instruction manual.

Model Name

INS-S420

Serial No.

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Applicant Address

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.

To: Noise Laboratory Co., Ltd.

1-4-4 Chiyoda Chuo-ku Sagamihara City,

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Tel: +81-(0)42-712-2051 Fax: +81-(0)42-712-2050

Outline

Outline

4. PREFACE

We thank you very much for your purchase of our Impulse Noise Simulator INS-S420 ("the Simulator"). This instruction manual ("the Manual") contains how to use the Simulator and other important information. In order to obtain the highest performance from the Simulator, thoroughly understand the contents of the Manual and use as ready reference for operation

-
- **The Manual will help operators handle and utilize the Simulator in safety.**
 - **Keep the Manual in a place where it is readily available.**
-

4-1. Feature

The Simulator generates fast rise time square wave pulses and couples them to the power supply lines of the EUT for noise testing purpose.

- Generates pulses of less than 3ns rise time up to 4kV.
- Selectable pulse widths from 50ns to 1000ns at a step of 50ns.
- Selectable pulse repetition from 10ms to 999ms at a step of 1ms.
- Selectable test time from 1s to 999s at a step of 1s.
- Square wave high-voltage pulse can be injected to EUT power line. The injection method between normal mode and common mode can be easily switched.
- EUT power-capacity for testing: Single phase AC240V 16A and DC65V 16A.
- Generates high voltage pulses synchronized with EUT power line frequency. Synchronization phase angle can be controlled from 0 to 360 degrees.
- Capability for a single pulse by using the manual trigger and for synchronization with external signals.
- Built-in terminator.
The connection/disconnection of this terminator can be easily selected with the connection of the coaxial cable.
When the terminator is not connected, the pulse voltage can be output up to about 8kV (no waveform specification).
- Injection unit is optionally available and operation in synchronization with the relevant supply is also available.
- Optionally provided are radiation probes, coupling clamps and others.



For details about each option, *P. 58 "OPTIONAL PRODUCTS"*.

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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 Simulator or related equipment is operated incorrectly.



DANGER

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



WARNING

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



CAUTION







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 Simulator or related equipment is handled incorrectly.

6–2. Symbols of Instruction, Warning and Caution


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


	Indicates attention (a matter that must be paid attention fully)		
	Indicates prohibition (an action that must not be taken)		
	Indicates a compulsory action (an action that must be taken)		

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


	<p>Noticing possibility of an electric shock It indicates that there is possibility of an electric shock.</p>
	<p>Noticing caution, warning and danger It indicates that there is a possibility of harm or physical damage if the Simulator is or related equipment is handled incorrectly and that the Manual should be referred.</p>
	<p>It indicates warnings for electric shock etc. and the Manual should be referred.</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. 感電の危険あり、カバーを外さないこと。</p>	<p>Notifying danger of electric shock and the Manual should be referred.</p> <p><u>Warning</u> To reduce the risk of electric shock, do not remove cover.</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. 誤った取扱いによる損害に対しては、一切責任を負いません。</p>	<p>Notifying danger of electric shock and the Manual should be referred.</p> <p><u>Caution in handling</u> 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>
 <p>DANGER HIGH VOLTAGE!! NEVER TOUCH ANY CONNECTOR AND SG TERMINAL DURING OUT THE PULSE!! 高電圧危険!! パルス発生中はコネクタやSG端子に絶対に触れないこと!!</p>	<p>Notifying danger of electric shock and the Manual should be referred.</p> <p><u>Warning</u> Danger high voltage !! Never touch any connector and SG terminal during out the pulse!!</p>


6-3. Danger


 Do not disassemble	<p>Do not take the Simulator apart or do not remodel. Do not open the cover.</p> <p>Imminent danger might occur resulting in death or serious injury. Repair, internal adjustment, and inspection of the Simulator should be performed by a qualified service engineer. Ask the Company or its sales agent.</p>
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 Prohibited	<p>Do not use the Simulator in an explosive are or fire-prohibited area etc.</p> <p>Use of the Simulator in such an area is liable to cause combustion or ignition.</p>
	<p>A person who has a pacemaker on should not operate the Simulator and also should not enter the area where it is operating.</p> <p>It may result in a fatal or serious accident.</p>

6-4. Warning


 Compulsory	<p>Stop operation if following unusual phenomena should occur.</p> <ul style="list-style-type: none"> ○ 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.) <p>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.</p>
	<p>Insulate and protect the test facility against 8000V* (Max. output voltage of the Simulator).</p> <p>If the test facility is not so insulated and protected, there is the dangerous possibility of an electric shock, leak or fire</p> <p>* When the 50Ω terminator is not connected: The maximum output at 50Ω termination is 4000V.</p>
	<p>Turn off power supply of the Simulator when setting or changing connection of related equipment.</p> <p>The misuse may cause electric shock, injury, or malfunction.</p>
	<p>Be sure to turn off power supply for EUT when connecting EUT to the Simulator.</p> <p>The misuse may cause electric shock, injury, or malfunction.</p>
	<p>Use a proper EUT power supply equipped with protection network enough for EUT's current capacity.</p> <p>EUT line of the Simulator does not have any protection network against over current. Connect an appropriate EUT power supply which has protection network (circuit breaker, fuse, etc.) to the input terminal of EUT line. If you fail to follow this precaution, the equipment or test facilities may be broken or be in danger.</p>


 Compulsory	<p>Do not supply over-rating power to EUT Line input terminal.</p> <p>Do not supply over-rating power to EUT line. The misuse may cause a damage of equipment or a fire. The rating of input is; Maximum voltage: AC240 V, DC125 V, Maximum current 16 A;</p>
	<p>Use the Simulator after understanding instructions in the Manual fully.</p> <p>There may be danger causing a fatal or serious wound or emitting over-ristricted-value electromagnetic noise in using the Simulator. NOISE LABORATORY and its sales agents shall have no liability against any accident resulting in injury or death, any damage to equipment or any resultant damage thereof, which is caused by abuse or careless handling of the Simulator.</p>
	<p>Watch equipment while the Simulator is operating.</p> <p>If this instruction should not be followed, a third person or equipment related to the test may be exposed to a danger.</p>
	<p>Supply power within the indicated range (AC100 V to 240 V).</p> <p>The misuse may cause an electric shock or a fire. The supplied AC cord in the accessory is for AC100~120 V. Prepare a proper 3-line AC cord with a protective earth pin conforming to the local safety standard in using with AC220~240 V power supply.</p>
	<p>Use proper connectors and cables and connect them securely.</p> <p>Avoid using a damaged connector or cable. The misuse may cause an electric shock or damage of equipment.</p>
	<p>Insert AC plug securely to the end.</p> <p>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.</p>
	<p>Install the Simulator on a stable place.</p> <p>If the Simulator is installed on an unstable place, human body may be in danger due to drop or overturn of the Simulator.</p>
<p>Connect the protective earth of AC cord.</p> <p>Using the Simulator without connecting it may cause an electric shock.</p>	


 Prohibited	<p>Do not use the Simulator for any other purpose than Impulse noise test.</p> <p>The misuse may result in an electric shock, an injury, or damage of equipment.</p>
	<p>Do not put any substance into the Simulator or its connectors.</p> <p>If some metal or flammable things are put into the Simulator through a connector or a vent, it may result in a fire or an electric shock.</p>
	<p>Do not install the Simulator on the spot where quick operation of power key or STOP key is difficult.</p> <p>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.</p>

 Prohibited	<p>Do not use the supplied AC cord for any other purpose.</p> <p>The misuse may result in a fire or an electric shock.</p>
	<p>Do not damage AC cord.</p> <p>A damaged AC cord may cause a fire or an electric shock. For HV cable, be sure to take notice following points.</p> <ul style="list-style-type: none"> ○ Do not modify 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.
	<p>Do not touch the HV coaxial connectors and SG terminal when the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT.</p> <p>The misuse may result in a fire or an electric shock.</p>

6-5. Caution

 Compulsory	<p>Take actions against emission of electromagnetic waves.</p> <p>When a test is performed using the Simulator, a great amount of electromagnetic waves are emitted according to the type of EUT, sometimes adversely affecting the neighboring electronic equipment and radio communication apparatus. The user is required to provide a Faraday cage, shield room, shielding cable, etc. as necessary.</p>
	<p>Connect EUT power supply only to EUT LINE input terminal.</p> <p>If EUT power supply is connected directly to PULSE OUT connector, EUT FAIL input terminal, or other parts of the Simulator.</p>
	<p>If dewing occurs, fully dry up the Simulator before using it.</p> <p>Dews may cause an electric shock, a trouble, a fire.</p>
	<p>Use the Simulator in proper environment.</p> <p>Operating temperature range is 15~35°C. Operating humidity range is 25~75%. If these precautions are not followed, the Simulator may be broken or the prescribed performance may not be warranted.</p>
	<p>Clean up the AC plug periodically.</p> <p>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.</p>

 Compulsory	<p>Clean up PULSE OUT connector periodically.</p> <p>If dust gets damp in PULSE OUT connector, insulation capability deteriorates. It may result in a fire. Clean up PULSE OUT connector periodically. Be sure to pull the AC cord out from the outlet to make the Simulator turning off before cleaning and blow dehumidified air to PULSE OUT connector to blow off dust.</p>
	<p>When the body is dirty, wipe the body with a dry cloth.</p> <p>Do not wipe the Simulator 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.</p>
	<p>Make hazardous labels always noticeable.</p> <p>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.</p>

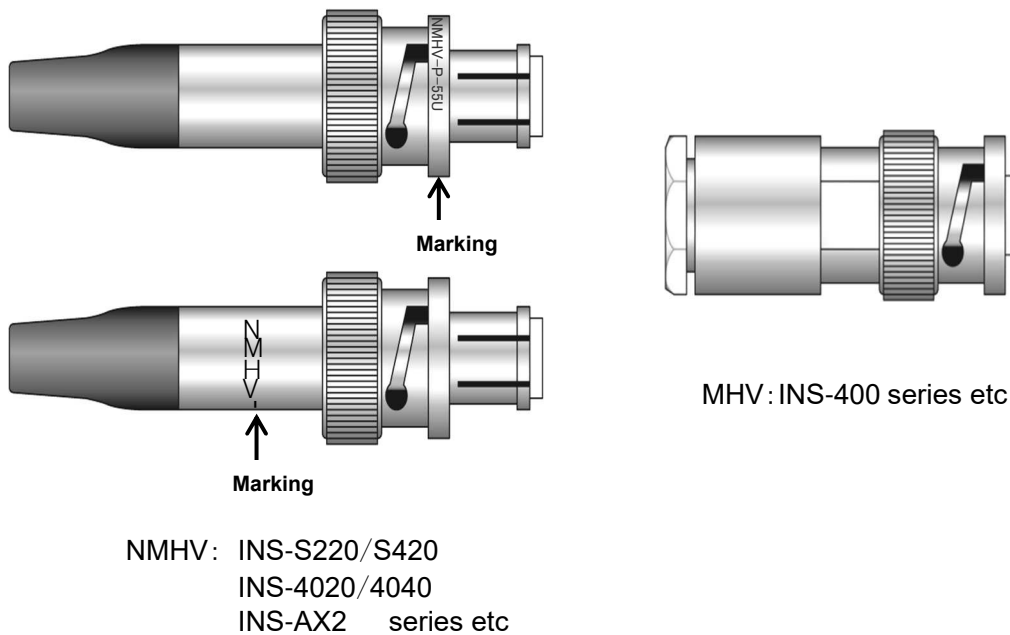
 Prohibited	<p>Do not install the Simulator on following places.</p> <p>Setting up the Simulator on wrong places as follows may result in a fire, an electric shock, or an injury.</p> <ul style="list-style-type: none"> ○ A very humid or dusty place ○ A hot place, e.g. a place exposed to direct rays of the sun, a place close to a heater. ○ A place easy to bedew, e.g. a place close to a window.
	<p>Do not block a vent or do not use the Simulator in a place poorly ventilated.</p> <p>If a vent is blocked, the internal heat is close. It may cause a fire. For ventilation, be sure to take notice following points.</p> <ul style="list-style-type: none"> ○ Do not lay the Simulator on its back, sideways, or upside down. ○ Do not put the Simulator into a small, poorly ventilated place. ○ Keep the Simulator at least 10cm away from a wall or some substance.
	<p>Do not handle the AC plug with your hand wet.</p> <p>The misuse may result in an electric shock or trouble.</p>
	<p>Do not put any container containing water on the Simulator.</p> <p>If water is spilled or gets into the Simulator, it may result in a fire or an electric shock.</p>
	<p>Do not drop or shock the Simulator excessively.</p> <p>The misuse may cause trouble or damage.</p>
	<p>Do not bump or rub the Simulator against something hard.</p> <p>The misuse may damage a surface of the Simulator.</p>
	<p>Do not put any heavy thing or sit on the Simulator.</p> <p>The misuse may result in a dent on the body or damage of internal components.</p>

7. Coaxial connectors used for this product

The coaxial connectors used for the Simulator is of NoiseKen original design. Use of other type of connectors may cause electric shock hazards or malfunctions of the Simulator. Be sure to use accessories and options supplied by our company.

We have updated coaxial connector specifications to match the output pulse voltage from the NoiseKen INS. This product (INS-S420) uses a custom design connector called NMHV which our company designed for 3kV or higher voltage application. In the market, there are some other types of coaxial connectors similar to the NMHV. Even when they have similar appearances, they are different from the NMHV in terms of the inner conductor projection and length of the insulator. Misconnection of a different type of connector to the NMHV may cause internal discharges, leading to an unexpected shock hazard or a failure of this product. For avoiding this kind of misuse, a marking of "NMHV-P-55U" is given Connector body or on the fringe of the leading edge of a connector lock. If NMHV connectors have been mixed up with other types of connectors, discriminate NMHV connectors and use them only. Before adoption of the NMHV, our company used the other type connector called MHV for INS-400 series (2kV pulse output) such as model INS-410, INS-420 etc. and their options. The MHV connector cannot be used for this product (INS-S420) for the above mentioned reason. The NMHV and MHV connectors are quite different in appearance and thus they can be easily identified.

When using an injection unit, check the connector type and use accessory and cables supplied by our company.



8. CAUTION ABOUT EXPENDABLE SUPPLIES

- Coaxial cable and high-voltage coaxial connector
 - The high-voltage coaxial cable (incorporated in the Simulator) and high-voltage coaxial connector (external) are consumable supplies
 - Check the high-voltage coaxial cable and high-voltage coaxial connector with an insulation-resistance tester every half-year or when they are used for about 200 hours. When the performance drops below DC1000V/100MΩ, change them for new ones.
 - If it is necessary to change, please ask Noise Laboratory or its distributor/agent closest to you for replacement.
- Fuse
 - The instrument contains fuses.
 - A fuse holder is located in the AC inlet on the rear panel and the fuse can be replaced by the user.
Please replace with a fuse of the following type.
Rated voltage 250V/Rated current 3.15A Time-Lag Fuse
Recommended fuse: Littelfuse 02153.15*XP
* : Quantity code H, M, T etc.
Quantity: 2
 - If unable to obtain the correct fuse, please contact your sales agent or the Noise Laboratory repair and calibration center.

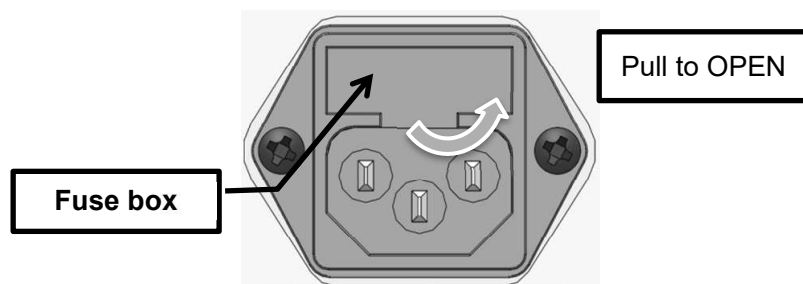






Fig 8-1. Fuse Box

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.

9. INTRODUCTORY NOTES

9–1. Introductory Notes

The meaning of following symbols is as follows.

