Hardware User's Manual

LE12006

Student Stimulator

References:

LE12006 (76-0061)

Publication:

PB-MF-MAN-025-REV1.1

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1. SYMBOLS TABLE

Recognising the symbols used in the manual will help to understand their meaning:

DESCRIPTION	SYMBOL
Warning about operations that must not be done because they can damage the equipment	
Warning about operations that must be done, otherwise the user can be exposed to a hazard.	
Protection terminal ground connection.	
Warning about a hot surface which temperature may exceed 65ºC	
Warning about a metal surface that can supply electrical shock when it's touched.	
Decontamination of equipments prior to disposal at the end of their operative life	
Waste Electrical and Electronic Equipment Directive (WEEE)	

2. GOOD LABORATORY PRACTICE

Check all units periodically and after periods of storage to ensure they are still fit for purpose. Investigate all failures which may indicate a need for service or repair.

Good laboratory practice recommends that the unit be periodically serviced to ensure the unit is suitable for purpose. You must follow preventive maintenance instructions. In case equipment has to be serviced you can arrange this through your distributor. Prior to Inspection, Servicing, Repair or Return of Laboratory Equipment the unit must be cleaned and decontaminated.

Decontamination prior to equipment disposal

In use this product may have been in contact with biohazardous materials and might therefore carry infectious material. Before disposal the unit and accessories should all be thoroughly decontaminated according to your local environmental safety laws.

3. UNPACKING AND EQUIPMENT INSTALLATION

WARNING: Failure to follow the instructions in this section may cause equipment faults or injury to the user.

A. No special equipment is required for lifting but you should consult your local regulations for safe handling and lifting of the equipment.
B. Inspect the instrument for any signs of damage caused during transit. If any damage is discovered, do not use the instrument and report the problem to your supplier.
C. Ensure all transport locks are removed before use. The original packing has been especially designed to protect the instrument during transportation. It is therefore recommended to keep the original carton with its foam parts and accessories box for re-use in case of future shipments. Warranty claims are void if improper packing results in damage during transport.
D. Place the equipment on a flat surface and leave at least 10 cm of free space between the rear panel of the device and the wall. Never place the equipment in zones with vibration or direct sunlight.
E. Once the equipment is installed in the final place, the main power switch must be easily accessible.
F. Only use power cords that have been supplied with the equipment. In case that you have to replace them, the spare ones must have the same specs that the original ones.
G.  Make sure that the AC voltage in the electrical network is the same as the voltage selected in the equipment. **Never connect the equipment to a power outlet with voltage outside these limits.**

WARNING

For electrical safety reasons you only can connect equipment to power outlets provided with earth connections  .
This equipment can be used in installations with category II over-voltage according to the General Safety Rules.

The manufacturer accepts no responsibility for improper use of the equipment or the consequences of use other than that for which it has been designed.

PC Control

Some of these instruments are designed to be controlled from a PC. To preserve the integrity of the equipment it is essential that the attached PC itself conforms to basic safety and EMC standards and is set up in accordance with the manufacturers' instructions. If in doubt consult the information that came with your PC. In common with all computer operation the following safety precautions are advised.

WARNING

- To reduce the chance of eye strain, set up the PC display with the correct viewing position, free from glare and with appropriate brightness and contrast settings

- To reduce the chance of physical strain, set up the PC display, keyboard and mouse with correct ergonomic positioning, according to your local safety guidelines.

Class A equipment is intended for use in an industrial environment.

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

4. MAINTENANCE

WARNING: Failure to follow the instructions in this section may cause equipment fault.

- PRESS KEYS SOFTLY – Lightly pressing the keys is sufficient to activate them.
- Equipments do not require being disinfected, but cleaned for removing urine, faeces and odour. To do so, we recommend using a wet cloth or paper with soap (which has no strong odour). NEVER USE ABRASIVE PRODUCTS OR DISSOLVENTS.
- NEVER pour water or liquids on the equipment.
- Once you have finished using the equipment turn it off with the main switch. Clean and check the equipment so that it is in optimal condition for its next use.
- The user is only authorised to replace fuses with the specified type when necessary.

