



INSTRUCTION MANUAL
AUTOMOTIVE TRANSIENT
SIMULATOR
MODEL ISS-7630

Noise Laboratory Co., Ltd.

2.00 Edition
AEJ00369-00E-1-F

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1. IMPORTANT SAFETY PRECAUTIONS

The following instructions are very important for safe handling of ISS-7650 (the "Unit"). Read them carefully before use.

- 1. Do not use the Unit near flammable materials or fire sources. When used, there is a risk of fire due to pulses, etc**
- 2. Any person with medical electronics such as a heart pacemaker is not to operate the Unit. And, do not enter the test area while the Unit is operating.**
- 3. To avoid electric shock, be sure that the power of the Unit, the power source, and the device under test ("DUT") are all turned OFF, and make sure there is no residual voltage before making any connections.**
- 4. A number of safety recommendations are listed in the later chapter "BASIC SAFETY PRECAUTIONS". Be sure to read them before test environment settings, connecting and testing.**
- 5. Do not touch AC power voltage switch terminals or external output terminals. There is a risk of electric shock.**

Memorandum

2. APPLICATION FORM FOR INSTRUCTION MANUAL

We place an order for an instruction manual.

Model: ISS-7630 _____

Serial No.: _____

Applicant:

Company name: _____

Address: _____

Department: _____

Person in charge: _____

Tel No.: _____

Fax No. _____

Cut off this page “APPLICATION FORM FOR INSTRUCTION MANUAL” from this volume and keep it for future use with care.

When an INSTRUCTION MANUAL is required, fill in the above Application Form and mail or fax it to the following sales department of our company.

To: Noise Laboratory Co., Ltd.

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

Kanagawa Pref., 252-0237 Japan

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

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

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4. PREFACE

Thank you very much for purchasing ISS-7630 (the "Unit"). Please read this instruction manual (the "Manual") thoroughly prior to use of the Unit in order to attain the maximum and safe use of the Unit.

Remote Control Software to control the Unit by a PC is also attached. When you control the Unit through the software, please read the instruction manual of Remote Control Software thoroughly in addition to the Manual to ensure safety and correct procedures.

- **The Manual will let you operate ISS-7630 safely and make the most use of it if you strictly follow the operational procedures and the safety instructions.**
- **Keep the Manual handy whenever you operate ISS-7630.**

5. BASIC SAFETY PRECAUTIONS

5-1. Symbols of Hazard



WARNING



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。

NOISE LABORATORY CO.,LTD. IS EXCLUDED ALL THE
LIABILITY OF ANY FORMS OF DAMEGE, OF EQUIPMENT
OR HUMANS, CAUSED BY USER'S MISHANDLING DURING
OPERATION.
誤った操作による損害に対しては、一切責任を負いません。

Indication of Warning

The following warning indication is placed on the upper left of the rear-panel of the Unit, and alerts a risk of electric shock.



This sign indicates the presence of "dangerous voltage/current" that may endanger persons.



This sign indicates "handle with care".
Refer to the Manual to protect human bodies and devices.



This sign indicates a protective ground terminal.



This sign indicates a connection to FG (steel case).

5-2. Basic Safety Precautions

1. The Unit is grounded by the three line AC cord with a grounding conductor. Never fail to insert the AC cord to an outlet with an earth terminal to avoid an electric shock.
【Precautions regarding connection and use】
2. Use the AC cord which matches the source voltage, as the shape of the AC cord differs depending on the source voltage.
【Precautions regarding connection and use】
3. When changing fuses, choose the same melt off type and rating. Also, be sure to unplug the AC chord before changing fuses.
【Precautions regarding use and safety】
4. Do not supply the Unit with voltage or overload beyond the specification range. The Unit may be damaged if this is not obeyed.
【Precautions regarding connection and use】
5. Use the input and output cables which meet the current and power capacity requirements.
【Precautions regarding connection and use】

6. Before connecting the Unit, turn OFF the DC power source and the Unit, and make sure that there is no residual voltage. Connect each cable securely. Nonobservance may cause electric shock or damage to the internal parts of the Unit and connected devices.
【Precautions regarding bodily injury and connection】
7. When a protective cover, etc. of the Unit is removed for connection to the Unit, be sure to place the protective cover before supplying electricity. There is a risk of short-circuiting or electric shock.
【Precautions regarding connection and use】
8. Use accessories and optional items supplied by the Company to ensure safe operation.
【Precautions regarding connection and use】
9. Do not open the Unit's cover, as voltages are generated within the Unit's enclosure,
【Precautions regarding bodily injury】
10. Do not block any ventilation openings of the Unit.
【Precautions regarding environment】
11. Do not utilize or store the Unit under extremely high or low temperature environment (Operating environment: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ / Operating Humidity Range: 25~75%).
【Precautions regarding environment】
12. Do not use the Unit under high humidity or dusty conditions.
【Precautions regarding environment】
13. Should condensation form, fully dry the Unit before usage.
【Precautions regarding environment】
14. Do not wipe the body of the Unit with solvents such as lacquer thinner or alcohol. When the Unit gets dirty, wipe it with a detergent moistened fabric etc.
【Precautions regarding use】
15. Do not use the Unit near flammable materials or fire sources. When used, there is a risk of fire due to discharge, etc.
【Precautions regarding bodily injury and environment】
16. The Company and its sales agent assume no responsibility for any bodily injury, loss, damage or resultant damage arising from derelict misuse of the Unit on the part of the user.
【Precautions regarding bodily injury, use, environment, and connection】
17. Should the necessity of services such as repair, maintenance, or internal calibration arise, leave them to qualified service personnel only.
【Precautions regarding use and safety】

5-3. Loss of Warning Label

1. If the warning label is peeled off and missing or it gets dirty, replace it with a new one for safety.
2. If the warning label is lost, order a new one from our sales agent or the technical service center of the Company.

6. MAIN FEATURES

6-1. Distinctive Features

- Capable of performing tests of Test Pulse 3a/3b in accordance with ISO/DIS 7637-2.2 (2002-07-16), ISO/DIS 7637-2.3 (2003-05-20), ISO 7637-2 (Second edition 2004-06-15), and ISO 7637-2 (Third edition 2011-03-11).
- Capable of performing Coupling Clamp Tests (Optional)
- Capable of detailed configuration of output waveform voltage/time.
 - Test Pulse 3a output voltage U_s is variable from -10V to -350V in steps of -1V.
 - Test Pulse 3b output voltage U_s is variable from 10V to 350V in steps of 1V.
 - Pulse cycle t_1 is variable from 10 μ s to 999 μ s in 1 μ s steps (10 μ s to 1000 μ s when controlled by Remote Control Software)
 - Burst interval (t_4) is variable from 1ms to 100ms in steps of 1ms.
 - Burst rest interval (t_5) is variable from 9ms to 999ms in steps of 1ms.
- Capable of tests with rise time $t_r < 3.5$ ns, which is harsher than the Standards.
- Ensures the standard waveform (Annex D) for both with no load and with 50 Ω load by DC LINE OUT/PULSE.
- An optional measuring device is available to allow easy verification (pre-start checkup) of the standard waveform (Annex D).
- The maximum DUT (Device Under Test) capacity is 60V 30A.
- Output terminals are the electric-shock free safety plugs which protect against electric shock.
- Compatible with AC Input driving voltage of 100V, 110V, 120V, 200V, 220V, and 240V by a jumper switch on the rear panel.
- Capable of creating test conditions not limited to the Standards by utilizing optional Remote Control Software. Also capable of running user defined sequential tests (sequence) combining various test settings.
- Capable of noise unsusceptible stable transmissions by using an optional Optical Interface Unit and Remote Control Software for the purpose of communication between the Unit and the PC (when used standalone without mounting to a rack).
- An optional ISS-7690 is capable of integrated pulse output when the Unit is installed onto System Rack ISS-7602 (Optional). The optional 50A type ISS-7690 can expand DUT capacity to 60V max, 50A max.

6-2. Schematic Circuit Diagram of the Unit

The schematic circuit diagram of the Unit's pulse generation is shown in Figure 1. The basic action is that when the SW1 is closed ON, the electric charge stored in capacitor C1 will flow through L1, C2, the internal resistor Ri, and the DUT connected between the HOT-GND Output Terminals, and then return to capacitor C1.