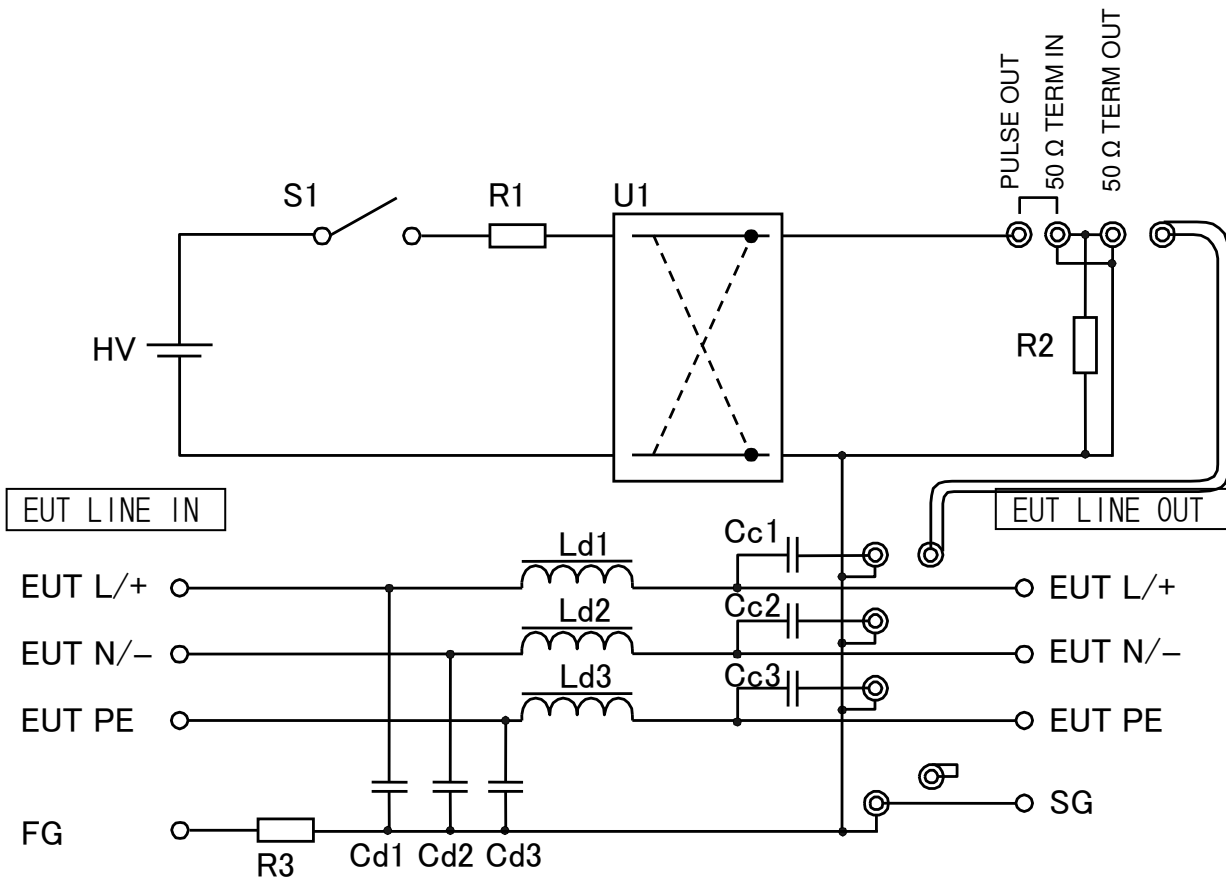
	Additional explanation.
	Indicating other parts to be referred in the Manual.
	Indicating restriction of setting up
	Indicating items to be confirmed before usage.
【 】	Indicating text on the panel of the Simulator.
┌ └	Indicating text on the 7-segment-display of the Simulator.

9–2. Terms and Definitions

The terms and their definitions are shown as follows.

Term	Difinition
Impaluse Noise	Fast rising square wave noise waveform
Immunity	Ability of a device, equipment, or system to perform without degradation in the presence of electromagnetic disturbance.
Ground Plane	Reference Ground Plane Flat conductive surface whose potential is used as a common reference.
SG	Signal Ground Output pulse signal ground. Connect SG terminal 【SG】 to ground plane with the supplied SG cable. For details, see P38 “ Connecting Ground Plane(SG terminal) ”.
FG	Frame Ground Do not connect to Ground Plane. Connect to the protective earth terminal of test room. For details, see P24 “ FG terminal ”.
EUT	Equipment Under Test
Test for Power Line	Way of testing coupling high voltage pulses to AC/DC power supply port and/or protective earth of EUT. The test is conducted with using CDN.
CDN	Coupling/Decoupling Network Electric circuit to prevent the applied pulse voltage from affecting the device or equipment not under test or system.
Test for Signal Line	Way of testing applying high voltage pulses to ports for I/O signal, data, and controll without direct coupling. The test is conducted with using coupling clamp.
Coupling Clamp	Equipment to capacitively or inductively couple disturbance signals to a circuit to be tested without direct coupling like an electric circuit.

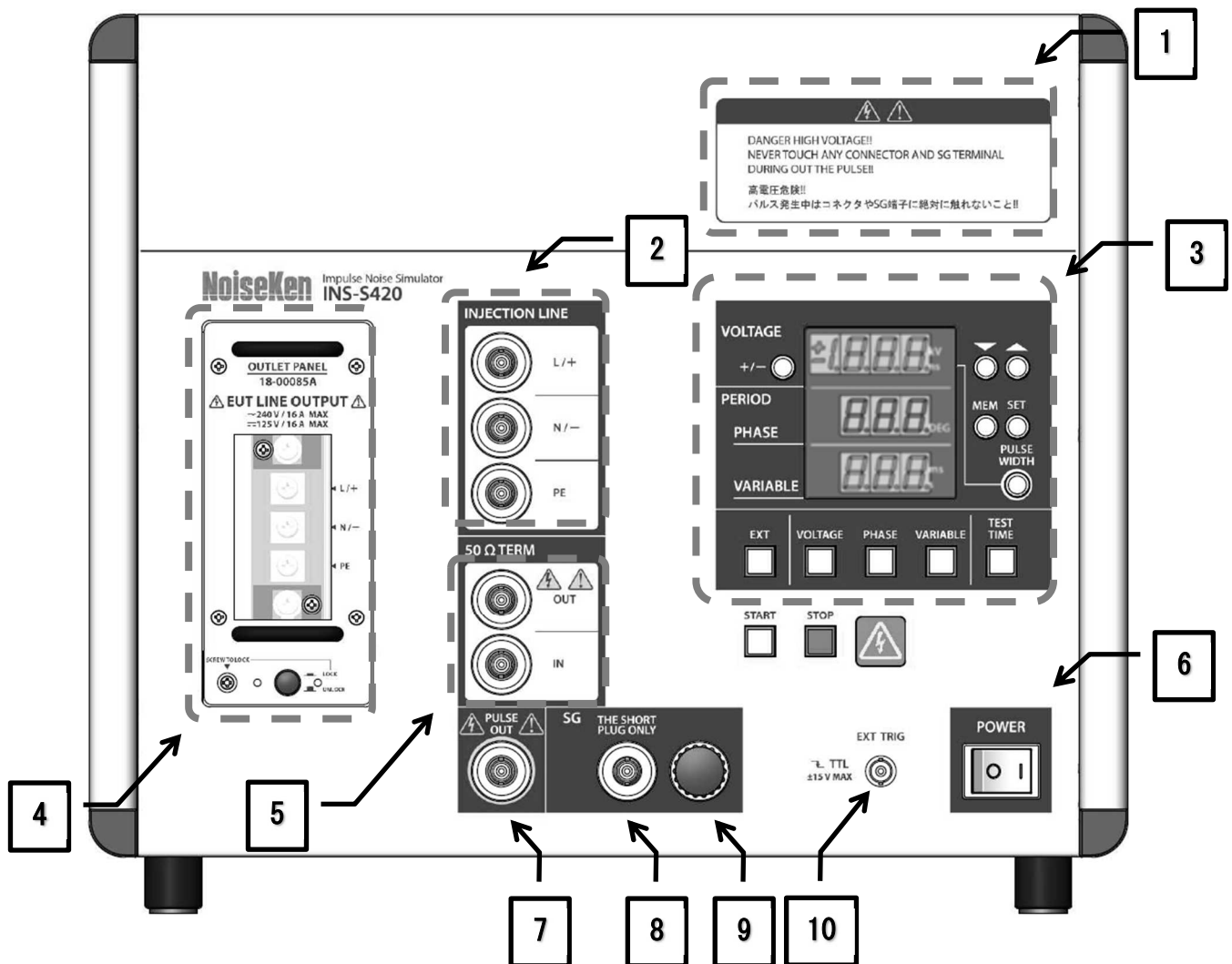
9-3. Block Diagram of INS-S420



HV : High voltage power supply	Cc1~Cc3 : Coupling capacitor (0.2047 μ F)
S1 : Discharging switch (semiconductor type)	Ld1~Ld3 : Decoupling coil (200 μ H)
R1 : Impedance matching resistor (50 Ω)	Cd1~Cd3 : Decoupling capacitor (0.3 μ F)
R2 : Terminating resistor	U1 : Polarity switching unit
R3 : Floating resistor(1M Ω)	

10. APPEARANCE AND FUNCTION OF EACH PART

10-1. Front Panel



1. Warning on handling

Draws your attention to such points as "Danger high voltage !!!" and "Never touch any connector and SG terminal during out the pulse !!!".



When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

2. Pulse Injection Connector 【INJECTION LINE】

To inject the pluses into the EUT power line, connect from the 【50 Ω TERM OUT】 connector to this connector with the supplied coaxial cable for connection. 【L/+】 【N/-】 【PE】

To set them on the pulse signal ground, connect the supplied SG short plug to the connector.



For details, see [P40](#) "[Select injection line](#)".



When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

3. Control Panel

Set test conditions and execute / stop the test.



For details, see [P21](#) "[Control Panel](#)".

4. EUT LINE OUTPUT terminal 【EUT LINE OUTPUT】

EUT line output, terminals to which EUT is connected. The output pulses are coupled to this line L1, L2 or PE depending on coupling mode setting.



The screw size on the terminals is M5.



High voltage pulse and power for EUT are output on test. Be sure to install protection cover after completing connection. Mishandling or careless operation may result in a fatal wound. Carefully handle it.

5. 50 Ω TERM connector 50 Ω TERM IN /50 Ω TERM OUT
Input/Output connector for 50Ω termination resistor.

50 Ω TERM IN: Input connector for 50Ω termination resistor. The HV output pulses from PULSE OUT terminal are input to this terminal through a supplied coaxial cable.

50 Ω TERM OUT: Output at 50Ω termination resistance. The pulse output with the selected peak amplitude exists across this terminal.



When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

6. POWER switch 【POWER】

Used to turn ON/OFF the Simulator, turn to (I) side for ON, (0) side for OFF.

7. Pulse out connector 【PULSE OUT】

PULSE OUTPUT connector. Outputs the pulses set through Control Panel section.



The output pulse from the PULSE OUT connector is not 50Ω terminated.



When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

8. SG connector 【THE SHORT PLUG ONLY】

HV pulse signal ground connector.



- No parts other than the SG short plug shall be connected to this connector. If other supplied parts or coaxial cables were connected by mistake, it may result in an electrical shock.
- When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

9. SG terminal 【SG】

Pulse signal ground terminal.

When conducting a common mode noise test, connect the SG terminal to the ground plane with the supplied SG cable in the shortest length.



When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the SG terminal. Touching them may cause a shock hazard.



For details, see [P.38 "Connecting Ground Plane\(SG terminal\)"](#).



If connection is not possible with the supplied SG cable, use a thick and short wire as much as possible (3.5mm² or thicker braided wire recommended) to connect to the ground plane.

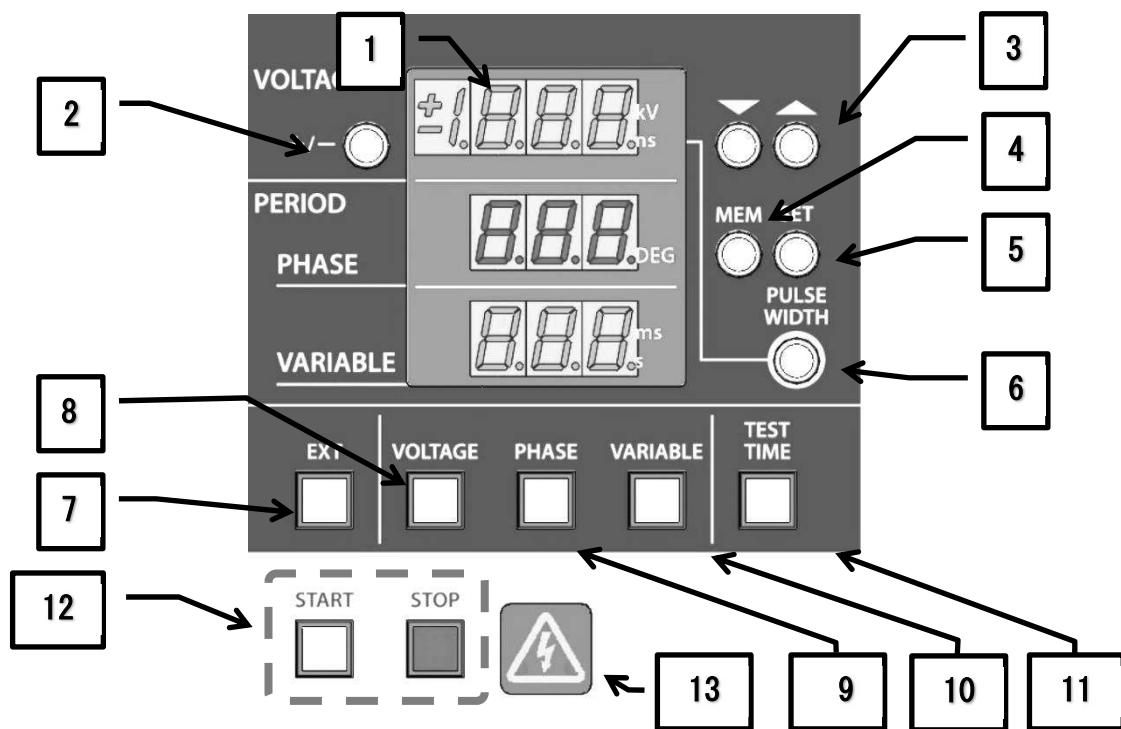
10. External trigger input connector. 【EXT TRIG】

External trigger input connector. Signals are input externally from an injection unit or others. The type of this connector is **BNC**.



For details, see [P.49 "Operation in EXTernal Trigger mode"](#).

10-2. Control Panel



1. 7-Segment-display
This is a 7-segment LED to display set values.
The contents of the display vary depending on the setting/operation.
2. POLARITY Setting button 【+ / -】
Used to select polarity of output pulse. The switch light turns on/off according to the set polarity.
Switch light on : polarity “+”
Switch light off : polarity “-”



The setting cannot be changed in START status.
For 1 second immediately after transition from START status to STOP status, the setting cannot be changed for internal circuit protection.

3. Increment and decrement button 【▼ 【▼】
Increment and decrement of the selected parameter. The upward triangle button is used for increment and the reverse triangle is for decrement. For fast change in value, continue to press either key.
4. MEMORY button 【MEMORY】
Saves or calls up test settings.
5. SET button 【SET】
Used to specify the memory storage.
6. PULSE WIDTH button 【PULSE WIDTH】
Used to set the output pulse width.
When the switch is blinking, the pulse width can be changed.
The pulse width can be selected from 50ns to 1000ns with ▲UP / ▼DOWN switches.



In START status, the setting cannot be changed.

7. EXT button 【EXT】

Places the Simulator in EXT TRG mode: the Simulator generates pulses in synchronization with signal inputs. While the Simulator is in the STOP status, EXT TRG mode can be selected by pressing the EXT TRG button. When selected, the lamp is lit. Appropriate signal inputs shall be done to the EXT TRIG BNC connector. Their characteristics are 10ms repetition or slower 1ms or longer pulse width and negative polarity. (As +5V pull up circuits is built-in, TTL signal or open-collector can be applied. Pulse generation synchronize with the input signal's the falling edge)

8. VOLTAGE button 【VOLTAGE】

Places the Simulator in status to accept the output voltage a change.
When blinking, changes can be done by means of Increment and Decrement buttons from 0.50kV to 4.00kV.

9. PHASE mode button 【PHASE】

Places the Simulator in PHASE mode: the output pulses synchronize with the frequency of the LINE (EUT).
When the switch is lit, PHASE (LINE synchronization) mode is being selected.
When blinking, change can be done by means of Increment and Decrement buttons from 0 to 360°



In START status, the setting cannot be changed.



No pulse is output when this AC power supply is not fed to the EUT LINE INPUT terminal block.

10. VARIABLE mode button 【VARIABLE】

Places the Simulator in VARIABLE mode: pulses generated irrelevantly to the EUT supply AC frequency.
When the switch is lit, VARIABLE mode is being selected.
When blinking, change can be done by means of Increment and Decrement buttons from 10ms to 999ms at 1ms step.



In START status, the setting cannot be changed.

11. TEST TIME button 【TEST TIME】

Used to change the test time.
When the switch is blinking, the test time can be changed.
The test time can be set from 1s to 999s in 1s steps with ▲UP / ▼DOWN switches. When the set test time has passed, it automatically transfers to STOP status.



Setting zero "000" activates continuous test operation and the test is continued until the STOP switch is pressed.