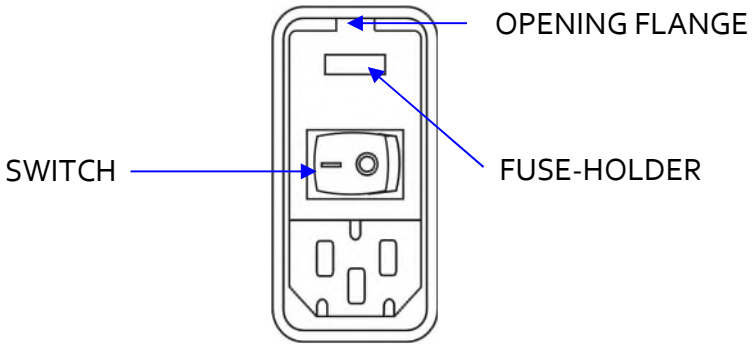


Figure 1. Power inlet, main switch and fuse holder.

FUSE REPLACEMENT OR VOLTAGE SETTING CHANGE

In case of an over-voltage or other incident in the AC net making it impossible to turn on the equipment, or if the equipment voltage setting is incorrect, check fuses according to the following procedure.

1 Remove power cord from the power inlet.

2 Open fuse-holder by pulling the flange with a regular screwdriver.

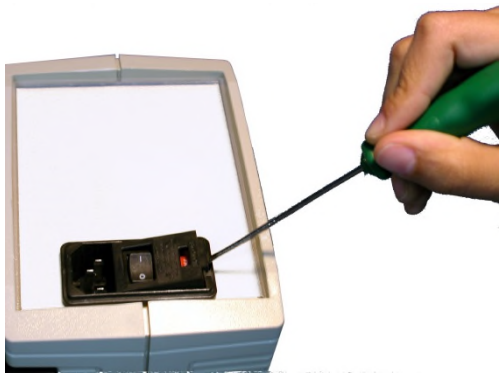


Figure 2. Open fuse-holder door.

3 Extract fuse holder using the screwdriver.

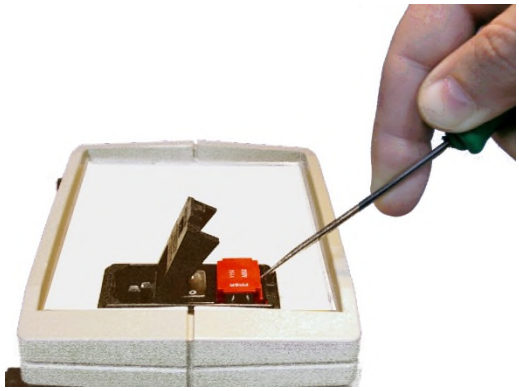


Figure 3. Extract fuse-holder.

4 Replace fuses if necessary. Insert fuses in the fuse-holder in the correct position.

CORRECT INCORRECT

Figure 4. Fuses position.

5 Insert the fuse-holder again, positioning it according to the voltage in the AC net.

115V POSITON 230V POSITION

Figure 5 Fuse holder position.

6 If the fuses blow again, unplug the equipment and contact technical service.

WARNING **For electrical safety reasons, never open the equipment. The power supply has dangerous voltage levels.**

5. TABLE OF CONTENTS

6. INTRODUCTION

The LE 12006 is a general-purpose voltage stimulator, distinguished by high precision, stability and ease of use. These characteristics make it an excellent tool for students as well as researchers.

Figure 6. LE 12006 Stimulator.

The LE 12006 allows adjustment of pulse width, pulse frequency and pulse amplitude along with single-pulse stimulation or repetitive-pulse (train of pulses) stimulation.

The LE 12006 can be easily connected to a computer or other external device as an accessory to its controls. This makes it a more flexible tool for several applications. It is also possible to connect the LE 12006 to an external stimulator for it to act as a power module.

The OUTPUT of the stimulator is electrically floating from ground, which means that it does not refer to ground. Therefore, to avoid the appearance of parasite signals and frequencies (50 or 60 Hz) when monitoring the shape of the stimulus output with an external device (such as an oscilloscope or a computer) it is necessary to keep the external device electrically floating, without any connection to ground.