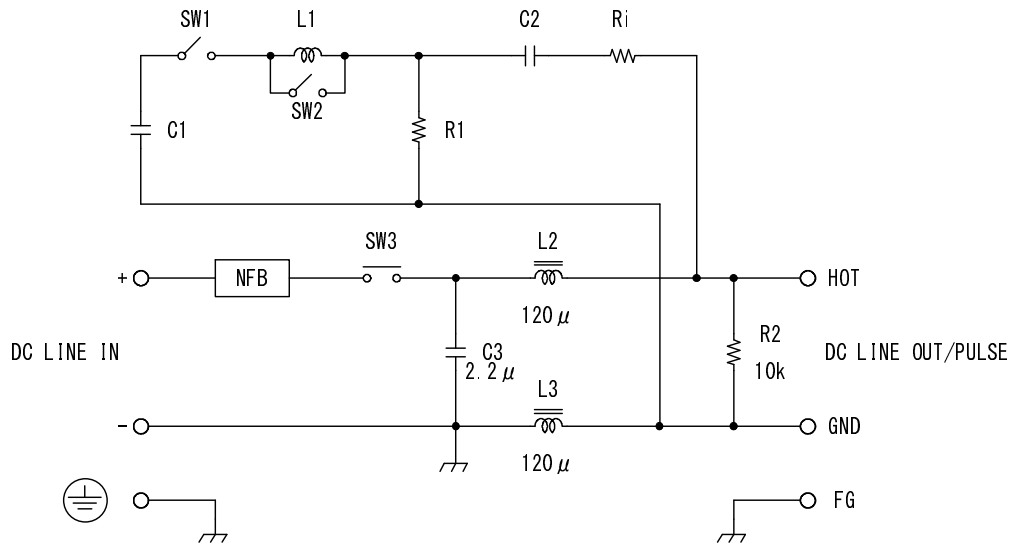
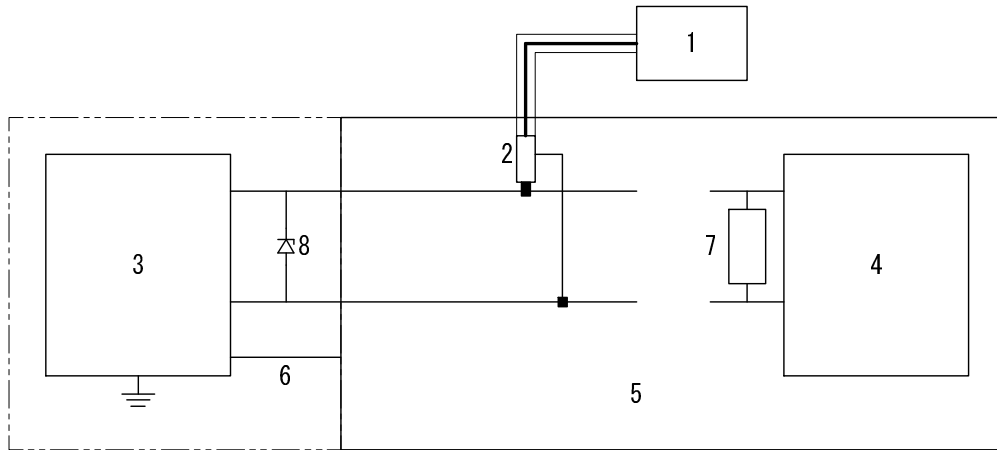


Figure 1 Circuit Schematic

- L1 is for adjusting pulse rise time, and short-circuiting SW2 realizes $t_r < 3.5\text{ns}$.
- L2, L3, and C3 direct the pulse injection to LINE OUT (PULSE) only and not to LINE IN.
- C2 is the coupling capacitor for injection onto LINE.
- DC ON/OFF Switch controls the SW3. **When SW3 is ON, DC voltage input into LINE IN is output to LINE OUT (PULSE).**

6-3. Regarding ISO7637-2 (Second edition 2004-06-15)

ISO7637-2 (Second edition 2004-06-15) specifies the standards relevant to the transient pulse simulator for in-vehicle devices. This specifies the configurations of the test, the pulse voltage waveforms, the testing voltage level and testing environment, etc. The Unit is capable of performing tests in accordance with this standard. The schematic test setup is excerpted from the standard and shown below. For details, be sure to refer to the ISO Standards.



a) Pulse adjustment

Figure 2 Test Configuration (During Pulse Verification)

When verifying the Unit waveform, do not connect DUT and leave the output open. Turn DC LINE ON (Circuit Breaker also ON), and be sure to short the + and – terminals of DC INPUT with the accessory Shortlead Cable (for Waveform Verification). The resistor 7 and diode 8 in Figure 2 should not be connected under the Pulse 3a and Pulse 3b testing environment.

In the text of the standard, Use of the voltage probe is specified for verifying pulse, but Annex D expressly specifies that coaxial measuring device shall be used for the purpose of verification of Pulse 3a and Pulse 3b. Also, the reasons for this are given in the same text.

For non-load measurement of Pulse 3a and Pulse 3b in accordance with Annex D, coaxial type measuring devices developed by the Company are used. By employing this measuring device, the ringing and probe cable interference that used to be generated by conventional voltage probes is highly improved, and clean waveforms (see Figure 3) can be observed.

This measuring device is available as an optional item.

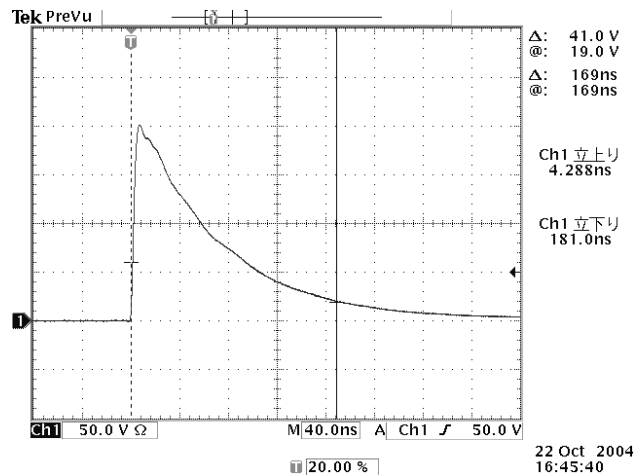


Figure 3 No Load Waveform

Pulse 3a Waveform Standard (ISO7637-2 (Second edition 2004-06-15))

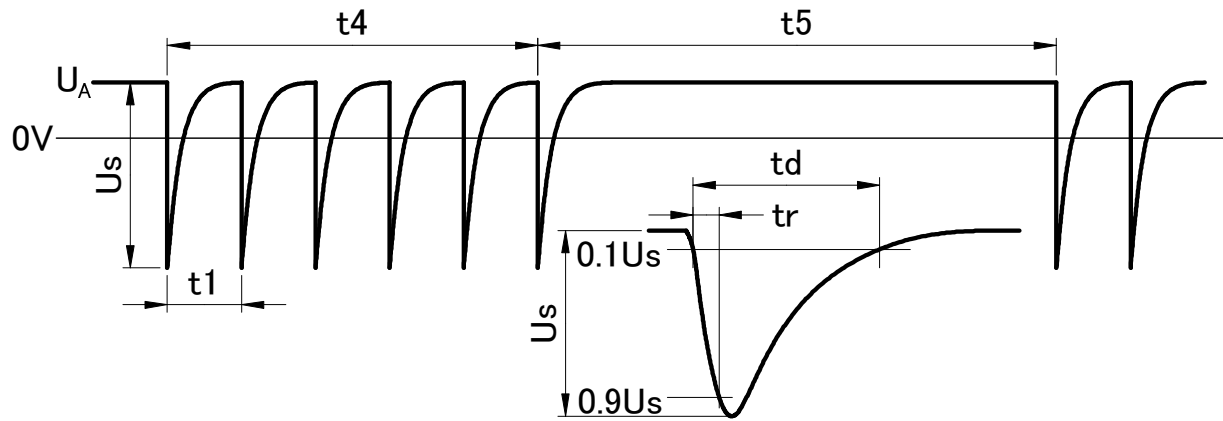


Figure 4 Pulse 3a Waveform

Table 1 Pulse 3a Parameters

	Parameter	12V System	24V System
Output Open	Us	-112V~-150V	-150V~-200V
	Ri	50 Ω	
	Td	0.1μs -0/+0.1μs	
	Tr	5ns ± 1.5ns	
	t1	100μs	
	t4	10ms	
	t5	90ms	
Annex D (No load)	Us	-200V ± 20V	
	Tr	5ns ± 1.5ns	
	Td	150ns ± 45ns	
Annex D (50 Ω load)	Us	-100V ± 20V	
	Tr	5ns ± 1.5ns	
	Td	150ns ± 45ns	

Annex D Requirements

- 12V/24V System (UA = 0V, Coaxial Measuring Device)

Pulse 3b Waveform Standard (ISO7637-2 (Second edition 2004-06-15))