The transition to STOP status by this function controls only STOP of the pulse output. The transition to STOP status by this function does not turn the EUT line off. As long as the EUT power supply is fed to the EUT line input terminal block on the back of the Simulator, the EUT power supply continues to be output from the output panel (EUT line output terminal block) on the front. Be very careful.



Also used in 1SHOT mode
For details, see P52 "Operation in 1 SHOT mode".

12. START/STOP buttons 【START】 【STOP】

The START button places the Simulator in START status: the START lamp is lit and the Simulator generates pulses according to settings. Pressing the STOP button stops the pulse generation and turn off the START lamp. While the Simulator is in the START status, connection changes shall not be done as it is generating HV pulses.



Do not change the connection of cables in START status.

Change in the connection should be made 5 seconds or more after the stop of the pulse output and after confirmation of the halt of EUT power supply.



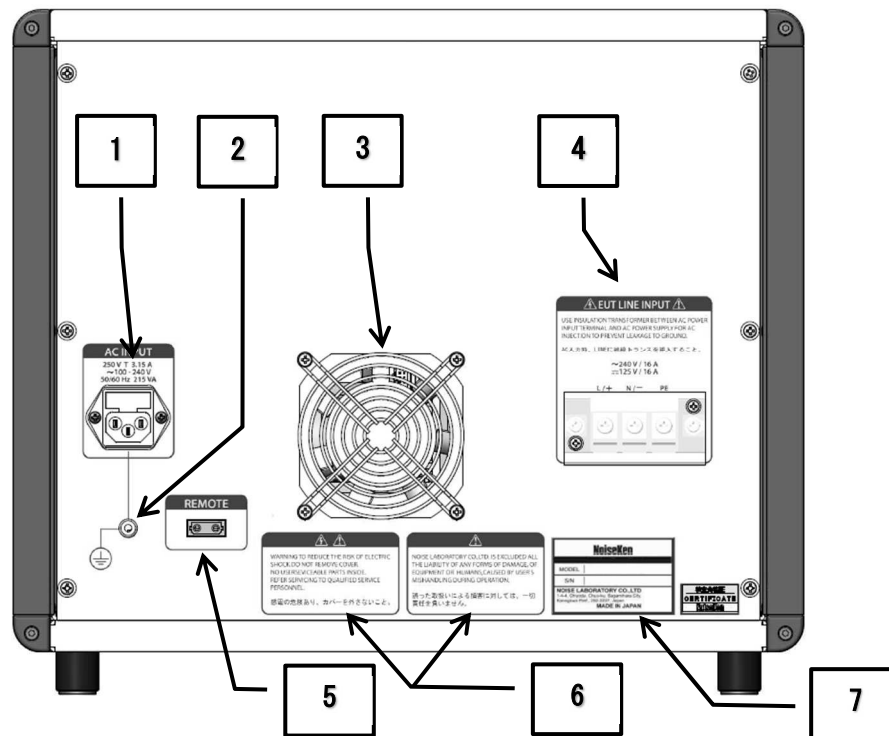
These two switches control only START/STOP of the pulse output. Even when the Simulator is put in STOP status by pressing the STOP switch during pulse output, the EUT line is not turned off. As long as the EUT power supply is fed to the EUT line input terminal block on the back of the Simulator, the EUT power supply continues to be output from the output panel (EUT line output terminal block) on the front. Be very careful.

13. Warning lamp

Blinking while a test is being performed.

This lamp blinks when the high voltage circuitry is on. It interacts with START and STOP button, blinking when the START button is pressed and being off when the STOP button is pressed.

10-3. Rear Panel



1. AC inlet (with fuse) 【AC INPUT】

Input connector for power supply of the Simulator, incorporating fuse. In exchanging fuses, prepare a fuse rated 250V T 3.15A.



When replacing the fuses, refer to “Fuse” section of 8. CAUTION FOR EXPENDABLE SUPPLIES.

2. FG Terminal

Terminal for connection to safety earth. This terminal is electrically connected to the center conductor of the AC INPUT. This terminal shall be connected to the safety earth of the Simulator installation area by using an appropriate wire when the Simulator is not grounded through AC INPUT earth conductor.



Do not connect this terminal directly to the ground plane in test environment.

3. Fan

Cools the internal circuits. Ventilation shall be kept.

4. EUT LINE INPUT 【EUT LINE INPUT】

Power supply input to the EUT. An appropriate cord shall be used. The maximum rating of EUT LINE is 240VAC/125VDC, and 16A. Use a cord meeting the specifications of the Simulator and the local safety regulations.

AC voltage input between L1 and L2 of the EUT LINE INPUT works as a phase angle control reference in PHASE (EUT LINE synchronization) mode operation.



The screw size of the terminals is M5.



When connecting the EUT AC power supply, input must be done through an isolation transformer.

Input not through the isolation transformer may result in an electric shock.



The EUT line of the Simulator does not have any overcurrent protection circuit. Thus, to the EUT line input terminal of the Simulator, connect a power supply equipped with protection circuit (circuit breaker, fuse, etc.) that is compatible with EUT's current capacity. If this is not observed, the device or test facilities may be damaged or placed at risk.

5. Optical communication connector 【REMOTE】

Connect the optical connector for remote control, which is sold separately as an option.

Use a dedicated optical cable as a communication cable and a conversion adapter to connect to the PC.

Place a cap when it is not used.

6. Warning on handling

Draws your attention to such points as “exemption from responsibility”, etc.

7. Serial number label

Indicates serial number of the Simulator.

11. TEST SET UPS AND ENVIRONMENT

11–1. Precautions for use

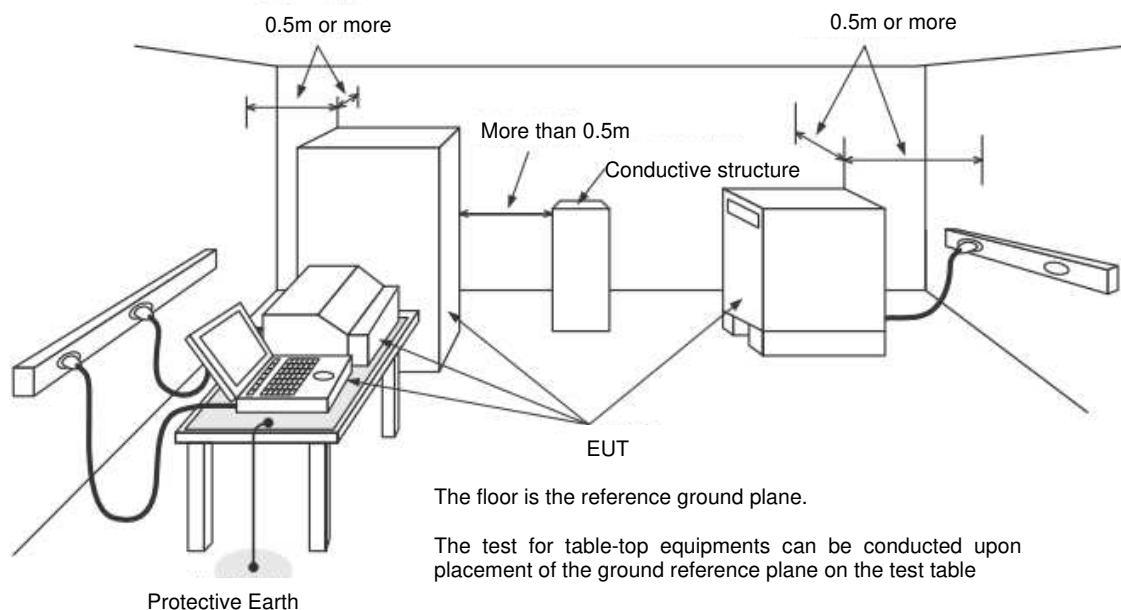
Follow the Section 1 IMPORTANT SAFETY PRECAUTIONS, and Section 6 BASIC SAFETY PRECAUTIONS.

11–2. Coupling modes

The following coupling modes and methods are shown in later pages.

- Line to ground mode (common mode) for AC operated equipment.
- Line to Line mode (normal mode) for AC operated equipment
- Line to ground mode (common mode) for DC operated equipment
- Line to Line mode (normal mode) for DC operated equipment
- Capacitive coupling test for signal lines(option)
- Inductive coupling test for signal lines(option)
- Test by using a radiation probe(option)

11–3. Test set-ups



- To conduct an impulse noise test, the EUT and auxiliary equipment must be separated at least 0.5 m from the wall of the test room or other metallic structures.
- When the coupling adaptor is used, the coupling adaptor must be separated at least 0.5m from the wall of the test room or other metallic structures.

11–4. Components in test environment

A recommended test set-up example is shown here. Included are the following main components (NoiseKen product model numbers)

Item	MODEL No.	Remarks
Ground plane (for floor standing equipment)	03-00007A	For floor standing equipment under test. If the test room has a metal floor, the floor works as the ground plane.
Ground plane (for the table top equipment)	03-00020A	Ground plane for table top equipment. Use by laying it on a test table. * Our brand name is "Horizontal Coupling Plate".
Test table (wooden)	03-00039A	For the table top equipment under test.
Insulation support (wooden)	03-00024A	For floor standing equipment under test. This support shall be installed on the floor ground plane.
Cubic insulation block(wooden)	03-00029A	Used as 0.1m separators of the EUT and its cable from the ground plane.
Isolation transformer	TF-2302P TF-6503P	This shall be inserted between the EUT power supply and the EUT line input terminal block of the Simulator. Not required when the EUT power supply is DC.



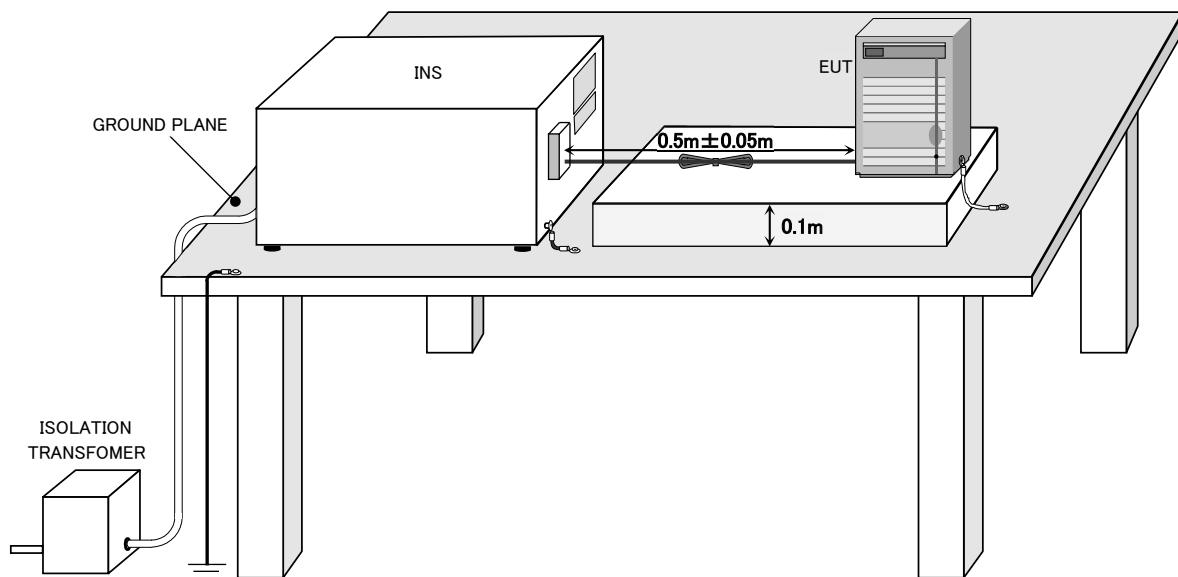
When connecting the EUT AC power supply, input must be done through an isolation transformer.
Input not through the isolation transformer may result in an electric shock.



For details about each option, refer to "OPTIONAL PRODUCTS" on P. 58.

11–5. Test set-ups (Example of table-top equipment)

Example of a test environment for a table top EUT is shown in the following figure.



1. The ground plane shall be placed on the test table. With the grounding cable, it is connected to the protective earth system in the test room.



When an insulation sheet is laid on the ground plane to obviate short circuit, care should be taken to position the EUT higher than the ground plane by $0.1\text{m} \pm 0.01\text{m}$.

2. The Simulator shall be placed on the ground plane.
Connect the SG terminal of the Simulator to the ground plane with the supplied SG cable.
3. Place the EUT, AE (auxiliary equipment), and cables on the ground plane by using 0.1m-thick insulators such as an insulating support or cubic insulation block.
4. Ensure connection of the EUT's FG terminal in the shortest distance to the ground plane by using a high-frequency low impedance wire (3.5mm^2 or thicker braided wire recommended). When there are two or more EUTs, each FG terminal shall be individually connected to the ground plane. When the EUT does not have any FG terminal or is used without grounding the FG terminal, test the EUT's FG without grounding to the the ground plane.



Follow the specification of EUT to determine whether or not the EUT's FG should be connected to the ground plane.

5. Connect the EUT's power cable (power line overlapping an impulse noise) to the EUT line output terminal block. Adjust the length of the power cable to $0.5\text{ m} \pm 0.05\text{ m}$. If the length cannot be adjusted, fold the cable to prevent it from being coiled, and carefully place it on the insulator so that it should not run in parallel or cross with other communication cables.
When the EUT's driving power supply has a protective earth conductor, connect that wire in the same manner.
6. Make sure that the EUT power supply is off, and then connect it to the line input terminal block of the Simulator.



When connecting the EUT AC power supply, input must be done through an isolation transformer.

Input not through the isolation transformer may result in an electric shock.



Do not connect the FG terminal of the Simulator directly to the ground plane in test environment.

11–6. Test set-up

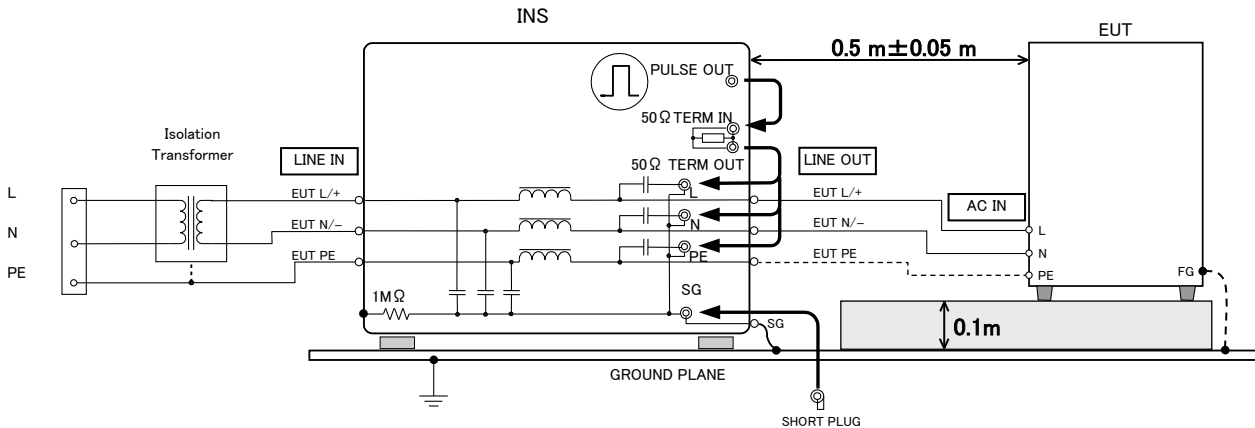
This section explains the test connection method for each noise coupling method.



For test setting/operation procedures after connection, refer to "*OPERATION*" on *P.44*.

Line to ground mode (common mode) for AC operated equipment

Example of a table top EUT is shown in the following figure.



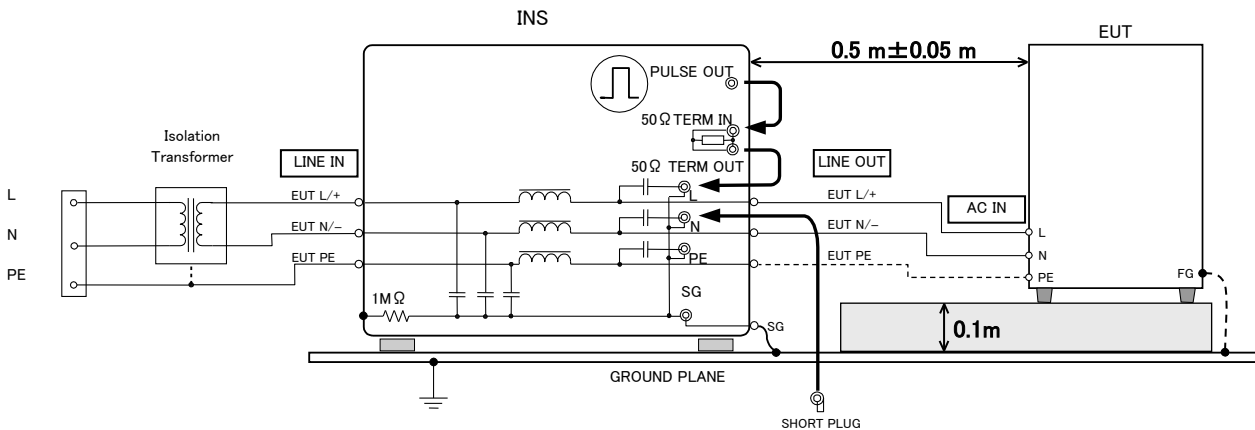
1. Place the equipment with reference to "*11-5. Test set-ups (Example of table-top equipment)*".
2. Connect supplied coaxial cables to PULSE OUT connector and 50ΩTERM IN connector.
3. Connect the 50ΩTERM OUT connector to either of L1 or L2 (PE when required) by using the supplied coaxial cables. This is the selection of the line to which the pulses are injected.
4. Plug the SG connector with the supplied SG short plug.
5. Turn on the POWER of the Simulator. Set the required test voltage, polarity and test mode.