7. EQUIPMENT DESCRIPTION

7.1. CONTROL UNIT FRONT PANEL

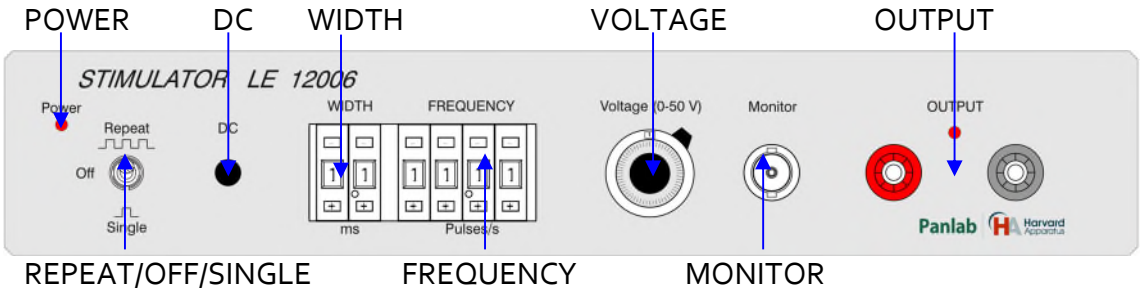


Figure 7. LE 12006 Front Panel.

- **POWER:** 3mm red led that remains on while the stimulator is on.

- **REPEAT/OFF/SINGLE:** 3-position switch that selects the pulse mode:
  - REPEAT: In this position the stimulator gives a train of pulses at the selected frequency with the selected pulse width and amplitude.
  - OFF: In this position the stimulator does not give pulses.
  - SINGLE: In this momentary position the stimulator gives a single pulse of the selected width and amplitude.

- **DC:** There is a continuous output while this button is pressed.

- **WIDTH:** Decimal selector used to set pulse width in ms. The range is between 0.1 ms to 9.9 ms in steps of 0.1 ms.

- **FREQUENCY:** Decimal selector used to set train of pulses frequency; the range goes from 0.01 Hz to 99.99 Hz in steps of 0.1 Hz.

- **VOLTAGE:** 10-turn rotary potentiometer used to select pulse amplitude. Output amplitude can be calculated with the following formula: V=5*N, where N is the value shown on the dial. The range goes from 0V to 50V.

- **MONITOR:** BNC connector with a TTL output at the same frequency and pulse width as the output. It can be used to monitor power pulses in an oscilloscope.

- **OUTPUT:** The output has two 4mm plugs to connect the electrode and one 3mm red led that blinks with the selected pulse width at the selected frequency.

7.2. CONTROL UNIT REAR PANEL

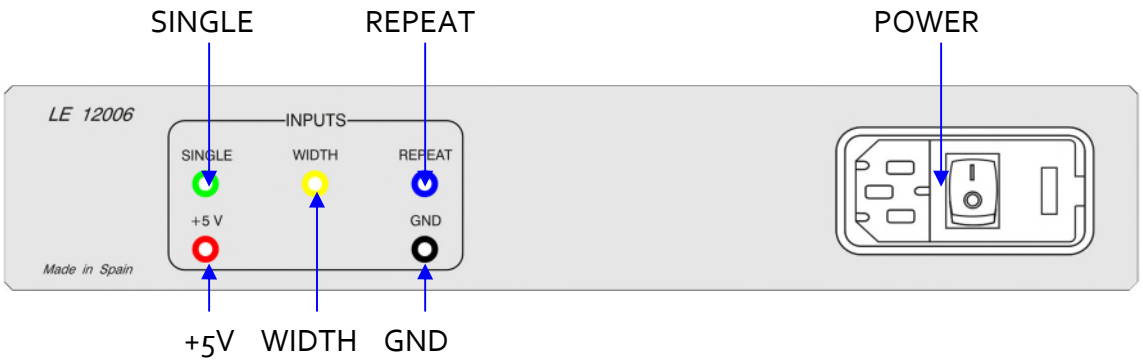


Figure 8. LE 12006 Rear panel.

The range of signals that can be given to the inputs go from 4V to 24V.

- **SINGLE:** By giving a TTL signal in this input the stimulator will give a single pulse with the selected width and amplitude.
- **WIDTH:** The output will be continuous at the selected amplitude while a TTL signal is given to this input. This input makes the stimulator more versatile because an external pulse generator can be connected to it, making possible more complex trains of pulses.
- **REPEAT:** The stimulator will give a train of pulses of the selected frequency with the selected pulse width and amplitude while a TTL signal is given to this input.
- **+5V:** This 5V DC output can be used as a source of the control signal.
- **GND:** Ground reference for the control signals.
- **POWER:** Main switch, power inlet and fuse holder.