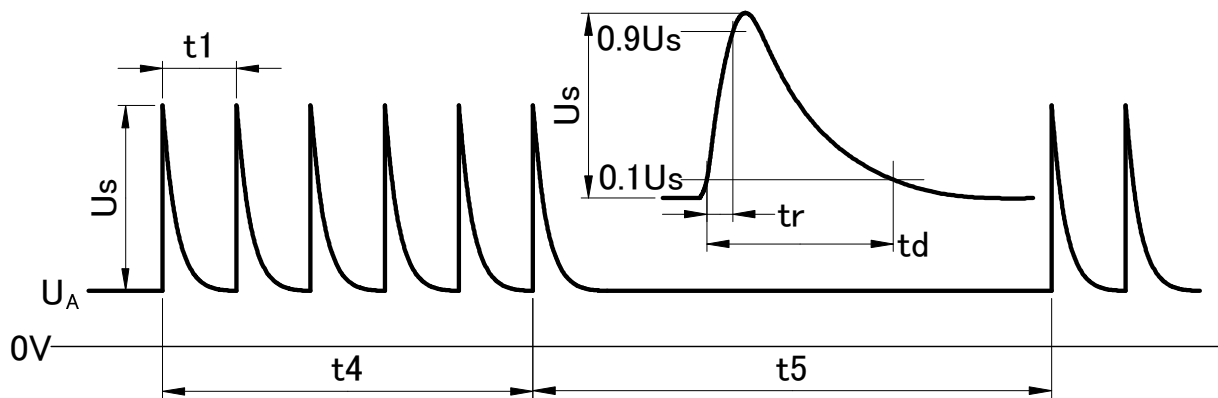


Figure 5 Pulse 3b Waveform

Table 2 Pulse 3b Parameters

	Parameter	12V System	24V System
Output Open	U _s	+75V ~ +100V	+150V ~ +200V
	R _i	50 Ω	
	T _d	0.1 μs -0/+0.1 μs	
	T _r	5ns ± 1.5ns	
	t ₁	100 μs	
	t ₄	10ms	
	t ₅	90ms	
Annex D (No load)	U _s	+200V ± 20V	
	T _r	5ns ± 1.5ns	
	T _d	150ns ± 45ns	
Annex D (50 Ω load)	U _s	+100V ± 20V	
	T _r	5ns ± 1.5ns	
	T _d	150ns ± 45ns	

Annex D Requirements

- 12V/24V System (U_A=0V, Coaxial Measuring Device)

7. PART NAMES AND FUNCTIONS

Main Unit (ISS-7630)