- When connecting the EUT AC power supply, input must be done through an isolation transformer. Input not through the isolation transformer may result in an electric shock.
- Do not touch the HV coaxial connectors and SG terminal when the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT. The misuse may result in a fire or an electric shock.

Line to line (normal mode) for AC operated equipment

Example of a table top EUT is shown in the following figure.



1. Place the equipment with reference to "*11-5. Test set-ups (Example of table-top equipment)*".
2. Connect supplied coaxial cables to PULSE OUT connector and 50ΩTERM IN connector.
3. Connect the 50ΩTERM OUT connector to either of L1 or L2 by using the supplied coaxial cables. This is the selection of the line to which the pulses are injected.
4. Plug the other connector (than the selected connector in Step 3) of L2 or L1 pulse injection connector with the SG short plug.
5. Turn on the POWER of the Simulator. Set the required test voltage, polarity and test mode.

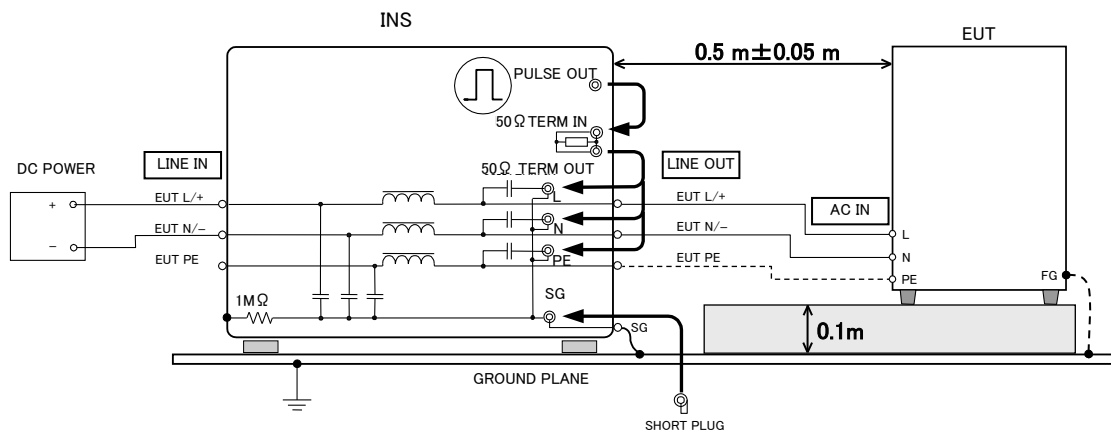


- When conducting coupling tests to the EUT LINE, the signal ground of the HV pulse generator circuit and one line of the EUT LINE may be connected, causing a shock hazard if the users touch the outer conductor of the HV coaxial connectors.
- In addition, if the outer conductor of the HV coaxial connectors is connected to any grounded object, leak current will flow, tripping the ground fault interrupter embedded in the facilities. To avoid these two types of events, use of an isolation transformer is indispensable.

Be sure to connect the EUT LINE INPUT to the isolation transformer secondary.

Line to ground mode (common mode) for DC operated equipment

Example of a table top EUT is shown in the following figure.



1. Place the equipment with reference to "*11-5. Test set-ups (Example of table-top equipment)*".



In case of two-voltage source such as DC +/-15V, connect +15V to L1, -15V to L2, and 0V to PE.

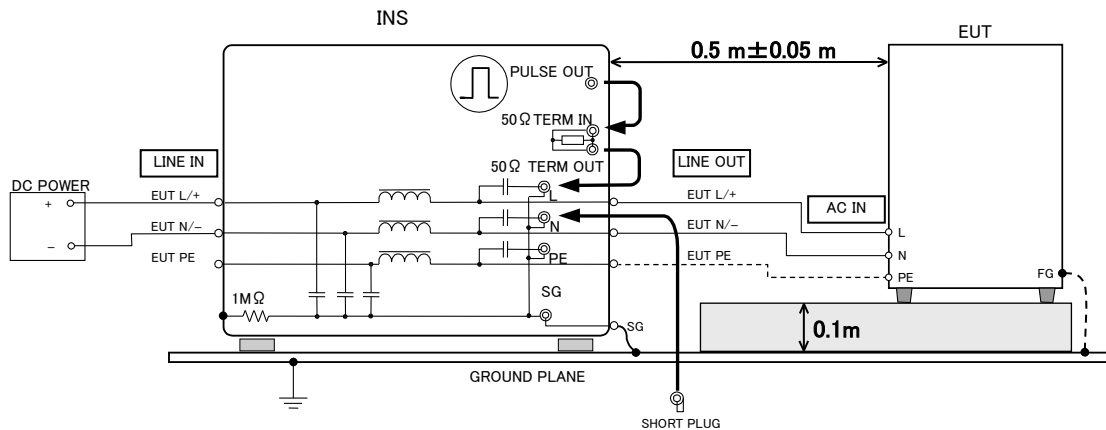
2. Connect supplied coaxial cables to PULSE OUT connector and 50ΩTERM IN connector.
3. Connect the 50ΩTERM OUT terminal to either of L1 or L2 or PE pulse injection connector by using the supplied coaxial cables. This is the selection of the line to which the pulses are injected
4. Plug the SG connector with the supplied SG short plug.
5. Turn on the POWER of the Simulator. Set the required test voltage, polarity and test mode.



When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

Line to line mode (normal mode) for DC operated equipment

Example of a table top EUT is shown in the following figure.



1. Place the equipment with reference to "11-5. Test set-ups (Example of table-top equipment)".



In case of two-voltage source such as DC +/-15V, connect +15V to L1, -15V to L2, and 0V to PE.

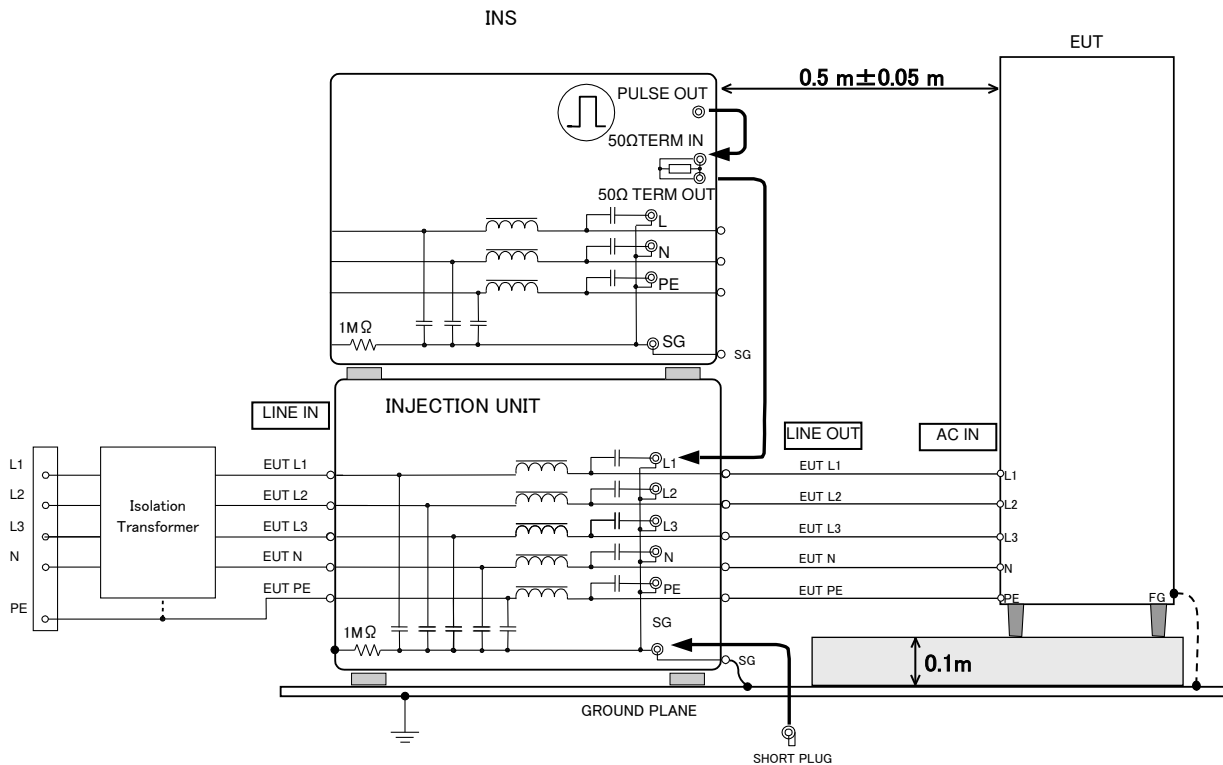
2. Connect supplied coaxial cables to PULSE OUT connector and 50ΩTERM IN connector.
3. Connect the 50ΩTERM OUT terminal to either of L1 or L2 or PE pulse injection connector by using the supplied coaxial cables. This is the selection of the line to which the pulses are injected.
4. Plug the other connector (than the selected connector in Step 3) of L2 or L1 pulse injection connector with the SG short plug.
5. Turn on the POWER of the Simulator. Set the required test voltage, polarity and test mode.



When conducting coupling tests to the EUT LINE, the signal ground of the HV pulse generator circuit and one line of the EUT LINE may be connected, causing a shock hazard if the users touch the outer conductor of the HV coaxial connectors.

Test by using for injection unit line to Ground mode (Common mode)

Example of a table top EUT is shown in the following figure.

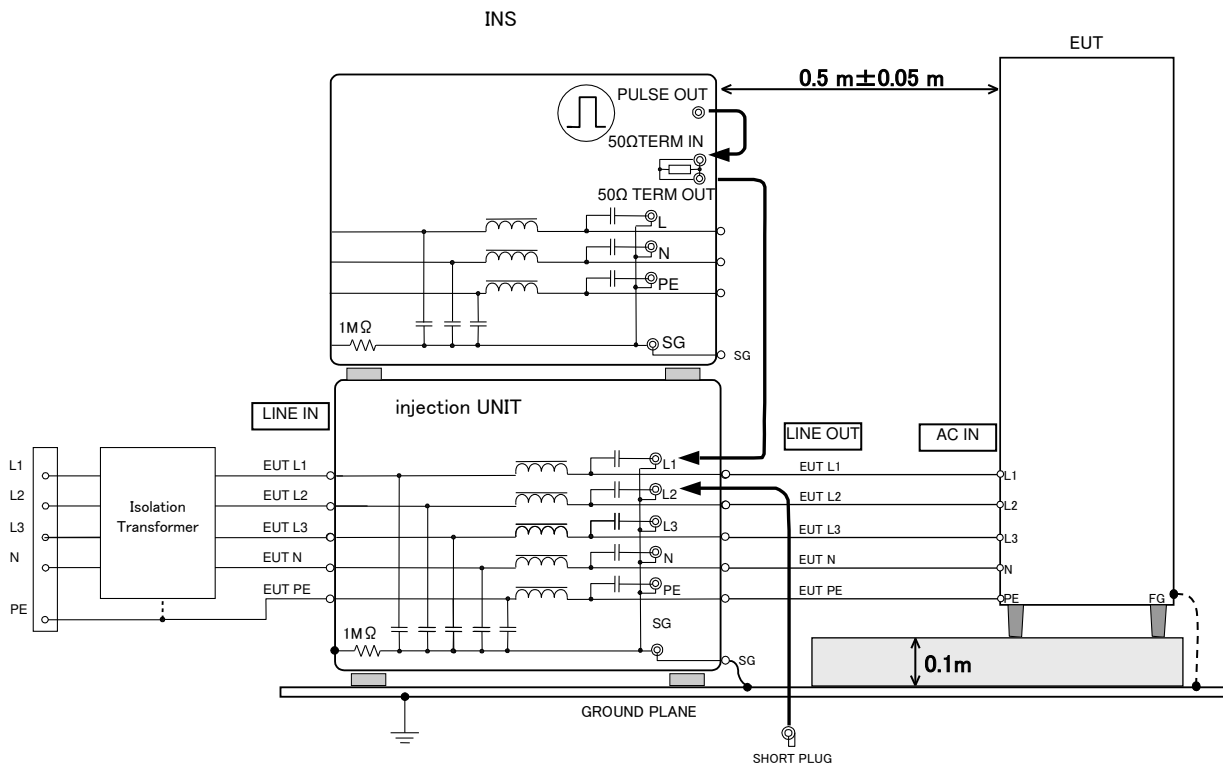


1. Place the equipment with reference to "*11-5. Test set-ups (Example of table-top equipment)*".
2. Connect the Simulator supplied coaxial cables to PULSE OUT connector and 50ΩTERM IN connector.
3. Connect the 50ΩTERM OUT terminal to either of injection unit pulse injection connector by using the injection unit supplied coaxial cables. This is the selection of the line to which the pulses are injected.
4. Plug the injection unit SG connector with the Simulator supplied SG short plug.



- When using injection unit IJ-4050, IJ-5100, IJ-5100Z, be sure to connect the pulse injection connector of the injection unit to 50 Ω TERM OUT of the Simulator.
- For connection in PHASE mode, please refer to the operation manual of the injection unit.

Test by using for injection unit line to line mode (normal mode)



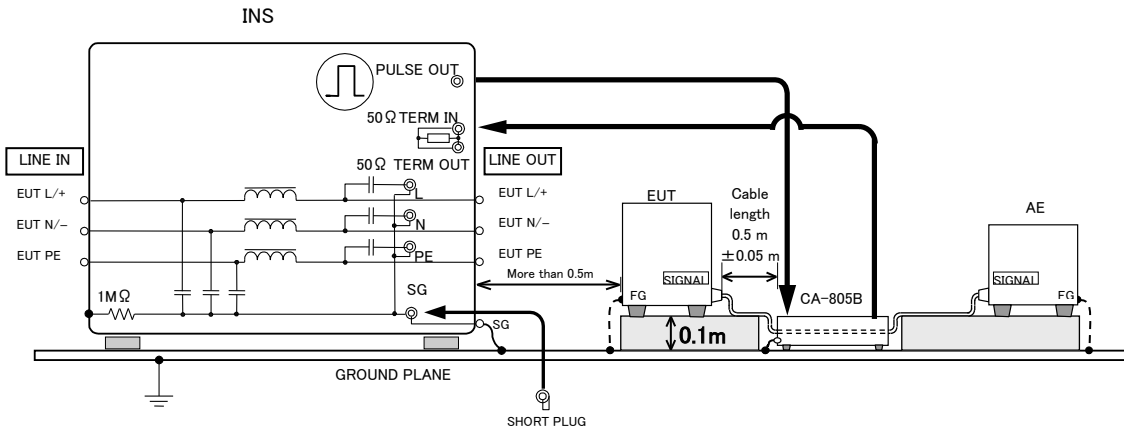
1. Place the equipment with reference to "*11-5. Test set-ups (Example of table-top equipment)*".
2. Connect the Simulator supplied coaxial cables to PULSE OUT connector and 50Ω TERM IN connector.
3. Connect the 50Ω TERM OUT terminal to either of injection unit pulse injection connector by using the injection unit supplied coaxial cables. This is the selection of the line to which the pulses are injected.
4. Plug the other connector (than the selected connector in Step 3) of the injection unit pulse injection connector with the Simulator supplied SG short plug.



- When using injection unit IJ-4050, IJ-5100, IJ-5100Z, be sure to connect the pulse injection connector of the injection unit to 50 Ω TERM OUT of the Simulator.
- For connection in PHASE mode, please refer to the operation manual of the injection unit.

Capacitive coupling test for signal lines (Option)

Example of a table top EUT is shown in the following figure.



- Place the equipment with reference to "11-5. Test set-ups (Example of table-top equipment)" section 1-4.
The Simulator and EUT shall be positioned so that the distance between the two is 0.5m or longer.
- Put the Coupling Adapter on the ground plane. The EUT 1 (equipment under test) and EUT 2 (auxiliary equipment required to operate the EUT 1) on a 0.1m height insulating support. The Simulator and EUT1 shall be positioned so that the distance between the two is 0.5m or longer. The length of the cable to be tested from the Coupling Adapter to EUT 1 shall be $0.5\text{m} \pm 0.05\text{m}$. The length of the cable from the Coupling Adapter to EUT 2 is not specified but recommended to be recorded for reproduction of the same test set up for future testing.
- The PULSE OUT connector shall be connected to one side of the adapter and the 50Ω TERM IN connector shall be connected to the other side.



Changing the injection and termination sides is also recommended as test results may vary.

- Open the coupling adapter and clamp cable under test.
- Plug the SG connector with the supplied SG short plug.



For the test using a coupling adaptor or a radiation probe, connecting the SG short plug to the SG connector is optional. However, connection is recommended in consideration of reproducibility of the test.

- The power cord of the EUT shall be connected to a service outlet or external source directly but not to the EUT LINE OUTPUT. Connection of the EUT to the EUT LINE OUPUT is not permitted as the injected signals onto the Coupling Adapter may return to the Simulator via the wrong route (power cord of the EUT).
- Turn on the POWER of the Simulator. Testing shall be done in VARIABLE mode only



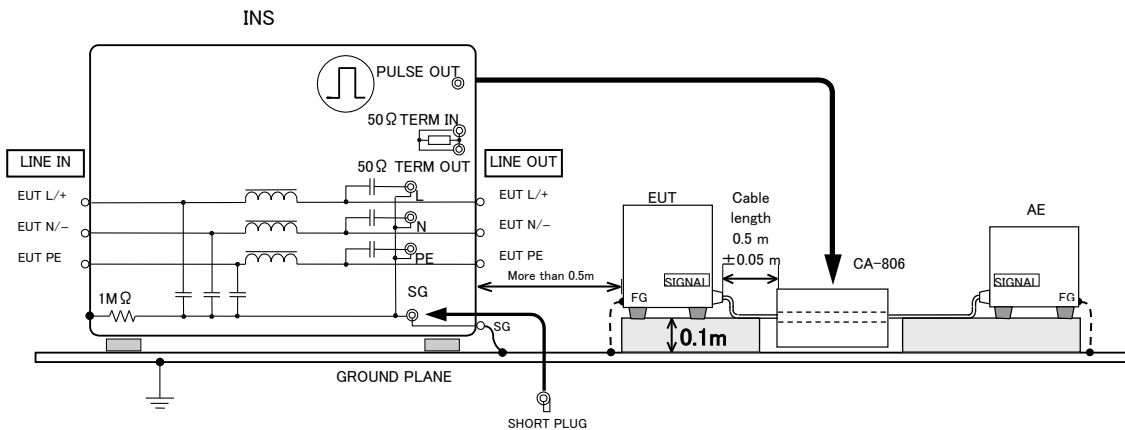
Because the power supply is not connected to the EUT line input terminal block, you will see an error even if you press START switch and cannot perform the test.



- Please refer to the operation manual of the coupling adapter being used.
- When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

Inductive coupling test for signal lines(option)

Example of a table top EUT is shown in the following figure.



1. Place the equipment with reference to "11-5. Test set-ups (Example of table-top equipment)" section 1-4.
The Simulator and EUT shall be positioned so that the distance between the two is 0.5m or longer.
 2. Put the Coupling Adapter on the ground plane. The EUT 1 (equipment under test) and EUT 2 (auxiliary equipment required to operate the EUT 1) on a 0.1m height insulating support. The Simulator and EUT1 shall be positioned so that the distance between the two is 0.5m or longer. The length of the cable to be tested from the Coupling Adapter to EUT 1 shall be $0.5\text{m} \pm 0.05\text{m}$. The length of the cable from the Coupling Adapter to EUT 2 is not specified but recommended to be recorded for reproduction of the same test set up for future testing.
 3. The PULSE OUT connector shall be connected to connector of the adapter.
 4. Open the coupling adapter and clamp the cable under test.
 5. Plug the SG connector with the supplied SG short plug.
-
- For the test using a coupling adaptor or a radiation probe, connecting the SG short plug to the SG connector is optional. However, connection is recommended in consideration of reproducibility of the test.
-
6. The power cord of the EUT shall be connected to a service outlet or external source directly but not to the EUT LINE OUTPUT. Connection of the EUT to the EUT LINE OUPUT is not permitted as the injected signals onto the Coupling Adapter may return to the Simulator via the wrong route (power cord of the EUT).
 7. Turn on the POWER of the Simulator. Testing shall be done in VARIABLE mode only.



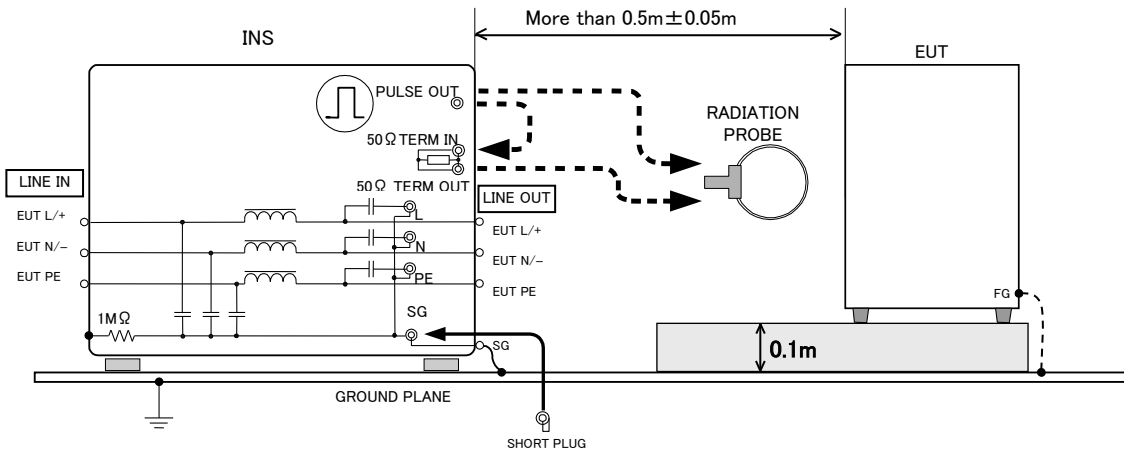
Testing shall be done in VARIABLE mode only. With no input to the EUT LINE INPUT, test cannot start in other modes than VARIABLE, pressing the START button causing an error shown on the display.



- Please refer to the operation manual of the coupling adapter being used.
- When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

Test by using a radiation probe (optional accessory)

Example of a table top EUT is shown in the following figure.



1. Place the equipment with reference to "11-5. Test set-ups (Example of table-top equipment)" section 1-4.

The Simulator and EUT shall be positioned so that the distance between the two is 0.5m or longer.

2. The Radiation Probe shall be connected to the Simulator at either of the following connectors.



The pulse waveform, pulse voltage, and destination of the Radiation Probe may vary depend on whether or not the built-in terminator of the Simulator is used.

- PULSE OUT – the probe is used with no termination resistor
- 50Ω TERM OUT – the probe is used with 50 ohm resistor termination. In this case the PULSE OUT and 50Ω TERM IN connectors shall be connected with a supplied coaxial cable.

3. Plug the SG connector with the supplied SG short plug.



For the test using a coupling adaptor or a radiation probe, connecting the SG short plug to the SG connector is optional. However, connection is recommended in consideration of reproducibility of the test.

4. The power cord of the EUT shall be connected to a service outlet or external source directly but not to the EUT LINE OUTPUT. Connection of the EUT to the EUT LINE OUPUT is not permitted as the injected signals onto the Coupling Adapter may return to the Simulator via the wrong route (power cord of the EUT).

5. Turn on the POWER of the Simulator. Testing shall be done in VARIABLE mode only.



Testing shall be done in VARIABLE mode only. With no input to the EUT LINE INPUT, test cannot start in other modes than VARIABLE, pressing the START button causing an error shown on the display.

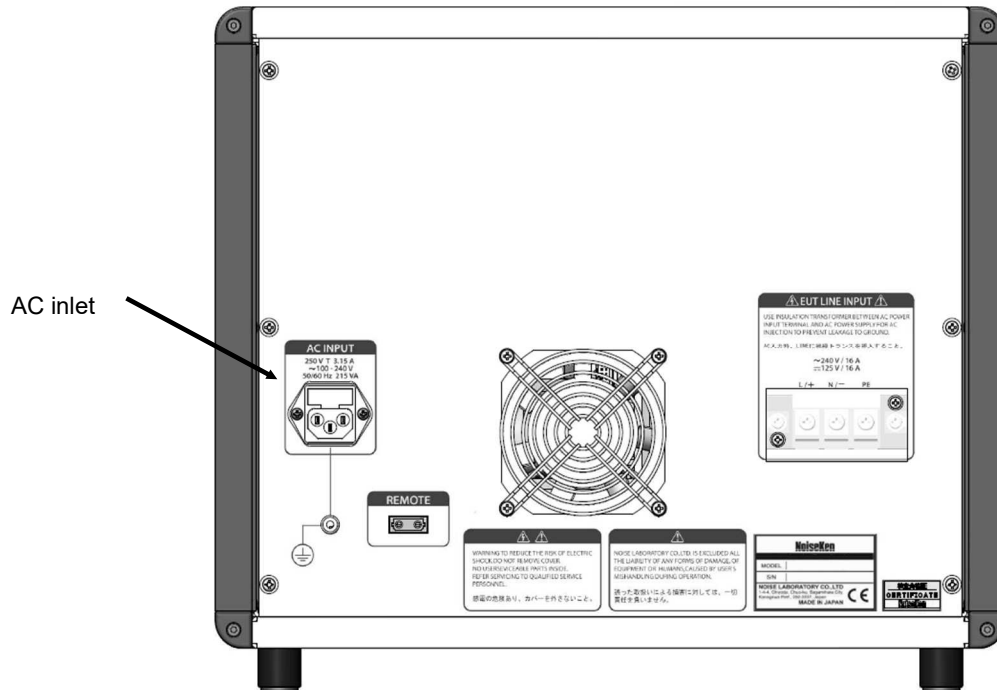


- Please refer to the operation manual of the Radiation Probe being used.
- When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.

12. Connection

12-1. Connecting AC Cord

Insert a proper AC cord into AC inlet 【AC INPUT】 .



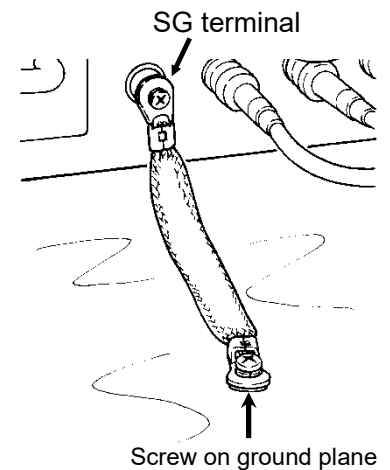
The supplied AC cord is for AC100~120 V. In case of AC220~240 V, prepare a 3-line AC cord with PE terminal pin which is conforming to the local safety standard.

12-2. Connecting Ground Plane(SG terminal)

Connect SG terminal 【SG】 to ground plane with the supplied SG cable.

IMPORTANT

Unlike old types of the INS simulators, this SG connection can remain installed for line to line (normal mode) testing too, since the port (coaxial connector) to which the supplied SG short plug is connected selects the reference ground, in both of common and normal modes.



In case that the supplied cable is too short to connect to ground plane, connect SG terminal to the ground plane by using a low RF impedance cable (3.5mm² or thicker braided wire recommended) of the shortest possible length.

12-3. Connecting Line Input

Connect EUT power supply to the Simulator.
Make a connection according to panel display of the Simulator.

1. Make sure that power supply to EUT is cut off and the Simulator is in OFF status.
2. Connect the EUT power supply to the line input connectors 【EUT LINE INPUT】 on the rear panel section.



- When connecting the EUT AC power supply, input must be done through the isolation transformer. Input not through the isolation transformer may result in an electric shock.
- EUT line of the Simulator does not have any protection circuit against over voltage or over current. Prepare a proper protection circuit separately.



screw size : M5

EUT LINE INPUT

Prepare an AC supply and AC cable suitable for the EUT power rating. When connecting an AC supply, an isolation transformer shall be inserted between the AC supply and EUT LINE INPUT. The screw size on the terminals is M5. Attach a 5 φ solderless terminal to each conductor of the AC cable. After connection of the AC cable to the EUT LINE INPUT terminals, put the cover back on the terminals. AC voltage input between L and N of the EUT LINE INPUT works as a phase angle control reference in PHASE (EUT LINE synchronization) mode operation.



For details, see [P.46 "Operation in PHASE mode"](#).

All terminals of L, N, and PE are floated from the enclosure of the Simulator. Thus, the Simulator can perform the test on the 3-phase 3-wire EUT by connecting the power supply as L ⇒ L1, N ⇒ L2, and PE ⇒ L3.

INFORMATION

An optional external circuit breaker box for circuit protection and also for on/off control of the EUT LINE is available.



For details about each option, see [P. 58 "OPTIONAL PRODUCTS"](#).

12-4. Select injection line

Connect 50Ω TERM OUT terminal to pulse injection terminal (L/+, N/-, PE) by using a coaxial cable.



- DO NOT CONNECT A COAXIAL CABLE TO SG CONNECTOR.

The supplied SG short plug selects the line to which the signal ground of the output pulse is connected. All of the permissible settings are shown below.

Connector				Test mode	Test contents
L / +	N / -	PE	SG		
HOT			PLUG	Common mode	HOT : L / + Reference : Ground plane
	HOT		PLUG	Common mode	HOT : N / - Reference : Ground plane
		HOT	PLUG	Common mode	HOT : PE Reference : Ground plane
HOT		PLUG		Normal mode	HOT : L / + Reference : PE
	HOT	PLUG		Normal mode	HOT : N / - Reference : PE
HOT	PLUG			Normal mode	HOT : L / + Reference : N / -
PLUG	HOT			Normal mode	HOT : N / - Reference : L / +

HOT : Connection from 50Ω TERM OUT.

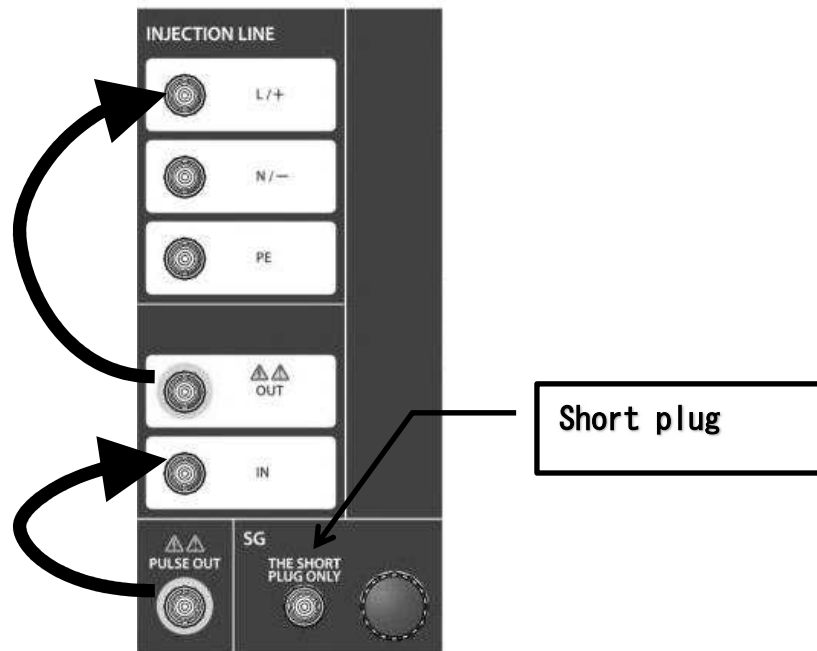
PLUG : Plugged by the SG short plug



- Any other connection than the supplied SG short plug shall not be connected to the SG connector of the Simulator. Wrong connections may apply HV pulses to the ground plane, causing a shock hazard.
- When the Simulator is producing pulses or EUT power is being supplied to the EUT LINE INPUT, do not touch the HV coaxial connectors. Touching them may cause a shock hazard.
- When conducting coupling tests to the EUT LINE, the signal ground of the HV pulse generator circuit and one line of the EUT LINE may be connected, causing a shock hazard if the users touch the outer conductor of the HV coaxial connectors. In addition, if the outer conductor of the HV coaxial connectors is connected to any grounded object, leak current will flow, tripping the ground fault interrupter embedded in the facilities. To avoid these two types of events, use of an isolation transformer is indispensable. Be sure to connect the EUT LINE INPUT to the isolation transformer secondary.