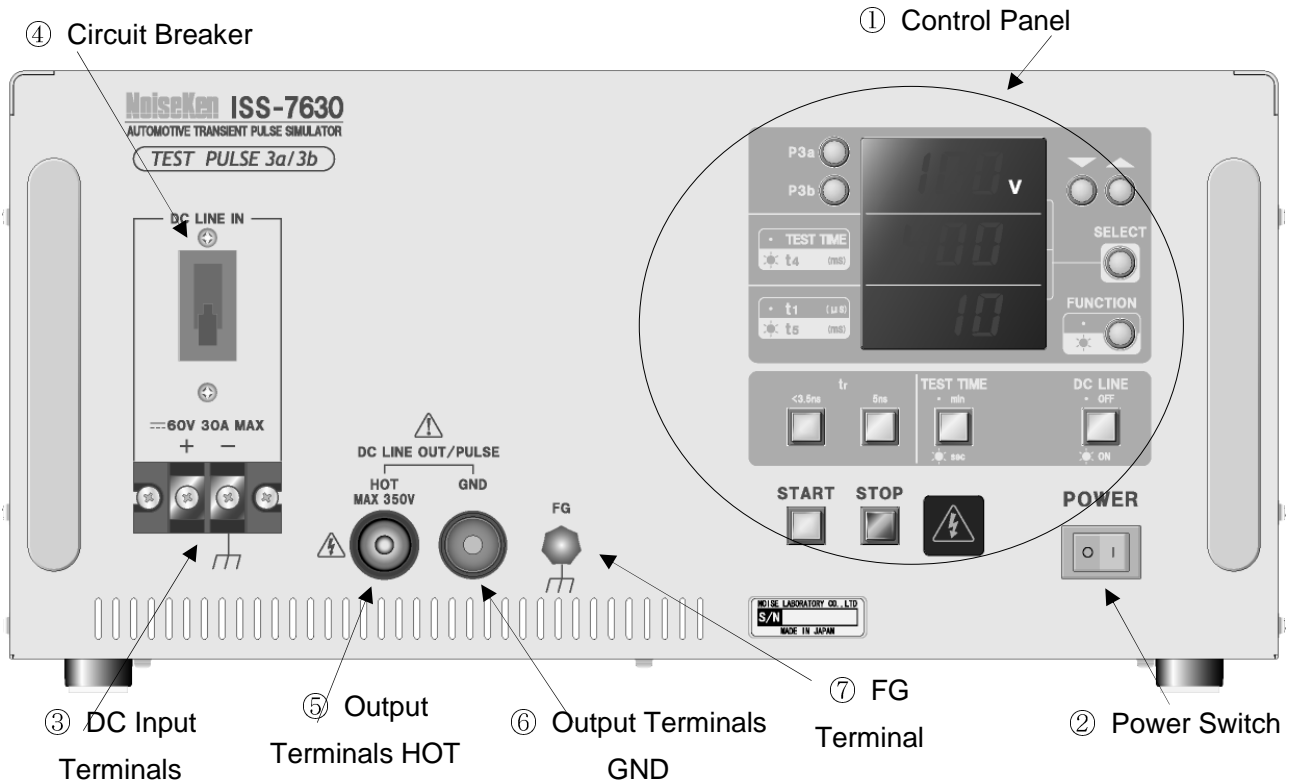


Figure 6 Front Panel

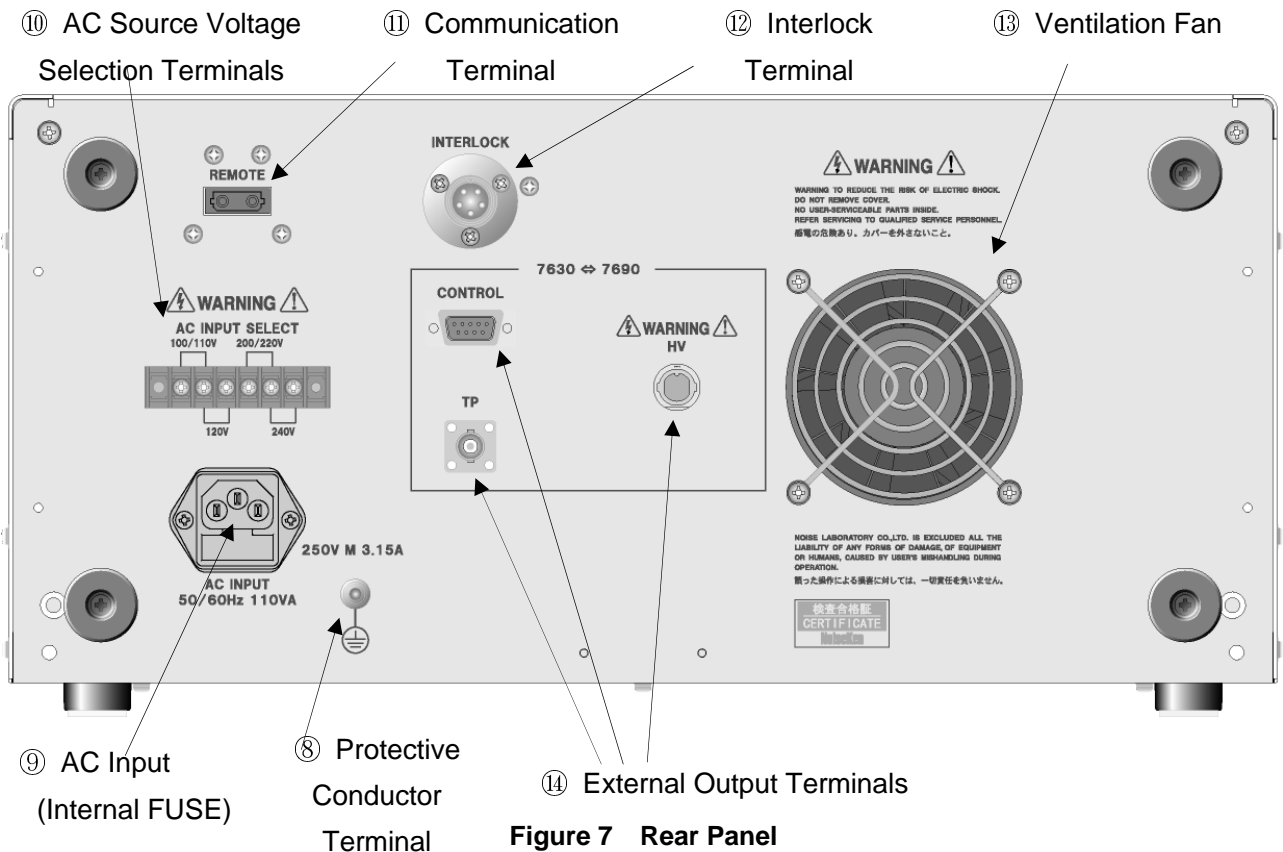


Figure 7 Rear Panel

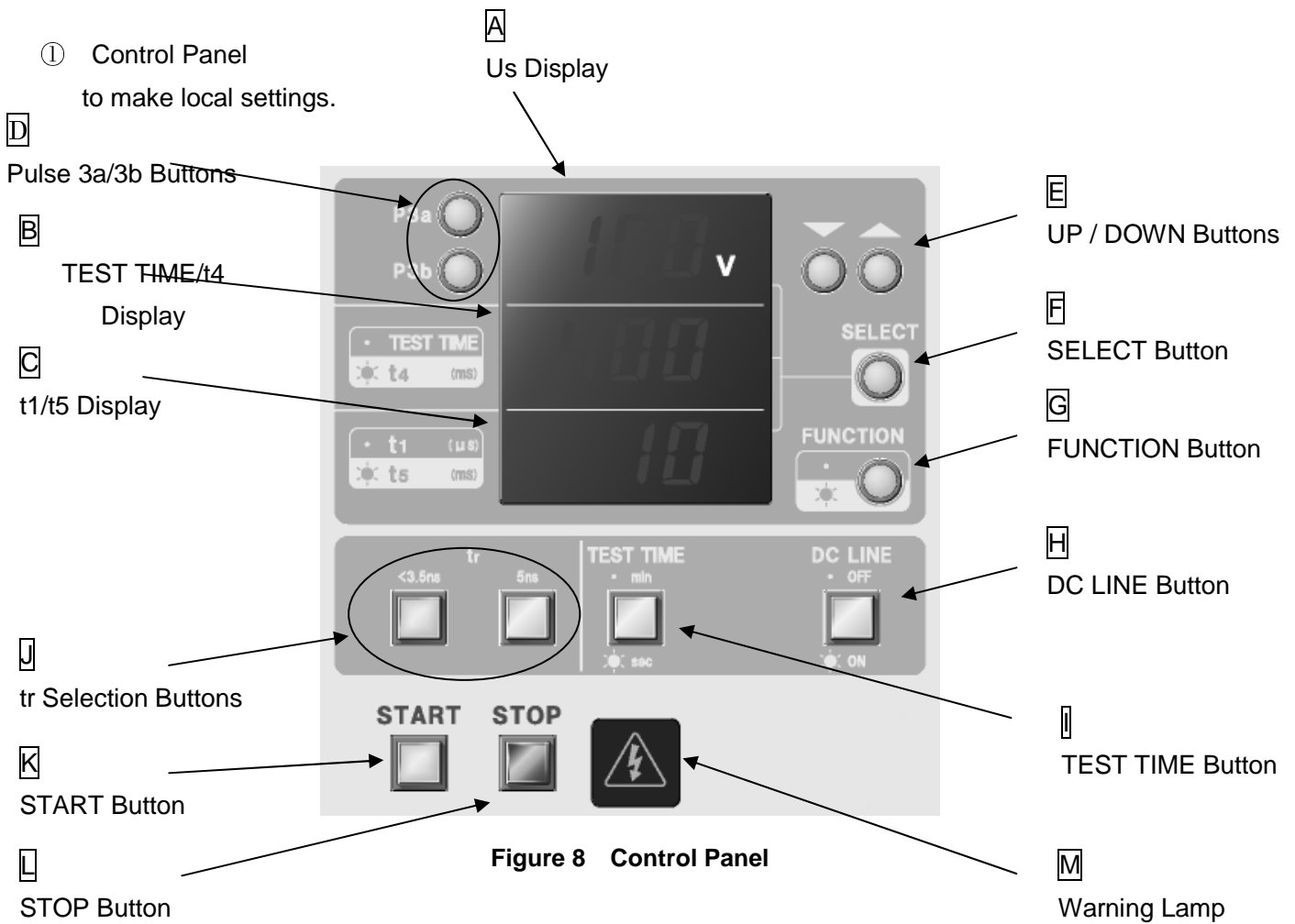


Figure 8 Control Panel

A Us Display

The “Us Display” monitors the Us value. It will display pulse voltage regardless of “FUNCTION **G**” ON or OFF. The waveform is shown in Figure 4 and Figure 5.

B TEST TIME/t4 Display

Displays either the “TEST TIME” or “t4” value. It will display “TEST TIME” when “FUNCTION **G**” is not lit, and “t4” when lit. When “START Button **K**” is pressed, the display will automatically change to “TEST TIME” (and FUNCTION will be unlit).



“TEST TIME” is the timer for the test duration of pulse injection, and can be set between 1~999. The unit of time can be set as [min] or [sec] with the “TEST TIME Button **I**.” The countdown timer displays the remaining time. The test completes 1 second after the displayed value becomes “0,” and the Unit goes into STOP mode.

“t4” is the pulse output duration, and can be set from 1 to 100 in steps of 1. The unit of measurement is [ms]. The set range of “t1” imposes limits on possible “t4” and “t5” values. Also, “t4” and “t5” impose restrictions each other. This relationship is shown on Table 3.

T1 Requirements	t4, t5 Limit Relationship
$t1 < 100 \mu s$	When $t4/(t4+t5) \leq 0.1$
$t1 \geq 100 \mu s$	When $t4/(t4+t5) \leq 0.9$

Table 3

C t1/t5 Display

Displays either “t1” or “t5” value. It displays “t1” when “FUNCTION ” is not lit, and “t5” when lit. When the “START Button ” is pressed, the display will automatically change to “t1” (and FUNCTION will be unlit). Refer to Figure 4 and Figure 5.

The value “t1” is the pulse output repetition cycle in the pulse output duration (t4), and can be set from 10 to 999 in steps of 1. It is measured in [μs]. The set range of “t1” sets limits to “t4” and “t5” values. Also, “t4” and “t5” are interdependent each other. This relationship is shown on Table 3.

The value “t5” is the pulse pause duration, and can be set from 9 to 999 in steps of 1. It is measured in [ms]. The set range of “t1” sets limits on “t4” and “t5” values. Also, “t4” and “t5” are interdependent each other. This relationship is shown on Table 3.

D P3a Button, P3b Button

The “P3a Button, P3b Button” let you choose Pulse 3a or Pulse 3b waveform output. The waveform of the lit button will be output. This choice must be made during STOP mode, as the setting cannot be altered in START (Run) mode.


E UP / DOWN Buttons

The “UP / DOWN Buttons” raise or lower the value displayed in the currently selected display. Keeping holding the button down will accelerate the value increment/decrement. Even if you try to set the value beyond the allowable range, it stops at the moment it reaches the limit. Changing the setting must be made in the STOP mode since they cannot be altered in START (Run) mode.

F SELECT Button

Lets you select one of the three row displays. The selected display repeats blinking. Every time the button is pressed, the selected row will change from row 1 → row 2 → row 3 → row 1.

G FUNCTION Button

Lets you select the values to be displayed in the three row displays. When this button is not lit, the displays will be “Us, TEST TIME, t1” from top to bottom and “Us, t4, and t5” when lit. When the START Button is pressed, the “FUNCTION Button ” will be unlit, and the displays will automatically become “Us, TEST TIME, and t1.” During START mode, keeping holding this button down will light the lamp and “Us, t4, t5” values can be confirmed.

H DC LINE Button

Serves as the switch to control DC output, and moves the DC ON/OFF contactor SW3 in Figure 1. It is OFF immediately after the Power Switch is turned ON, When the button is turned ON, externally inputted DC will be output from the HOT output terminal. It works independently of the “START Button **K**.”

During START mode, this button cannot be switched from LINE OFF to LINE ON. Also, it can be turned off in START mode (ON → OFF), At this time, the Unit will go into STOP mode, which is identical to “STOP Button **L**” pressing.

When error signals (“Connection being disconnected) are input from the Interlock Terminals ⑫ on the rear panel, DC LINE will be turned OFF.

I TEST TIME Button

Lets you select the unit of measure for the test time, which can be set from 1 to 999 in steps of 1. When not lit, the unit is [min (minutes)], and [sec (seconds)] when lit. The test time will be displayed on “TEST TIME/t4 Display **B**” when the “FUNCTION Button **G**” is not lit.

J tr Selection Buttons

Let you set the pulse waveform rise time t_r as “5ns” or “<3.5ns (less than 3.5ns)”. “5ns” setting meets the 3.5ns to 6.5ns range specified by the Standards. The rise time is guaranteed within the range between $\pm 20V$ and $\pm 350V$. “<3.5ns” setting allows tests with shorter rise time than the Standards, and can be employed when you prefer to outputting faster rising waveforms than the Standards. The rise time becomes shorter than 3.5ns when U_s is in the range of $\pm 50V$ to $\pm 300V$. This is very useful when examining the margins. Having fast rise time means that the wave spectrum will include much high frequency components, and from the spectral point of view, it is equivalent to tests with high pulse voltage U_s .

The settings must be made during STOP mode as they cannot be altered in START mode.

K START Button

By pressing the “START Button” for 1 second, the Unit will go into START mode and the pulses are output between Output Terminals HOT ⑤ and GND ⑥. The test will stop at completion or by pressing “STOP Button **K**.” The following functions (buttons) will be disabled in START mode.

Pulse 3a/3b Button **D**

UP / DOWN Buttons **E**

DC LINE Button **H** OFF to ON

tr Selection Buttons **J**

L STOP Button

Lets you stop START mode. When it is pressed, the pulses will no longer be output from the Output Terminals, and the Unit will return to STOP mode. **As STOP Button does not work with DC output , DC output is not turned OFF.** Turn the DC Output OFF with DC LINE Button.

M Warning Lamp

Turns ON when DC LINE is ON during STOP mode. Be aware that DC is output from the output terminals while the Warning Lamp is ON.