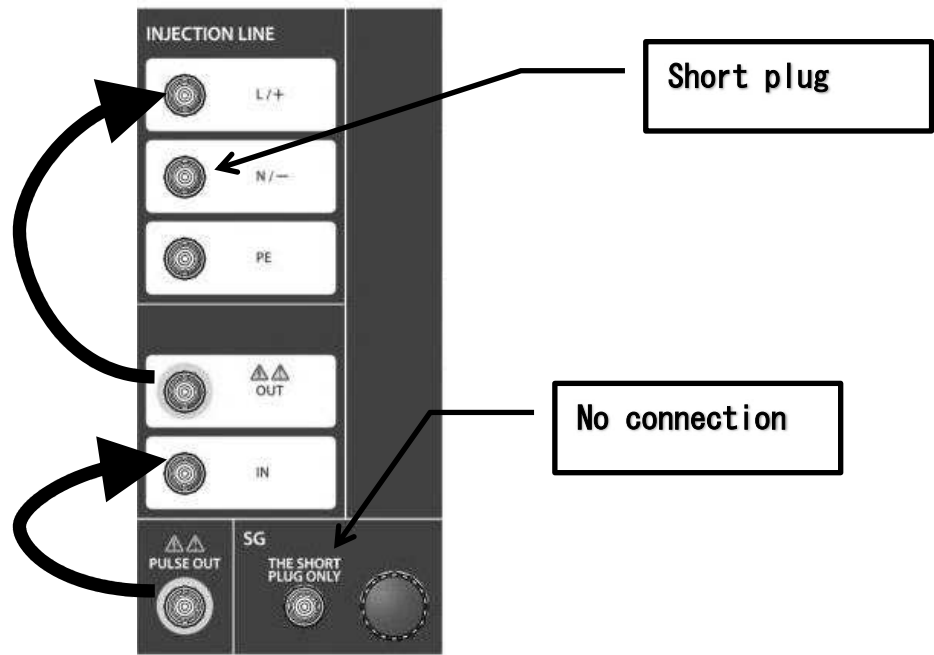
Examples of coupling mode settings are shown.

Example: Ground plane reference - L/+ common mode



- Any other connector than the supplied SG short plug shall not be connected to the SG connector of the Simulator. Do not touch the HV coaxial connectors. Touching a HV connector may cause a shock hazard.
- An isolation transformer is indispensable for power supply input to the EUT. Power supply connection to the EUT LINE INPUT shall be always done through an isolation transformer. The reference ground plane shall be grounded to a safety earth.

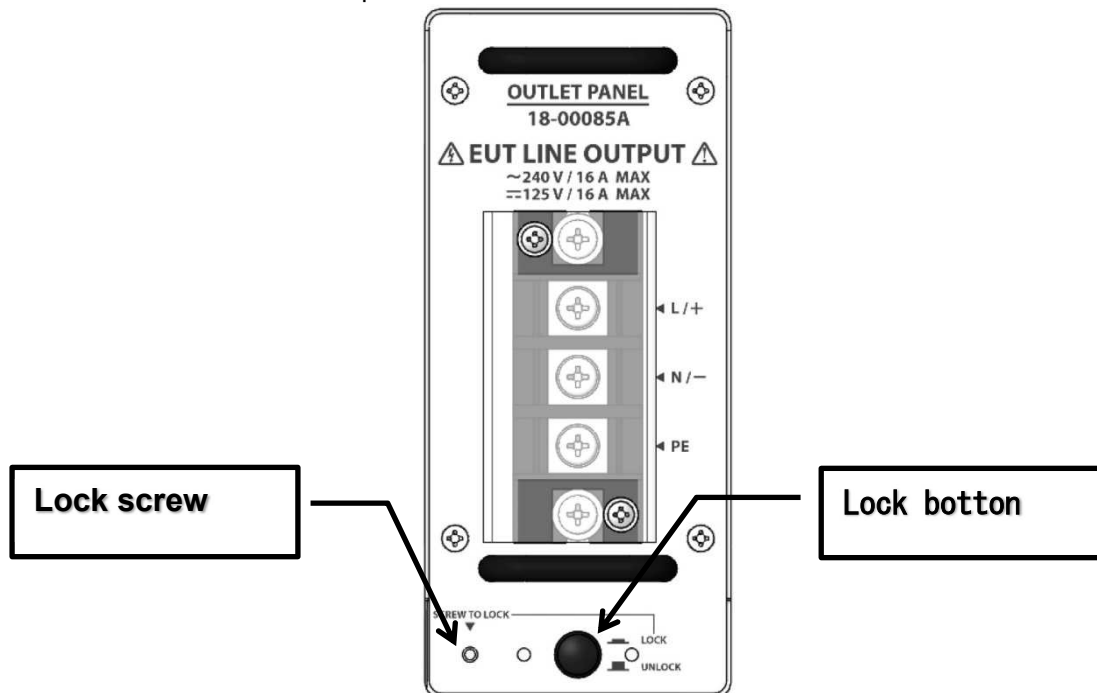
Example: N/- reference - L/+ to N/- normal mode



- Any other connector than the supplied SG short plug shall not be connected to the SG connector of the Simulator. Do not touch the HV coaxial connectors. Touching a HV connector may cause a shock hazard.
- An isolation transformer is indispensable for power supply input to the EUT. Power supply connection to the EUT LINE INPUT shall be always done through an isolation transformer. The reference ground plane shall be grounded to a safety earth.

12–5. Mounting and Dismounting of Outlet Panel

Checking for the right direction, gently insert the Outlet panel fully to the depth. And press the Outlet panel lock button to lock the Outlet panel and fasten the lock screw.



When dismounting, unlock the Outlet panel lock button and remove the lock screw and pull it gently. The lock screw can eliminate a risk of the panel accidentally dismounted. The lock screw shall be tightened before the EUT connection.



- Before mounting and dismounting the outlet panel, check to see that the EUT supply has been interrupted and the Simulator is in the STOP status and allow a 5 seconds lapse as residual voltages may exist, otherwise supply power voltage or the generated pulse voltage may cause an electric shock hazard or a failure of the Simulator.

12–6. EUT connection

Before connection of the EUT to the Simulator, be sure to check that all power switches on the EUT supply, the Simulator and EUT itself are off.

Prepare a cord meeting the local safety regulations and the EUT power rating and attach a 5 φ solderless terminal to each conductor of the cord. After connection of the AC cord to the terminals on the EUT LINE OUTPUT, put the plastic cover on the terminals as it was.

INFORMATION

The included outlet panel is of terminal block type. Outlet panels for a CEE plug and for a UL/Japan and multiple plug socket type are optionally available.

These options provide facility for easy direct connection of the AC plug of the EUT to the plug receptacle mounted on the Simulator.

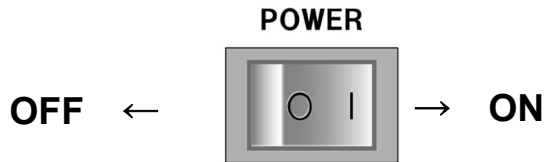


For details about each output panel option, see [P. 58 "OPTIONAL PRODUCTS"](#).

13. OPERATION

13-1. Turning ON and OFF power supply

1. Press the "1" side of the POWER button to turn on the Simulator.
2. The Simulator turns on with the previous settings for all parameters. But HV circuitry is always off at the Simulator power on.



3. To turn off the Simulator, press the "0" side of the button.



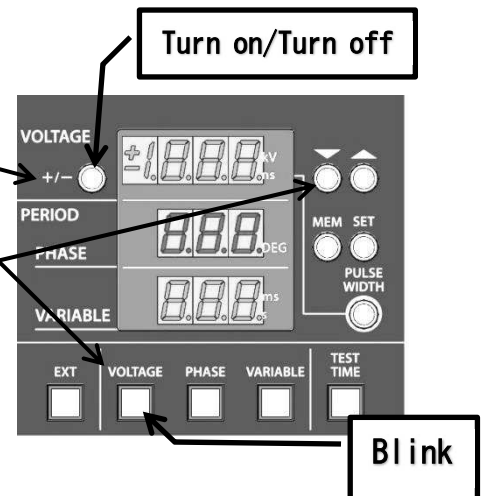
- Even when the Simulator power turns off, the EUT LINE is not automatically interrupted. Voltages on the EUT LINE OUTPUT terminals (terminal block outlet panel) remain present. Be sure to interrupt supply input to the EUT LINE INPUT before changing cable connections on the Simulator.

13-2. Setting the common items

Setting the pulse voltage and polarity

The output polarity and pulse output voltage common to each test mode can be set.

1. When the + / - switch is pressed, the switch light turns on/off. Correspondence between the state of the switch and the output polarity is as follows:
Switch light on: output polarity "+"
Switch lights off: output polarity "-"
2. When the VOLTAGE switch is pressed, the switch starts blinking and the pulse output voltage setting value is displayed at the top of 7-segment LED.
In this state, set the pulse output voltage by using the ▲UP / ▼DOWN switches.
When the ▲UP / ▼DOWN switches continue to be pressed, the numerical value is increased / decreased quickly.
3. Set each test mode by referring to the following pages.
The settings of the output polarity and pulse output voltage can be changed even after each test mode is set.

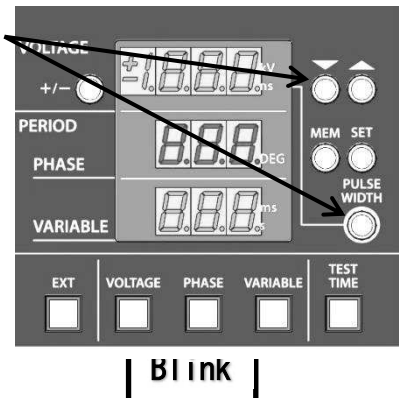


- In START status, the setting cannot be changed.
- The pulse output voltage, pulse width, and cycle period have limited setting ranges.
Voltage 0.50kV - 4.00kV Pulse width 50ns - 1000ns Cycle period 10ms - 999ms

Setting the pulse width

The pulse width common to each test mode can be set.

- When the PULSE WIDTH switch is pressed, the switch starts blinking and the pulse width setting value is displayed at the top of 7-segment LED.
In this state, set the pulse width by using the ▲UP / ▼DOWN switches.
When the ▲UP / ▼DOWN switches continue to be pressed, the numerical value is increased / decreased quickly.
- Set each test mode by referring to the following pages.
The settings of the pulse width can be changed even after each test mode is set.



- In START status, the setting cannot be changed.
- The pulse output voltage, pulse width, and cycle period have limited setting ranges.
Voltage 0.50kV - 4.00kV Pulse width 50ns - 1000ns Cycle period 10ms - 999ms

Setting the test time

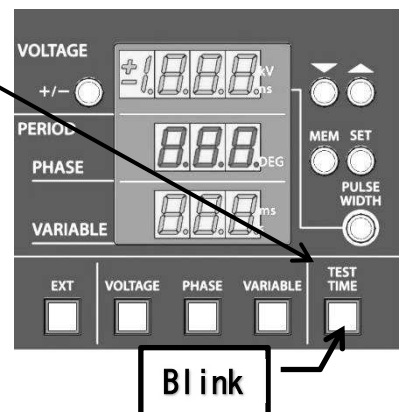
The test time common to each test mode can be set.

When the set test time has passed, it transfers to STOP status.



Setting zero "000" activates continuous test operation, and the test is continued until the STOP switch is pressed.

- When the TEST TIME switch is pressed, the switch starts blinking and the test time setting value is displayed at the bottom of 7-segment LED.
In this state, set the test time by using the ▲UP / ▼DOWN switches.
When the ▲UP / ▼DOWN switches continue to be pressed, the numerical value is increased / decreased quickly.
- Set each test mode by referring to the following pages.
The settings of the test time can be changed even after each test mode is set.



The Simulator allows you to choose either the test time function or 1 SHOT function in the operation when the power is turned on. When the power supply is turned on while pressing the VOLTAGE switch and the ▼DOWN switch, the 1 SHOT function becomes enabled and the test time function becomes disabled. When the TEST TIME switch is pressed in this state, the 1 SHOT mode can be turned on/off while the test time mode remains disabled. The selected function is initialized every time the power supply is turned on; the 1 SHOT mode is disabled and the test time function is enabled.

13-3. Operation in PHASE mode

In this mode, the Simulator generates pulses synchronizing with the frequency of AC supply for the EUT.

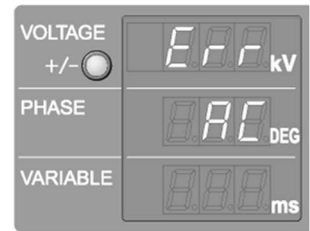
One pulse is generated every cycle.



In the following case, an Err sign is shown upon pressing the START button and the Simulator does not generate pulses.

- No AC source is connected to the EUT LINE INPUT terminal on the rear panel.
- When the voltage of AC supply is less than AC90V.
- When the frequency of AC supply is over 50/60Hz \pm 10%.
- The EUT LINE INPUT power supply is DC

In such case, cancel the error by pressing the STOP switch and check the AC power supply.

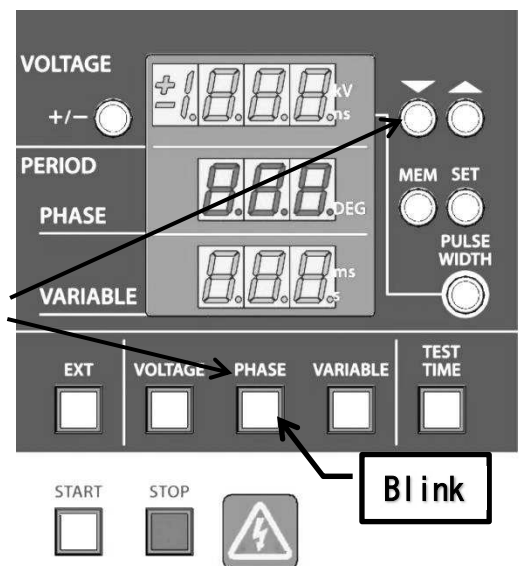


1. Before operation, prepare the test environment and make a connection for the intended test.
2. Set the output pulse polarity, pulse width, and output voltage, test time.



For details, see [P.44](#) "[Setting the common items](#)".

3. When the **PHASE** switch is pressed, the switch starts blinking and the application phase angle setting value is displayed at the middle of 7-segment LED. In this state, set application phase angle by using the **▲UP / ▼DOWN switches**. The phase angle can be set from 0 to 360° (DEG).
4. Check the connection for EUT LINE INPUT.
5. Press the START button to run the test. The warning lamp starts blinking.



Operation in PHASE MODE is available when the Simulator works with an optional injection unit.

For details, see [P.49](#) "[Operation in EXTERNAL Trigger mode](#)".

Pulse placement (phase angle) control in common mode testing

AC voltage input between L and N of the EUT LINE INPUT works as a phase angle control reference in PHASE (EUT LINE synchronization) mode operation. In Japan, generally, single phase AC supply is a system where N is earthed. L and N lines are irrelevant with the PE in terms of phase correlation, therefore, theoretically, no setting of phase angle placement in common mode testing comes to be defined. With the real test set up, however, L and N of the EUT LINE are balanced thanks to the external isolation transformer and decoupling capacitors within the Simulator, allowing N to have a 180° phase difference with respect to L.

The table shown below indicates required the correction value.

INJECTED LINE	CORRECTON	PHASE SETTING EXAMPLE FOR 90°
L-N	+0°	90 DEG
L-PE	+0°	90 DEG
N-PE	+180°	270 DEG※

※to place pulses at 90° of N – PE

$$90^\circ(\text{the value you want to set}) + 180^\circ(\text{correction}) = 270^\circ$$

The PHASE display shall be set to 270 DEG.

13-4. Operation in VARIABLE mode

In this mode, the Simulator generates pulses at the selected pulse period, irrespective of the frequency of AC supply to the EUT LINE.



- When an optional accessory such as Coupling Adaptor or Radiation Probe is used, operate the Simulator in this mode.



- In START status, the setting cannot be changed.
- The pulse output voltage, pulse width, and cycle period have limited setting ranges.
Voltage 0.50kV - 4.00kV Pulse width 50ns - 1000ns Cycle period 10ms - 999ms

1. Before operation, prepare the test environment and make a connection for the intended test.
2. Set the output pulse polarity, pulse width, and output voltage, test time.

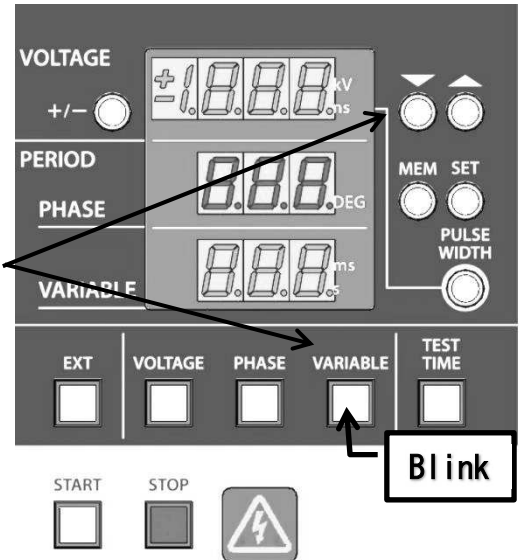


For details, see P.44 "Setting the common items".