Also, it blinks while the capacitor is charging, and will return to the pre-START mode when charge/discharge is complete (See Table 4 below).

Table 4 Warning Lamp Status

START/STOP	DC LINE ON/OFF	Display
STOP Mode	DC LINE OFF	Not Lit
	DC LINE ON	Lit
START Mode	DC LINE OFF	Blink
	DC LINE ON	Blink

② Power Switch

The “Power Switch” powers the Unit. When flipped to the right, the power turns ON, and settings will be displayed on the control panel. Power will turn OFF when flipped to the left. Be sure to turn OFF in STOP mode.

③ DC Input Terminals

Capable of receiving input up to 60V 30A. Connect the accessory DC Input Cable, and make sure that “+” and “-” are connected according to the signs. The DC voltage input from these terminals will be output from Output Terminals (HOT, GND) ⑤, ⑥ and into DUT.

④ Circuit Breaker

Serves as protection against DUT short circuits, and is inserted between the “+” of DC Input Terminal ③ and the Output Terminal (HOT) ⑤ (See Figure 1 NFB). It goes down (or trips) when an over current of more the 40A is detected.

⑤, ⑥ Output Terminals (HOT, GND)



The pulse output terminals from which pulse voltages are output with coupling DC voltages. The red terminal is HOT, and black is GND. The black GND Terminal is connected to FG (see Figure 1).

By inserting accessory BNC Conversion Adapter into these terminals, it is possible to perform Waveform Verification and Coupling Clamp tests in accordance with ISO Standard Annex D.




The connectors of these Output Terminals are made by Multi-Contact AG and they feature the snap-In lock system. This system automatically locks the plugs when they are inserted into the sockets. To unlock, push the plugs further into the socket and pull it out.

- ⑦ FG Terminal 

The frame ground terminal of the Unit. It has DC conduction with “Output Terminal GND ⑤.” For details, refer to Figure 1. Connect to the ground plane using the accessory GND Cable.

- ⑧ Protective Conductor Terminal 

The “Protective Conductor Terminal” is for protective grounding, and is connected to FG of the steel case.

- ⑨ AC Input (Fuse) 

The “AC Input (Fuse)” is the driving power connector for the Unit. Input the voltage set by the “AC Source Voltage Selection Terminals ⑩.” Also, if it is not possible to ground the Unit with the power cable, be sure to ground with the “Protective Conductor Terminal ⑧.”

Also the Fuse for the power source is built in here. It will melt off in emergencies such as extreme current flow. Should the melting off occur, turn the Unit and connected device powers OFF, check out the symptoms, the model name, and the serial number and contact our sales agent or the Technical Service Center.

In the event of fuse check-up or replacement, disconnect the power cable from the Unit and other connected devices and DUT INPUT power supply before proceeding.

Do not use any fuse other than the specified $\phi 5\text{mm} \times 20\text{mm}$, 250V, M, 3.15A (M: Medium Slow).

- ⑩ AC Input Voltage Selection Terminals

Let you select AC Input Voltage. The Unit is capable of running at 6 different voltages 100V, 110V, 120V, 200V, 220V, and 240V. AC Input ⑨ Voltage can be chosen by short-circuiting a pair of the terminals shown on Figure 9.

At the time of packing, the voltage is set to 100/110V. Be sure to adjust the setting when you use the Unit under different voltage. Never fail to unplug the AC plug from the outlet when changing configurations. Also, be sure to input electricity after placing the terminal covers since there is danger of electric shock if you touch the terminals.

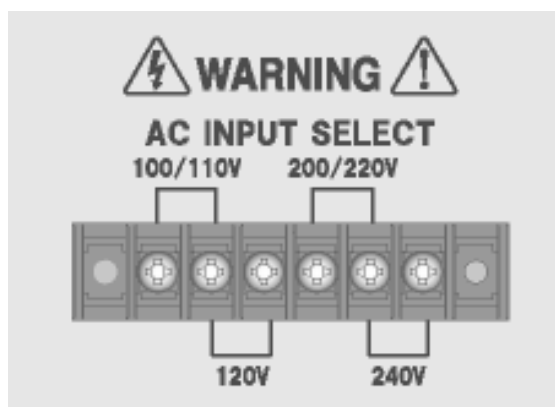


Figure 9 AC Source Selection Terminals

⑪ Communication Terminal

By connecting the Unit to a PC using the optional parts Optical Interface Unit and Remote Control Software through this “Communication Terminal”, parameter settings, START, and STOP can be controlled from the PC. For connection procedures, refer to “9. REMOTE CONTROLLING BY PC”.

⑫ Interlock Terminal

The “Interlock Terminal” is for inserting the accessory Interlock Plug. Either removal of the Interlock Plug or opening connection between the Pins 1 – 3 on the Interlock Plug will result in disconnection of Interlock, and the screen will display as shown in Figure 10. Once this occurs, it cannot be recovered without turning the power OFF.

When the Interlock is disconnected, the Unit will go into the following status:

- STOP mode
- DC LINE OFF

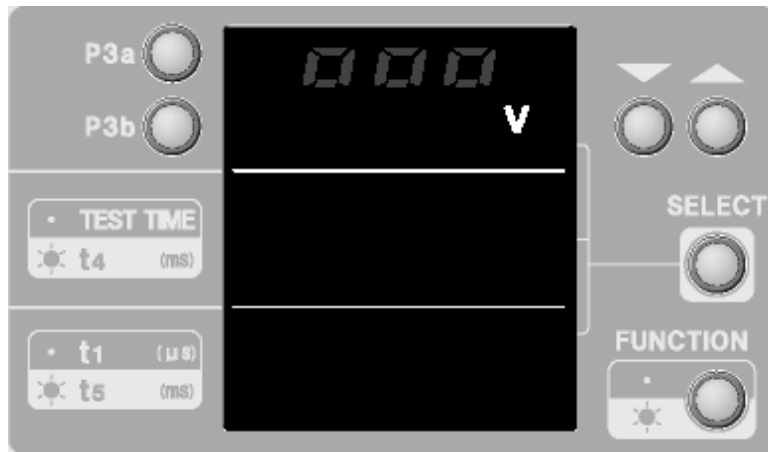


Figure 10 Display during Interlock Disconnection

Remote Controlling Interlock

1. The 1 and 3 pins on the accessory Interlock Plug on the rear panel are short-circuited. Open this connection. This will result in Interlock disconnection.
2. Control the number 1 and 3 pins by shorting or opening them at the contact point or by the Open Collector. While opening, input sequential signals for 100ms or more. Opening these pins will result in Interlock disconnection.
3. The control procedure is shown in Figure 11
 Pin 1 voltage: approximately 4V (when open, Pin 3 is the reference)
 Pin 3 voltage: 0V (the same electric potential as FG)
 Pin 1 – Pin 3 short circuit current: less than 2mA.
 Voltage identified as error: 2V to 4V
 Voltage identified as normal: 0V to 0.4V (0.4V to 2V is in the indefinite range)

Interlock plug

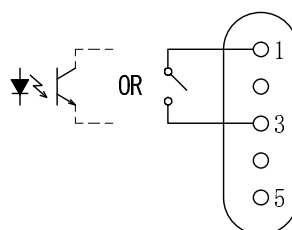


Figure 11 Interlock Control Procedure

⑬ Ventilation Fan

The “Ventilation Fan” is for cooling the internal devices. Do not block the vents.

⑭ External Output Terminals

The “External Output Terminals” are for outputting P3a/P3b pulses from ISS-7690 (CDN). Do not connect anything to these ports when using standalone.

8. TEST PROCEDURE

8-1. Pre-Operation Check

Check the installation environment, various wiring, and terminal connections.

- Confirming the Installation Location

Read the Important Safety Precautions and install the Unit in accordance with ISO Standards and the test plan
- Inserting Interlock Plug

Connect the accessory Interlock Plug to the “Interlock Terminal ⑫” on the rear panel. Confirm that either the Interlock Plug 1-3 Pins are short-circuited or that interlock remote control signals (refer to Figure 11 Interlock Control Procedure) are input.
- Connecting GND Cable

Connect the “FG Terminal ⑦” and the ground plane with the accessory GND Cable as necessary according to the ISO Standards and the test plan.
- Connecting DC Input Cable


First, be sure to turn off (lower) the “Circuit Breaker ④.”
Connect the accessory DC Input Cable to “DC Input Terminals ③” of the Unit, making sure + and – polarities are connected correctly. Use the appropriate DC Input Cable for the DUT, as large current may flow depending on the load.
Connect the other end of the DC Input Cable to the DC source or battery, and output the specified voltage from the DC source.
- Connecting Output Cable

Insert the plug of the accessory Output Cable into the “Output Terminals (HOT, GND) ⑤, ⑥.” As the Unit has the ability to output high voltage and large current, make sure that the connector is completely inserted. If the metal part of the connector is exposed, there is a risk of electric shock.
Connect the other end of the Output Cable to DUT. To ensure compatible and replicable tests, it is important to keep the same cable-to-cable distance, the same cable length to DUT, and the same height from the ground plane every time.
- Confirming AC Source Voltage

Never fail to confirm that the currently used AC source voltage is the same as the setting of “AC Source Voltage Selection Terminals⑩” on the rear panel. When you make a mistake, the Unit will be damaged.
- Connecting AC Cable

Insert the accessory AC Cable into the “AC Input ⑨” on the rear panel of the Unit. Insert the plug on the other end into the outlet. If the Unit cannot be grounded with the AC Cable, be sure to ground with “Protective Conductor Terminal ⑧.”
- Turning Unit ON

Once all the above confirmations are made, turn the Unit power ON with the “Power Switch ②.”
- Turning on and setting up DUT

Turn the “Circuit Breaker ④” ON. No current will flow to DUT at this time because the “DC LINE Button ” on the Unit is OFF. Set up DUT and peripheral devices according to the test plan.