3. When the VARIABLE switch is pressed, the switch starts blinking and the application the pulse period setting value is displayed at the bottom of 7-segment LED. In this state, set application phase angle by using the ▲UP / ▼DOWN switches.

In this state, set the cycle period of the pulse by using the ▲UP / ▼DOWN switches.

4. Check the connection for EUT LINE INPUT.
In VARIABLE mode, the Simulator can START (pulse generated) even when power supply is not fed to the EUT LINE INPUT.
5. Press the START button to run the test. The warning lamp starts blinking.



13-5. Operation in EXTernal Trigger mode

The EXT TRIG input connector on the front panel can be used for pulse generation synchronization with inputs from an external signal generator or injection unit, or control by using a contact switch. External trigger inputs function in the way shown below table.

Operation mode	Function	Signal source
VARIABLE	Trigger pulse	Signal generator
PHASE	Zero-cross reference signal	Injection unit

Synchronization with inputs from an external signal generator

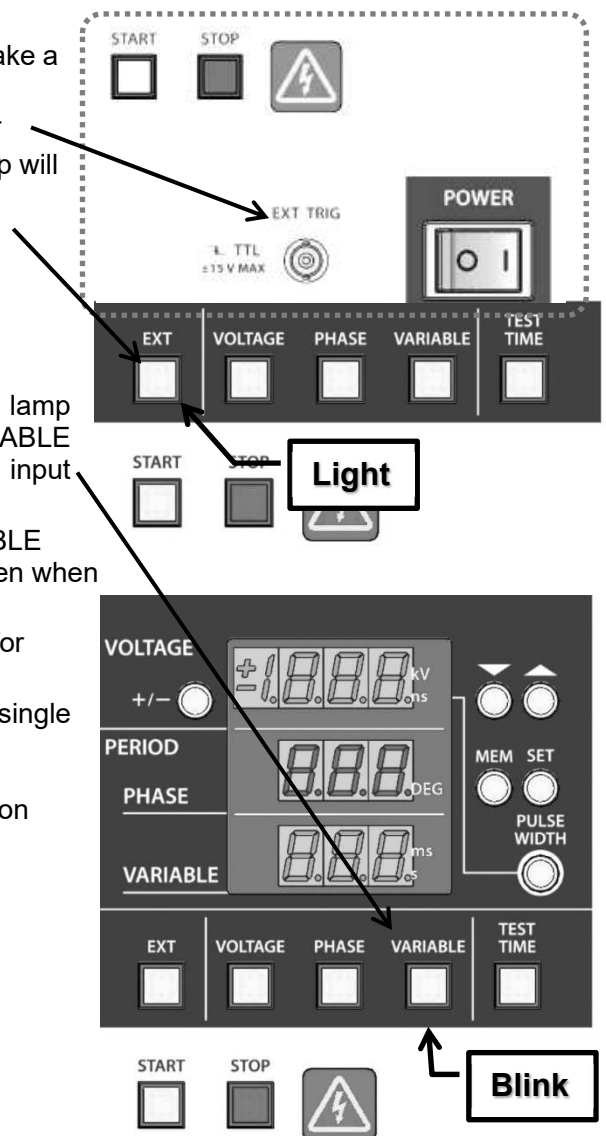
This mode is used to generate pulses in synchronization with signals to EXT TRIG input terminal. Appropriate signal inputs shall be done to the terminal. Pulse generation synchronizes with the falling edge of the signal whose characteristics shall be TTL or open-collector, of the negative polarity, 10ms repetition rate or slower.

1. Before operation, prepare the test environment and make a connection for the intended test.
2. Input appropriate signals to EXT TRIG input connector
3. Press the EXT trigger mode button and the button lamp will be lighted. (The Simulator is in EXT trigger mode with lighted EXT button)
4. Set the output pulse polarity, pulse width, and output voltage, test time.



For details, see [P.44](#) "[Setting the common items](#)".

5. Press the VARIABLE button. The VARIABLE button lamp will start blinking. Now that the Simulator is in VARIABLE mode, it reacts to signal inputs to the EXT TRIG input connector.
6. Check the connection for EUT LINE INPUT. In VARIABLE mode, the Simulator can START (pulse generated) even when power supply is not fed to the EUT LINE INPUT
7. Press the START button to let the Simulator stand by for pulse generation.
8. Each time a signal is input, the Simulator generates a single pulse
In VARIABLE mode, the pulse is applied at the timing delayed from the falling edge of external synchronization signal by a switching operation delay of the discharge switch.



Synchronization with zero-cross reference signal inputs form an injection unit

The EXT TRIG input connector is also used for zero-cross signal input from an injection unit (Option). To do this, place the Simulator in PHASE mode. Falling edges of the signals with the following period are recognized as zero-cross reference signals for the EUT supply.

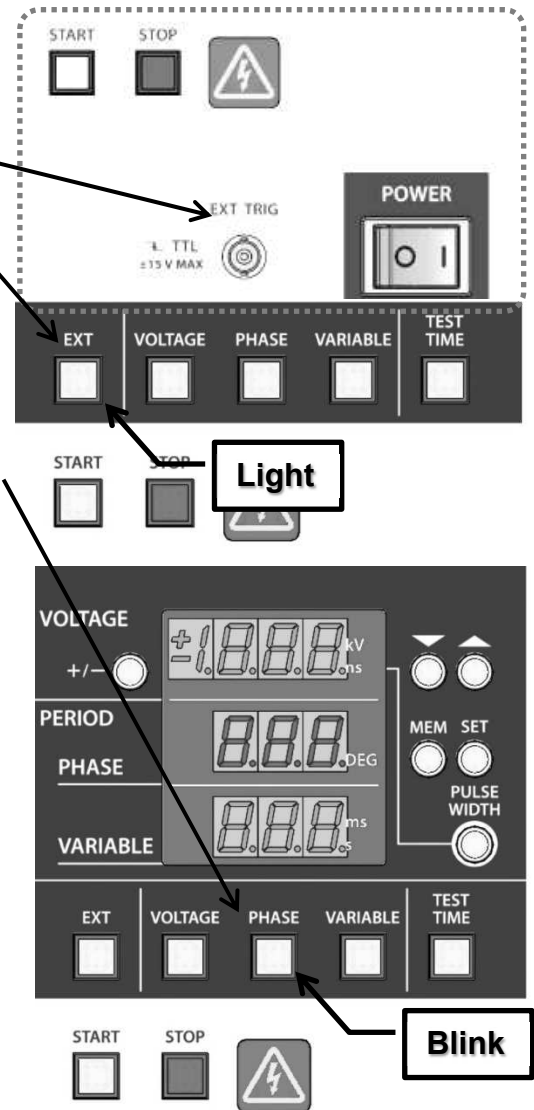
INS-S420 15.3ms minimum (65Hz) to 22.2 maximum (45Hz)

1. Before operation, prepare the test environment and make a connection for the intended test.
2. Input appropriate signals to EXT TRIG terminal from the injection unit.
3. Press the EXT trigger mode button and the button lamp will be lighted. (The Simulator is in EXT trigger mode with lighted EXT button)
4. Set the output pulse polarity, pulse width, and output voltage, test time.



For details, see [P.44 "Setting the common items"](#).

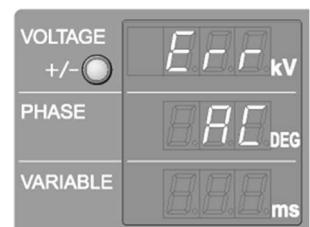
5. Press the PHASE button and check to see the PHASE button lamp is lighted. Select the desired placement phase angle.
6. Check the connection for injection unit EUT LINE INPUT.
7. Press the START button to run the test. The warning lamp starts blinking.



In the following case, an Err sign is shown upon pressing the START button and the Simulator does not generate pulses.

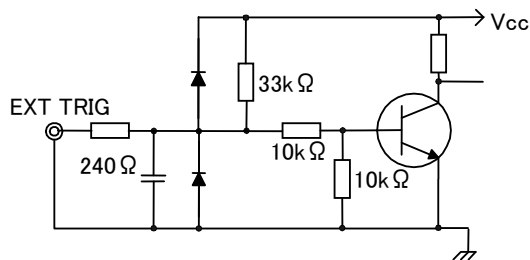
- Synchronization signal is not input to the external synchronization signal input connector
- Synchronization signal does not meet the specifications (shortest 15.3 ms, longest 22.2 ms)

To return to the normal operation mode, press the STOP button. Check the external synchronization signal from the injection unit and press the START button again.



Control by using a contact switch

Additionally provided is a pulse timing control by using on/off control of a contact switch. This mode can be active when the operator presses and holds the EXT button in the VARIABLE mode. In this mode, the Simulator ignores relay bounces generated by a push button or similar device, as the low state with 20ms or longer duration can only be regarded as a valid input. The VARIABLE indicator shows ". . . "



External synchronization signal input circuit

13-6. Operation in 1 SHOT mode

In this mode, the Simulator generates single pulse by pressing a button. Each time the TEST TIME button is pressed, the Simulator generates a single pulse. When PHASE mode has been selected, pulse generation synchronizes with the AC frequency and its placement can be set on PHASE indicator. When VARIABLE mode has been selected, pulse generation completely depends on the timing of the TEST TIME button being pressed.



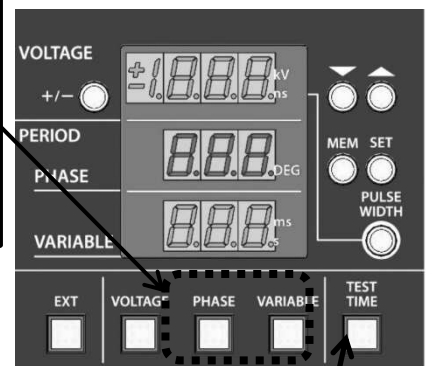
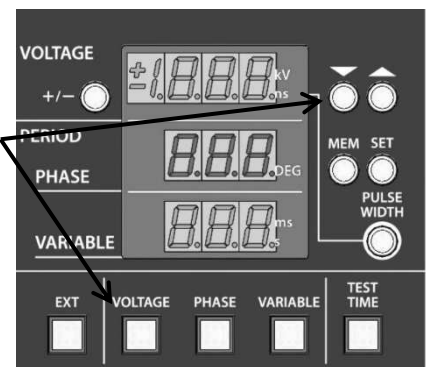
The Simulator allows you to choose either the test time function or 1 SHOT function in the operation when the power is turned on. When the power supply is turned on while pressing the VOLTAGE switch and the ▼DOWN switch, the 1 SHOT mode becomes enabled and the test time mode becomes disabled. When the TEST TIME switch is pressed in this state, the 1 SHOT mode can be turned on/off but the test time function remains disabled. The selected function is initialized every time the power supply is turned on; the 1 SHOT function becomes disabled and the test time mode becomes enabled.

1. Before operation, prepare the test environment and make a connection for the intended test.
2. Turn on the power supply of the Simulator while pressing the VOLTAGE switch and the ▼DOWN switch. By this operation, the 1 SHOT mode becomes enabled and the 1 SHOT mode is turned on.
3. Set the output pulse polarity, pulse width, and output voltage, test time.



For details, see P.44 "Setting the common items".

4. To generate pulses synchronizing with AC frequency, press the PHASE button and check to see the button lamp starts blinking. Adjust placement phase angle by using Increment or Decrement button.
5. To generate pulses in VARIABLE mode, press the VARIABLE button. Pulse release depends on timing of the TEST TIME button being pressed. Setting on the VARIABLE indicator cannot be done.
6. Check the connection for EUT LINE INPUT. In VARIABLE mode, the Simulator can START (pulse generated) even when power supply is not fed to the EUT LINE INPUT.
7. Check the "TEST TIME button" is light. The Simulator is in 1SHOT mode with lighted TEST TIME button. If the switch is Light off, press the TEST TIME switch to light
8. Press the START button to run the test.
9. Each time the TEST TIME button is pressed, the Simulator generates a single pulse. When PHASE mode has been selected, pulse generation synchronizes with the AC frequency and when VARIABLE mode has been selected, pulse generation completely depends on the timing of the TEST TIME button being pressed. (Strictly speaking, a switching operation delay of the discharge switch is included)



Light



In the PHASE mode, the Simulator does not generate pulses when no AC source is disconnected to the EUT LINE INPUT terminal or the EUT LINE INPUT power supply is DC (when the frequency of AC supply is out of a 45Hz to 65Hz range), In this case, an Err sign is shown upon pressing the START button.

For details, see P.46 "Operation in PHASE mode".

13–7. Stop the Simulator

Pressing the STOP button stops the pulse generation and turns off the START lamp. The high voltage circuitry within the Simulator turns off but requires approx. 4 seconds to eliminate residual voltages. When changing a connection, allow 5 seconds or more to elapse after pressing the button. When changing pulse polarity, press the STOP button first, selection is only available after 1 second has passed.



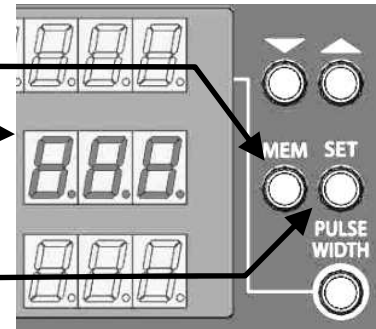
Even when the Simulator is in the STOP state, EUT LINE is not internally disconnected. The LINE output terminals (terminal block outlet panel) are still live. Be sure to disconnect the EUT supply from the EUT LINE INPUT.

13-8. Memory function

The Simulator can save the current settings for the output voltage (kV), phase angle (deg), and pulse period (ms) and also the settings for ramp mode. The memory is operative unless the backup battery is discharged.

How to save settings

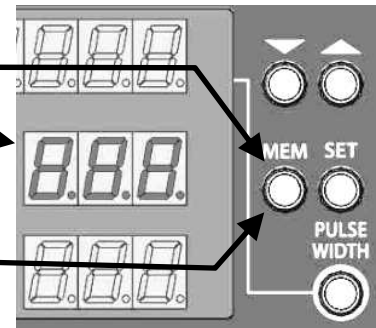
1. Press the MEMORY button.
2. The MEMORY button becomes alight. The number currently selected is displayed in the second column.
3. Select the desired memory number with Increment and Decrement button.
4. Press the SET button. The Simulator saves the current settings under the selected memory number.



※To skip the saving procedure, press any other button than MEMORY, SET, Increment and Decrement. The Simulator will not save the current settings and its display will return to ordinary status.

How to call up setting

1. Press the MEMORY button.
2. The MEMORY button becomes alight. The memory number currently selected is displayed in the second column.
3. Select the desired memory number with Increment and Decrement button.
4. Press the MEMORY button again. The Simulator calls up the settings saved under the selected memory number.



※To skip the calling procedure, press any other button than MEMORY, SET Increment and Decrement.



When the power supply of the Simulator is OFF, the memory of setting value is retained with an internal backup battery. The retainment time of the backup battery is approximate one month. If the term is over, the setting returns to initial setting.

14. SPECIFICATIONS

14-1. Specifications of Generator

【PULSE OUT】

Parameters	Specifications	Remark
Output voltage	0.50 kV to 4.00 kV \pm 10 % ※1	When the output is 50 Ω terminated. 0.01 kVstep
Pulse width	50 ns to 1000 ns \pm 10 % (50ns \pm 15%)	When the output is 50 Ω terminated. 50 ns step
VALIABLE	10 ms to 999 ms \pm 10 %	1 ms step
Rise time	< 3ns	When the output is 50 Ω terminated.
Peak voltage	Output voltage \pm 50 % at pulse width is 1000ns	When the output is 50 Ω terminated.

【EUT LINE OUTPUT】

Parameters	Specifications	Remark
Output voltage	0.50 kV to 4.00 kV \pm 20 % ※1	When the output is 50 Ω terminated. 0.01 kVstep
Pulse width	50 ns to 1000 ns	When the output is 50 Ω terminated. 50 ns step
VALIABLE	10 ms to 999 ms	1 ms step

※1 Specified when the pulse width is 1000 ns.