8-2. Various Settings


The previous settings except DC LINE ON/OFF are preserved immediately after the Power Switch is turned ON. The displays are also the same as the settings immediately before turning OFF.

- Selecting Pulse 3a / 3b
Select the pulse to be used in the test.
- Setting Pulse Output Voltage U_s
Confirm that the “FUNCTION Button **G**” is **not lit**. Press the “SELECT Button **F**” several times until the “ U_s Display **A**” **blinks**. **Set** the value shown in “ U_s Display **A**” according to the test plan with “UP/DOWN Buttons **E**.”
- Setting TEST TIME
Confirm that the “FUNCTION Button **G**” is **not lit**. Next, press “SELECT Button **F**” until “TEST TIME/ t_4 Display **B**” **blinks**. Select [min] or [sec] as the unit of measurement using the “TEST TIME Button **I**.”
Finally, **set** the value shown on “TEST TIME/ t_4 Display **B**” according to the test plan with “UP/DOWN Buttons **E**.”
- Setting Pulse Repetition Cycle Duration t_1
Confirm that the “FUNCTION Button **G**” is **not lit**. Next, press “SELECT Button **F**” until “ t_1/t_5 Display **C**” **blinks**.
Finally, **set** the value shown on “ t_1/t_5 Display **C**” according to the test plan with “UP/DOWN Buttons **E**.”
- Setting Pulse Output Duration t_4
Press the “FUNCTION Button **G**” to **light** it. Next, press “SELECT Button **F**” until “TEST TIME/ t_4 Display **B**” **blinks**.
Finally, **set** the value shown on “TEST TIME/ t_4 Display **B**” according to the test plan with “UP/DOWN Buttons **E**.”
- Setting Pulse Pause Duration t_5
Confirm that the “FUNCTION Button **G**” is **lit**. Next, press “SELECT Button **F**” until “ t_1/t_5 Display **C**” **blinks**.
Finally, **set** the value shown on “ t_1/t_5 Display **C**” according to the test plan with “UP/DOWN Buttons **E**.”
- Setting the Pulse Rise Time t_r
Set the pulse rise time t_r using “ t_r Selection Buttons **J**.” Setting “5ns” conforms to the ISO Standards. Choosing “<3.5ns” setting will make the test harsher than the ISO Standards. In view of spectrum, it is equivalent to boosting up the pulse voltage U_s . The rise time will become less than 3.5ns for the U_s range between $\pm 50V$ and $\pm 300V$.
- Turning DC LINE ON
While the DC source is outputting, turn the “DC LINE Button **H**” ON (**the button lights**) to output DC voltage from the “Output Terminals (HOT, GND) ⑤, ⑥” of the Unit. Voltage will drop in CDN (L2, L3 in Figure 1 Circuit Schematic) when the current flows to DUT. Adjust the DC source voltage if the voltage across the DUT does not fall within the range specified in the test plan.

8-3. Starting and Finishing Test

Be sure to carry out “11 Pre-Start Checkup” prior to proceeding with a test

Start the test after completing the checkups and various settings.

- Start
Keep pressing the START Button for 1 second or more. A beep sounds, “Warning Lamp ” begins to **blink** and the Unit will enter START (run) mode.
- Finish
The test finishes in 1 second after the value shown in “TEST TIME Display” changes from 1 to 0.
- Stop
A test can be stopped by pressing STOP Button during START mode, and the Unit goes back to STOP mode.
Do not START/STOP intentionally.

Turn the Unit power OFF after the test has been finished (or stopped), and the displays become ready to enter (one of the monitors will blink).

The recommended procedure for turning the Unit power OFF is as follows;

1. Put the Unit in STOP mode
2. Turn DUT OFF, or make ready to turn it OFF.
3. Reduce out put of DC source to 0V.
4. Turn DC LINE OFF.
5. Turn the Unit power OFF.
6. Remove the accessory “Output Cable” plugs from “Output Terminals ⑤, ⑥.” At the moment of the power OFF, the plugs are locked. Unlock the plugs by pushing them deeper. Then unplug,

9. REMOTE CONTROLLING BY PC

9-1. Preparation

The Remote Control Software on a PC (Personal Computer) lets you control the Unit externally. FG, SG, and PE of the Unit and the FG of the PC can be isolated.

Once communication with the Remote Control Software is established, you cannot control the Unit locally any more. To enable local control, the Unit must be turned off once.

The following items are necessary:

- Remote Control Software (Option ISS-7601)
- Optical Interface Unit (Option 07-00022A)
- PC (Personal Computer) (To be procured separately by the user)

9-2. Hardware Setup

- Confirm that the power of the Unit and the PC are both OFF.
- Remove the protective cap on the “Communication Terminal ①” on the rear panel of the Unit.
- Remove the protective rubber caps on the optical cable plugs. Insert the plug of the optical cable that comes with the optional Optical Interface Unit 07-00022A, into the Communication Terminal ①, and insert the other plug into the Optical Interface Unit. See Figure 12.
- Turn the Unit power ON.
- Turn the PC power ON, and run the OS.
- Log in as a user with administrative authority.
- Plug the USB plug of the Optical Interface Unit into the PC.

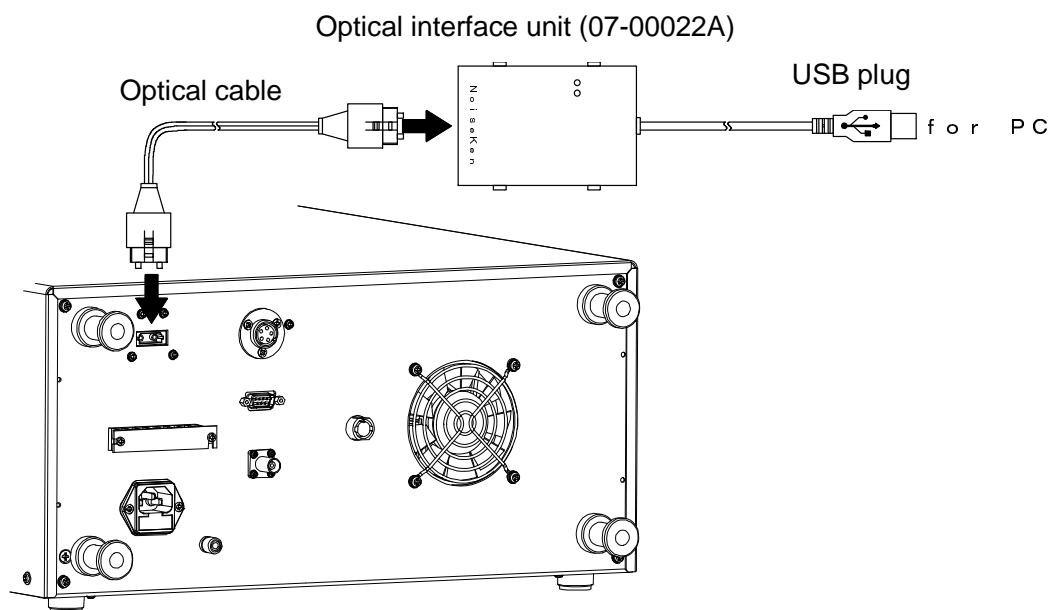


Figure 12 Hardware Setup

9-3. Installing the Software

Install the “Remote Control Software”ISS-7601 onto PC using the DISK of the Remote Control Software. Refer to the instruction manual of Remote Control Software for installation procedure (shown in Figure 15).

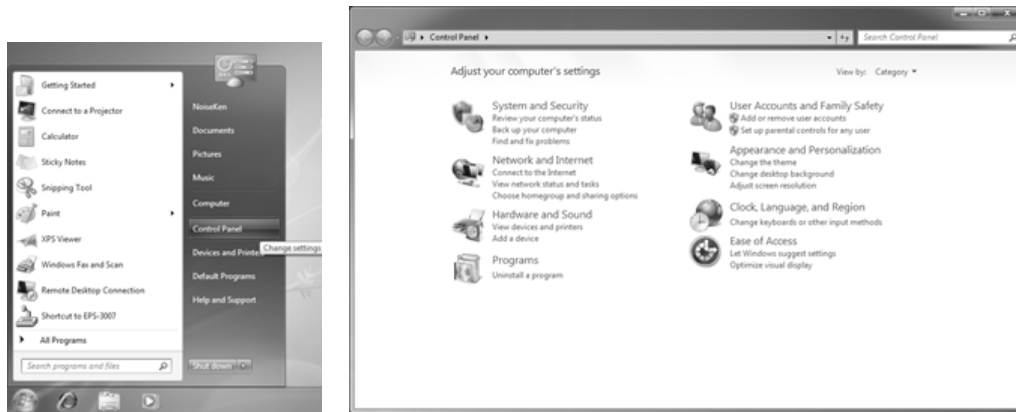


Fig. 15 Installing Software

9-4. Installing Remote Control Software

Refer to the instruction manual of Remote Control Software for installation procedure.

9-5. Installing Serial Port Drivers(At the time of Stand-alone Use)

Refer to the instruction manual of Remote Control Software for installation procedure.

9-6. Using Remote Control Software

Run the Remote Control Software and remote control the Unit. Refer to the instruction manual of the Remote Control Software for operation procedures.

9-7. Turning Off the Remote Control Software and the Unit

- **Be sure to** do the following steps;
- Set the Unit to “STOP” and “LINE OFF” with the Remote Control Software.
- Shutdown PC after closing Remote Control Software.
- Turn the Unit power switch OFF.
- Remove USB Cable.

10. SPECIFICATIONS

Table 5 Product Spec Chart

Parameter		Value	
Compatible Standard		ISO 7637-2(Third edition 2011-03-01) Test pulse 3a/3b ISO 7637-2 (Second edition 2004-06-15) Test pulse 3a/3b ISO/DIS 7637-2.3(2003-05-20) Test pulse 3a/3b ISO/DIS 7637-2.2(2002-07-16) Test pulse 3a/3b	
Us	Test pulse 3a	Set as 5ns	-10V~-350V ±10% -1V steps
		Set < 3.5ns	-10V~-350V ±20% -1V steps
	Test pulse 3b	Set as 5ns	10V~350V ±10% 1V steps
		Set < 3.5ns	10V~350V ±20% 1V steps
Ri		50 Ω (Capacity difference following Annex D) (Without Set <3.5ns)	
Td		150ns ±45ns	
Tr	Set as 5ns		5ns ±1.5ns(Us=±20V~±350V)
	Set < 3.5ns		Below 3.5ns (Us=±50V~±300V)
t1		10μs~999μs ±10% 1μs steps (Remote Control from PC 10μs~1000μs ±10% every 1μs)	
t4		1ms~100ms ±10% 1ms steps (for t1=10μs~99μs, t4/(t4+t5) ≤0.1) (for t1=100μs~099μs, t4/(t4+t5) ≤0.9)	
t5		9ms~999ms ±10% 1ms steps (for t1=10μs~99μs, t4/(t4+t5) ≤0.1) (for t1=100μs~099μs, t4/(t4+t5) ≤0.9)	
TEST TIME	Set min	1min~999min ±10% 1min steps	

	Set sec	1s~999s ±10% 1s steps
Circuit Breaker		Rated Current 40A
Interlock		External input: Control at contact point or Open Collector L level: 0V~0.4V H level: 2V~4V
Remote Control from PC	Interface	Option 07-00022A (Optical Interface Unit)
	Software	Option ISS-7601
	Compatible OS	Windows 7/10 (ISS-7601 requires version 2.1.0.0 or later)
EUT Capacity		DC60Vmax, 30Amax
Pulse Injection Method		Capacitor Coupling Method
Device Input Voltage		AC100V, AC110V, AC120V, AC200V, AC220V, AC240V (50Hz/60Hz) Tolerance: ± 10% for all Select on Rear Panel
Run-time Temperature Range		23°C ± 5°C
Run-time Humidity Range		25%~75%R.H. (with no condensation)
Perimeter		(W)430mmx(H)200mmx(D)522mm (Abutments not included)
Mass		Approximately 17kg
Electricity Usage		Approximately 110VA

Table 6 Tolerance Prescribed in Annex D

Parameter		Test pulse 3a	Test pulse 3b
Us	No load	-200V ± 20V	200V ± 20V
	50 Ω load	-100V ± 20V	100V ± 20V
tr	No load	5ns ± 1.5ns	5ns ± 1.5ns
	50 Ω load	5ns ± 1.5ns	5ns ± 1.5ns
td	No load	150ns ± 45ns	150ns ± 45ns


	50 Ω load	150ns \pm 45ns	150ns \pm 45ns
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11. WAVEFORM VERIFICATION

Before proceeding to the tests, verify that the Unit is outputting pulses normally. Verify it according to Annex D of ISO Standards.

Note: To verify P3a and P3b waveform correctly, use a PE-less 2P AC cable for the oscilloscope. With a 3P AC cable, PE (FG) of the oscilloscope will be conducted to the Unit FG and this status will shorten the pulse td (e.g. td 170ns →150ns).
The oscilloscope PE (FG) is conducted to the Unit FG after passing through coils on “Output Terminal GND ⑥” (see Figure 1), which means no risk of an electric shock caused by 2P cable usage.

Waveform Verification Procedure

1. Always short circuit the + and – of the “DC Input Terminals ③” with the accessory Short Lead Cable (for Waveform Verification).
This is because $U_A=0V$ is specified in Annex D of ISO Standards for waveform verifications.
2. Be sure to turn the “Circuit Breaker ④” lever ON (up).
3. Insert the accessory “BNC Conversion Adapter” into “Output Terminals (HOT, GND) ⑤, ⑥.” Confirm that “HOT” and “GND” are correctly connected.
4. Connect Option 00-00007A (No Load Waveform Verification ATT) to “BNC Conversion Adapter” for verification without load. If the verification is made with generally available voltage probe, ringing will occur on the waveform due to input capacity and ground lead inductance. Use of our optional item “No Load Waveform Verification ATT” is recommended. The attenuation ratio is 100:1. See Figure 14.
5. Connect Option 00-00006B (50 Ω Load Waveform Verification ATT) (connect two in series) to “BNC Conversion Adapter” for verification with 50 Ω load. Total attenuation ratio is 100:1.
6. Connect 50 Ω Coaxial Cable with BNC to No Load Waveform Verification ATT or 50 Ω Load Waveform Verification ATT. Connect the other end to the oscilloscope.
7. Be sure to terminate the oscilloscope with 50 Ω.
8. Turn the Unit “Power Switch ②” ON. Always turn “DC LINE Button ” ON.
9. Set the Unit according to the Table 7 below.

Parameter	Value Setting
Us	$\pm 200V$
Tr	5ns
t1	100μs
t4	10ms
t5	90ms
Test Duration	60min

Table 7 Setting for Waveform Verification

10. Press the "START Button \square " to run Unit in START mode. Measure the waveform with oscilloscope and verify it by matching it with Table 6.