SPECIFICATIONS

【COMMON】

Parameters		Specifications	Remark
Polarity		Positive / negative	
Output impedance		50 Ω	Impedance matching by 50Ω series resistance
Built-in terminator		50 Ω	About 55Ω combined resistance of CDN part 500Ω and 50Ω TERM part
Pulse repetition mode	LINE PHASE	50Hz/60Hz, placement phase angle 0 to 360°±10°, synchronized with L, N of the EUT supply (LINE IN) .	EUT power supply: Operates on AC90V to AC240V, 50Hz/60Hz±10%.
	VARIABLE	10 ms to 999 ms	
	EXT TRIG	Connector type : BNC Period : > 10ms Input signal level : -15 to +15V TTL/open collector negative logic Pulse width : > 0.5ms Also functions for timing reference signals input from an external injection unit.	In VARIABLE mode, a switching operation delay of the discharge switch is included.
	1 SHOT	Single pulse generation, each time the TEST TIME button is pressed. Synchronized (phase angle set on the PHASE control) or asynchronized pulse period.	In VARIABLE mode, a switching operation delay of the discharge switch is included.
Test time		1 s to 999 s ± 10%	1s step

14-2. Specifications of CDN

Parameters	Specifications	Remark
Overlapping phase switching	L(+), N(-), PE / PULSE OUT ※ By coaxial cable connection	
EUT Power capacity	AC : Single-phase 240 V / 16 A DC : 125 V / 16 A	
Coupling phase	L(+), N(-), PE / PULSE OUT ※ By coaxial cable connection ※ The PE line has a circuit structure equivalent to L and N	※ Simultaneous application to all or multiple phases is not possible.
Coupling mode	Normal / Common ※By short plug connection	
EUT Line input / output	Terminal	Screw size:M5
Coupling capacitor	Each phase: 0.2047 μ F	
Decoupling coil	Each phase: 200 μ H	
Decoupling capacitor	Each phase: 0.3 μ F	
Resistance for eliminating residual charge of decoupling capacitor	Each phase: 470 k Ω	
Residual impulse voltage at input terminal	Less than 10% of set voltage ※Measured with open circuit EUT LINE OUTPUT ports and EUT LINE INPUT ports	

14-3. Other Specifications

Parameters	Specifications	Remark
Control panel /Display	Push Button,7-segment-display	
HV Coaxial Connector	NMHV	Noiseken original
Driving power supply	AC 100 V to 240 V \pm 10 % 50 Hz / 60 Hz \pm 10 % Approx. 215 VA	
Operational environment	Temperature : 15 to 35 $^{\circ}$ C Humidity: : 25 to 75 %	
Dimensions(mm)	W 430×H 349×D540 (Without projection)	
Weight	Approx. 23 kg	

15. OPTIONAL PRODUCTS

Major optional products are as follows.

For details, enquire Noise Laboratory or your nearest sales agent of Noise Laboratory.

15-1. Attenuator for waveform

Item	MODEL No.	Remarks
Attenuator for waveform	00-00017A	Input impedance : 50Ω Output impedance : 50Ω Attenuation : 40dB (DC to 2GHz)

15-2. Injection unit

Item	MODEL No.	Remarks
Injection unit	IJ-4050	Maximum input voltage : 4000V with 50Ω termination 3-phase 5-wire (L1, L2, L3, N, PE) AC415V 50A Built-in Circuit protector Do not use for DC power
Injection unit	IJ-5100Z	Maximum input voltage : 4000V with 50Ω termination 3-phase 5-wire (L1, L2, L3, N, PE) AC 480 V / 100 A Built-in Circuit protector Do not use for DC power
Coupling Decoupling Network	IJ-AT450	Maximum input voltage : 4000V with 50Ω termination 3-phase 4-wire (L1, L2, L3, N) AC 500 V / 50 A DC 250 V / 50 A Built-in Circuit protector

15-3. Outlet panel

Item	MODEL No.	Remarks
Outlet panel JP/USA type	18-00059C	AC 125 V / 16 A
Outlet panel CEE type	18-00060B	AC 240 V / 16 A
Outlet panel Multiple type	18-00084A	AC 250 V / 16A

15-4. Other optional items

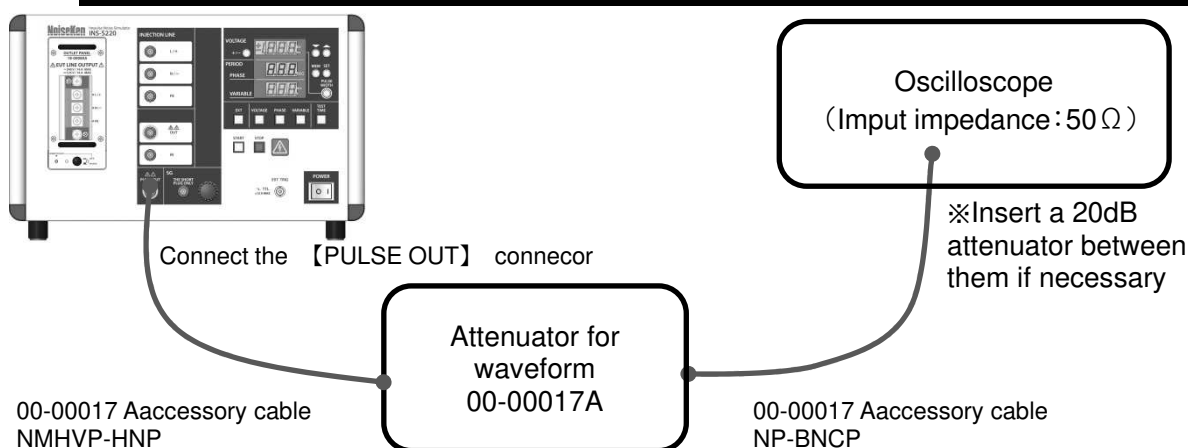
Item	MODEL No.	Remarks
EXTERNAL BREAKER BOX	18-00072A	"External breaker box" to turn the EUT line on/off, which also works as a protection circuit. Single phase AC 250V / 20A, DC 65V / 20A * Maximum input current to INS-S420 is 16A.
PULSE DIVIDER for INS (4:1)	00-00021A	Divide the pulse voltage of the INS (voltage divider ratio is 4:1). The product is useful when a pulse voltage 500 V or less (minimum output voltage of the INS series) is required. * Maximum input voltage is 2000V.

16. WAVEFORM VERIFICATION

16-1. Preparation

- * Oscilloscope (Frequency range: DC~600 MHz or more)
- * Attenuator 00-00017A: Optional product
(Input impedance: 50 Ω, Output Impedance: 50 Ω, Attenuation: 40 dB): Option

16-2. Checking the waveform



1. Disconnect the SG short plug from the Simulator. The SG short plug is not required for waveform check.
※There is no impact on waveform check even when the SG short plug is connected to the SG connector.
2. Connect the input connector of 00-00017A to PULSE OUT of the Simulator with the supplied coaxial cable (connector: NMHVP-HNP). Connect the output connector of 00-00017A to the input of an oscilloscope. Insert an attenuator between them if necessary.
3. As the output impedance of 00-00017A is 50 Ω, terminate the input of oscilloscope with 50 Ω.
4. Set the pulse output voltage and pulse width of the Simulator, and then press START.

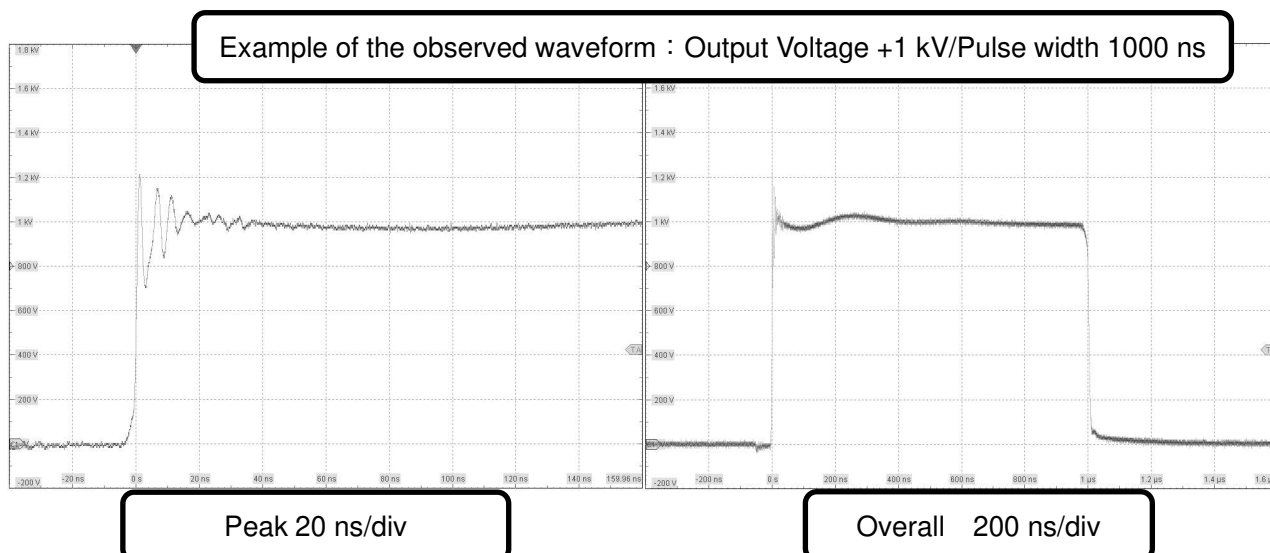


- Care should be taken not to exceed the maximum input voltage of the oscilloscope.
- Make sure the oscilloscope is properly grounded.



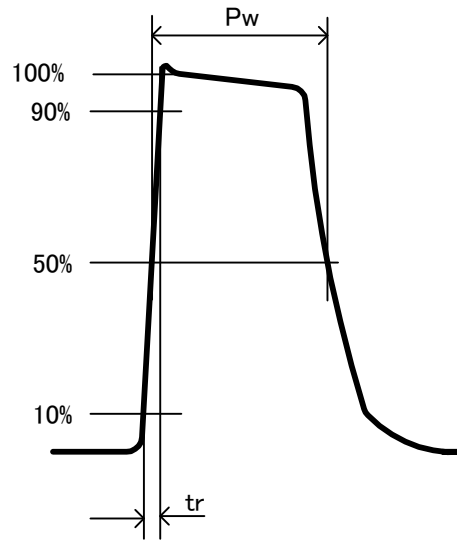
- When measuring voltages exceeding 2.0 kV, make sure that the pulse cycle period is 17 ms or longer. Please refer the manual of 00-00017A.

5. When working properly, the waveform as in the following figure will be generally observed.



16-3. How to read the waveform

Check the waveform in reference to the following figure and the example of the observed waveform.



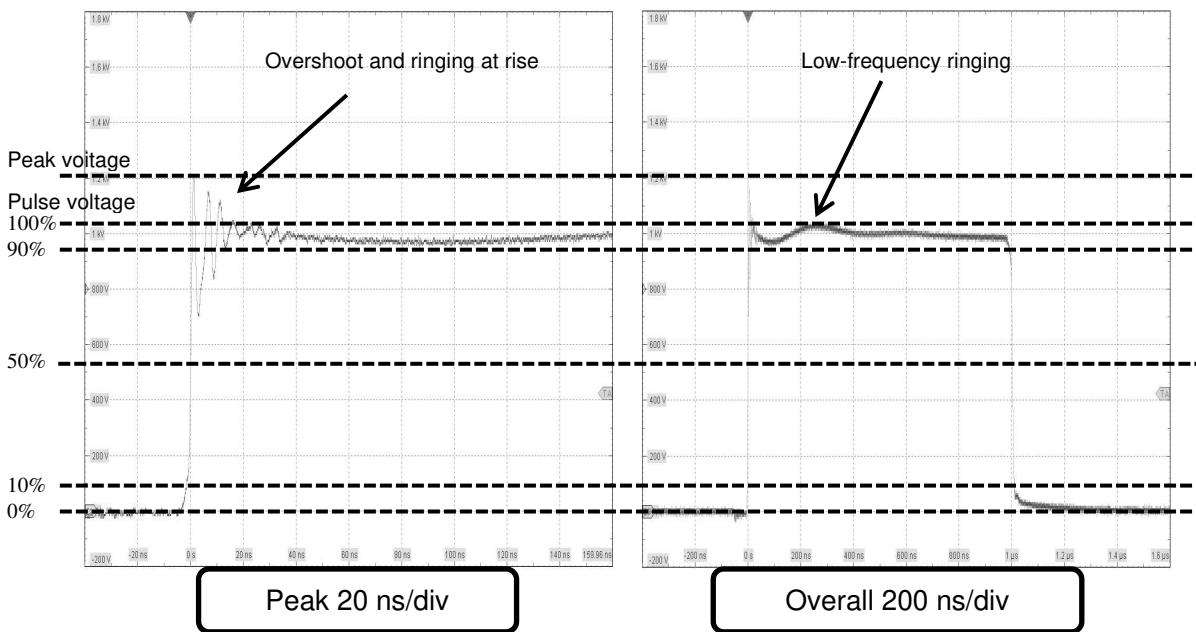
Output Voltage: 100% voltage in the figure
 Rise time : t_r (10% to 90% duration)
 Pulse width : P_w (50% to 50% duration)

Example 1 : when the pulse width is 1000ns

In the setting of the pulse width 1000ns, overshoot and ringing at rise and low-frequency ringing in the range from rise to around 400ns are observed. However, the pulse output voltage shall be read by excluding the overshoot and ringing at rise. In the example of the following figure, the low-frequency ringing is read as 100% of the pulse output voltage.

Check the rise time and the pulse width based on the read pulse output voltage.

* The pulse output voltage shall be based on the GND level of the oscilloscope and the preshoot immediately before the rise of the pulse shall be ignored.

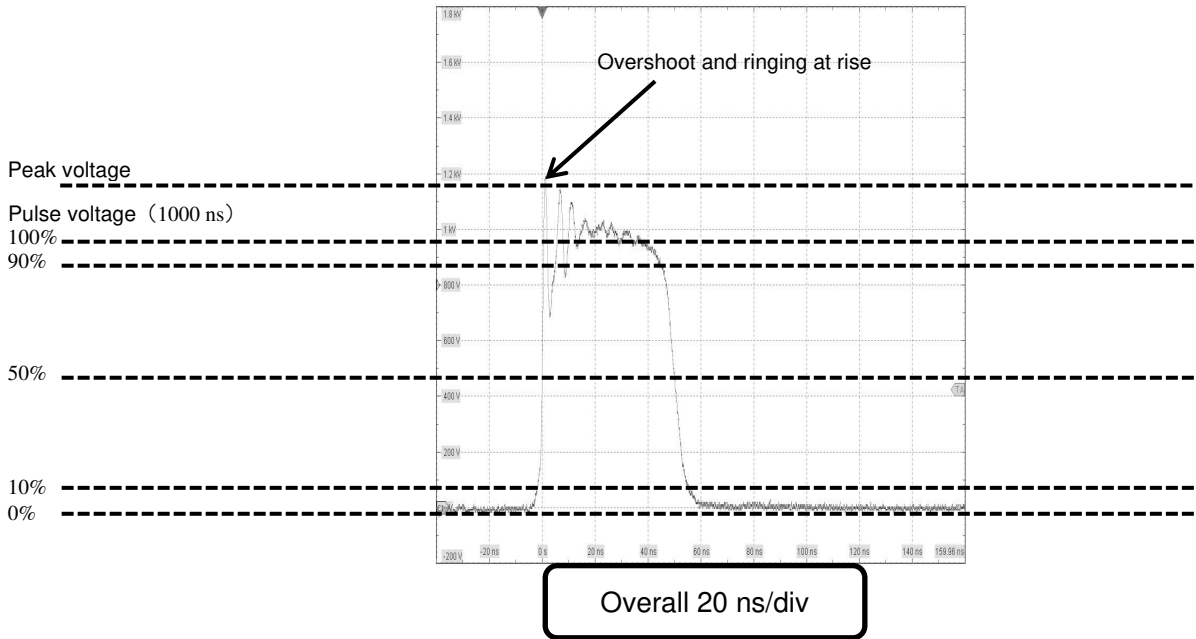


Example 2 : when the pulse width is 50ns

In the settings other than the pulse width 1000ns, the 100% voltage shall be the pulse output voltage measured at pulse width 1000ns (100% in the following figure).

Check the rise time and the pulse width based on the pulse output voltage at the pulse width 1000ns.

* The pulse output voltage shall be based on the GND level of the oscilloscope and the preshoot immediately before the rise of the pulse shall be ignored.



17. 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 defective parts

Any defective part exchanged under the Company's servicing belongs to it.

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. Refusal to offer servicing

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 HV relay)
- 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.

18. MAINTENANCE

1. When repair, maintenance or internal adjustment of the Simulator 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 Simulator.
3. When checking or replacing the fuse, turn off the switch of the Simulator and disconnect the plug socket beforehand.
4. When cleaning the Simulator, turn off the switch of the Simulator and the connected equipment and disconnect the plug socket beforehand.
5. Avoid using chemicals for cleaning. Otherwise, the coating of the Simulator may peel off or the sight glass may be broken.
6. Do not open the cover of the Simulator.

19. 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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