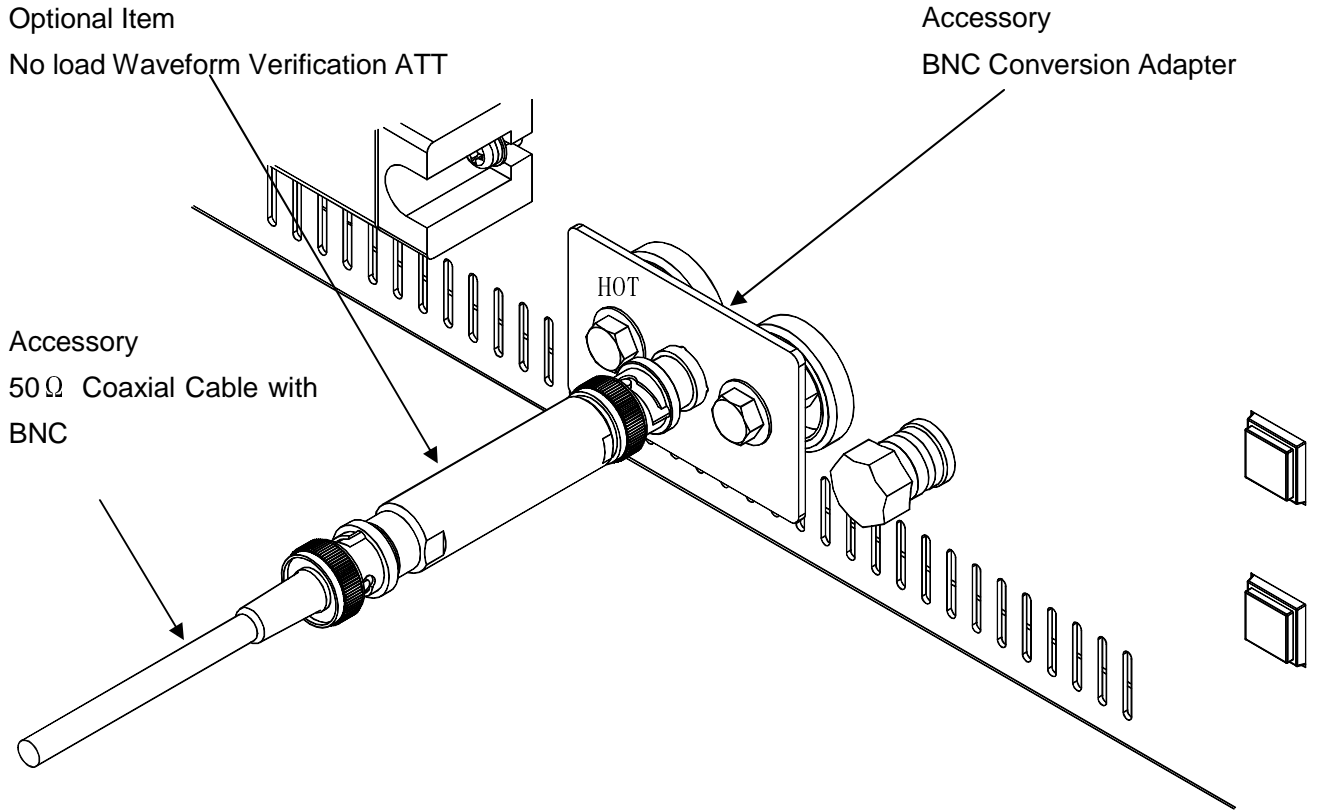


Figure 13 No load Waveform Verification ATT

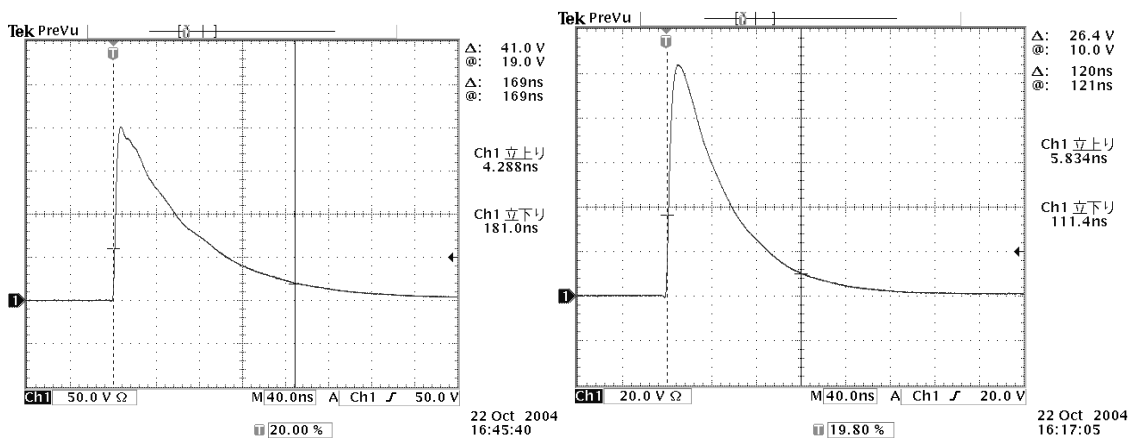
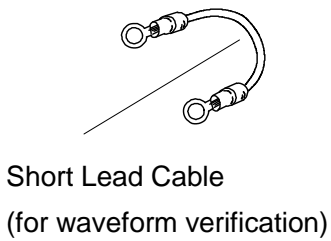
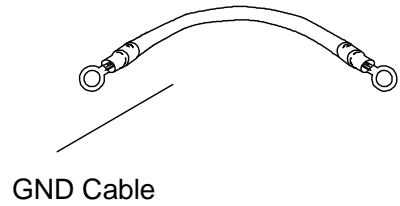
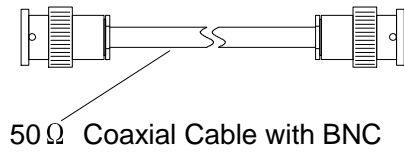
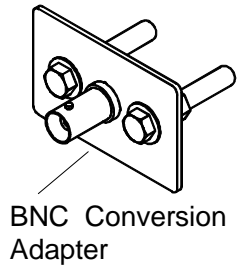
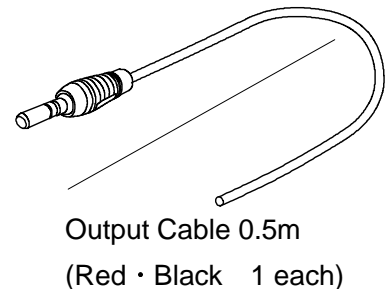
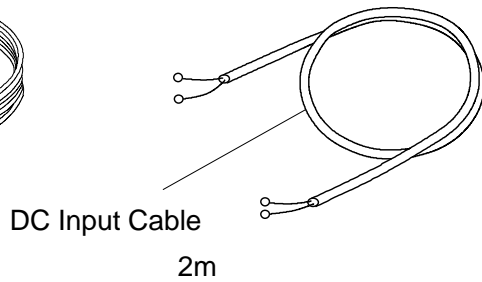
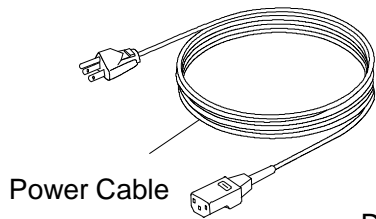
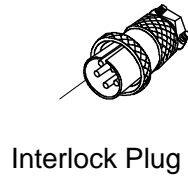
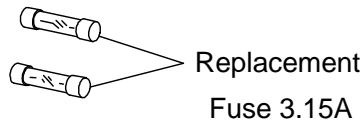
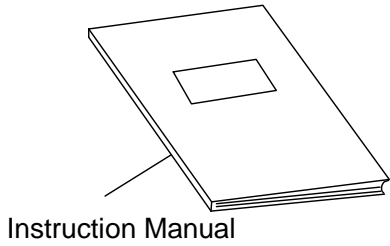
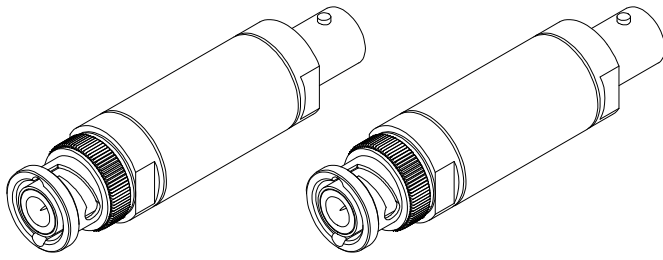


Figure 14 Pulse 3b No Load (left) and 50 Ω Load (right)

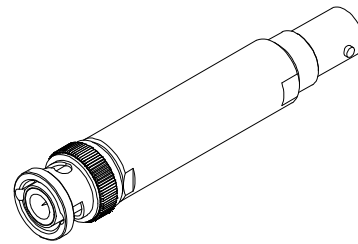
12. ACCESSORIES



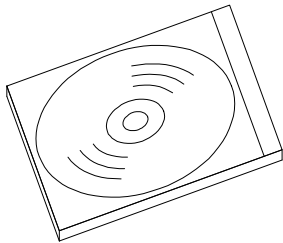
13. OPTIONS



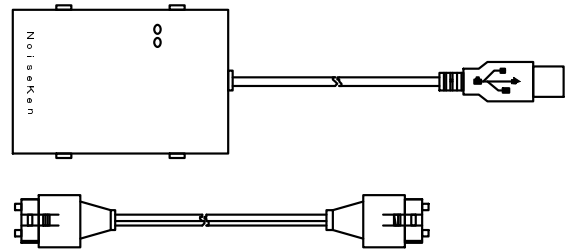
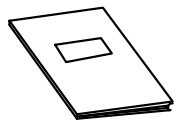
50 Ω Load Waveform Verification ATT
20dB Set of 2
00-00006B



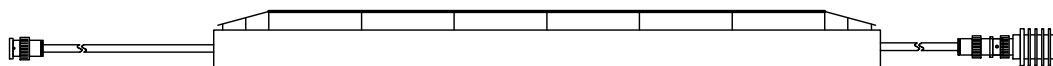
No Load Waveform Verification
ATT 40dB
00-00007A



Remote Control Software
ISS-7601



Optical Interface Unit
07-00022A



Coupling Clamp
ISS-7630-Cup

14. WARRANTY

Services

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

1. Scope

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

2. Technical Service Fee

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

3. Ownership of Defective Parts

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

4. Maximum Compensation

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

5. Wrong Parts, Missing Parts and Damage

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

6. Service Refusal

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

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

Limited Warranty

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

1. Scope

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

2. Warranty Period

One year from the date of delivery.

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

3. Exceptions

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

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

15. MAINTENANCE

1. Should the necessity of services such as repair, maintenance, or internal calibration arise, leave them to qualified service personnel only.
2. Limit your own maintenance works to exterior surface cleaning and functional tests.
3. When checking or changing replaceable fuses, turn OFF the power switches of the Unit and connected devices (if any).
4. Before cleaning the Unit, turn OFF the power switches of the Unit and connected devices (if any).
5. When face panels get dirty, wipe them lightly with a cloth moistened with water or mild detergent.
6. Do not open the Unit's covers unless such an action is expressly specified in the Manual.

16. 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.

NOISE LABORATORY CO., LTD.

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