8. EQUIPMENT CONNECTION

8.1. FRONT PANEL

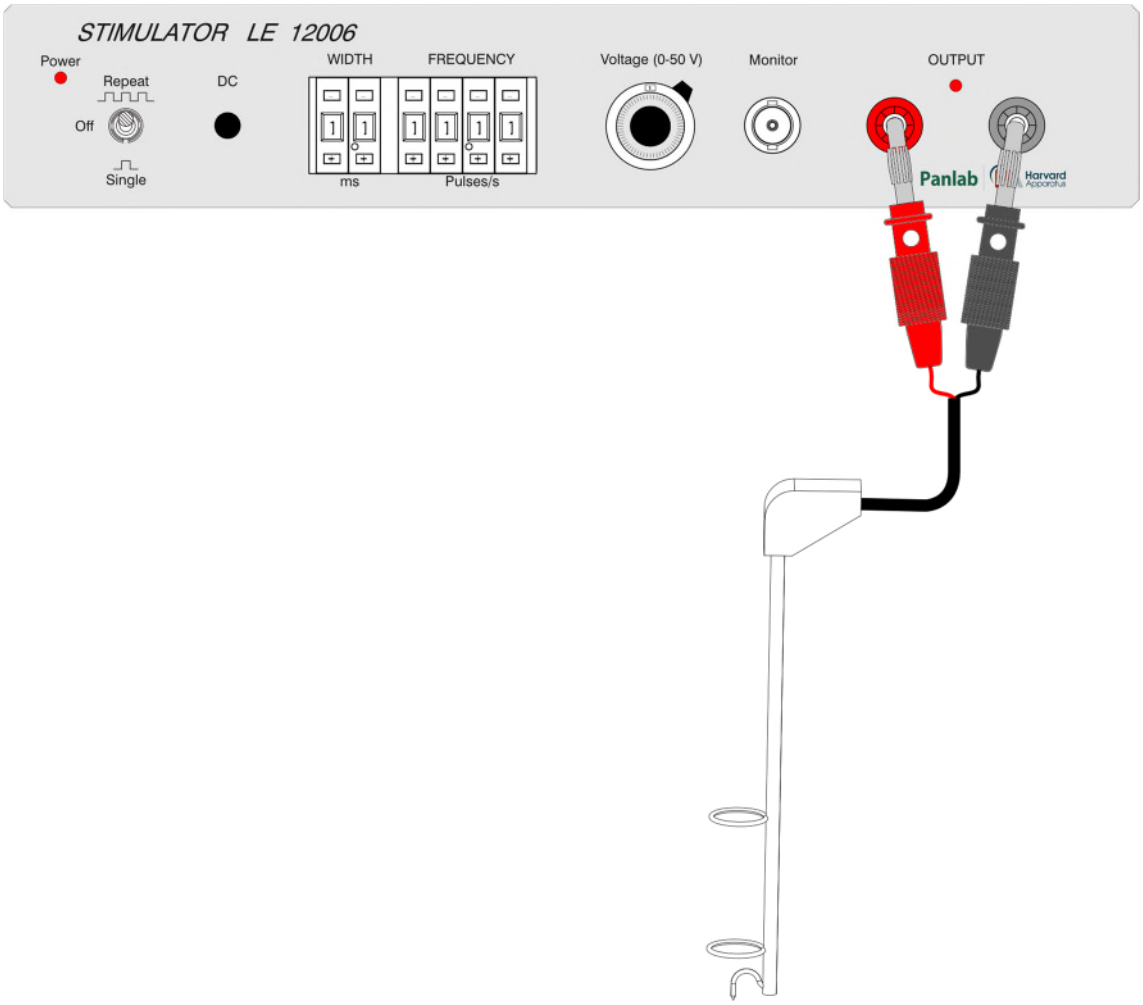


Figure 9. Front panel connections.

Front panel connections are as simple as connecting the electrode to the output.

8.2. REAR PANEL

For single pulses and simple trains of pulses, either the front panel switch labelled **REPEAT/OFF/SINGLE** or the rear panel inputs labelled **SINGLE** or **REPEAT** can be used by giving a TTL signal with respect to GND in these inputs.

To generate more complex train of pulse patterns, the **WIDTH** input can be used by connecting it to an external pulse generator.

8.2.1. Single Pulse

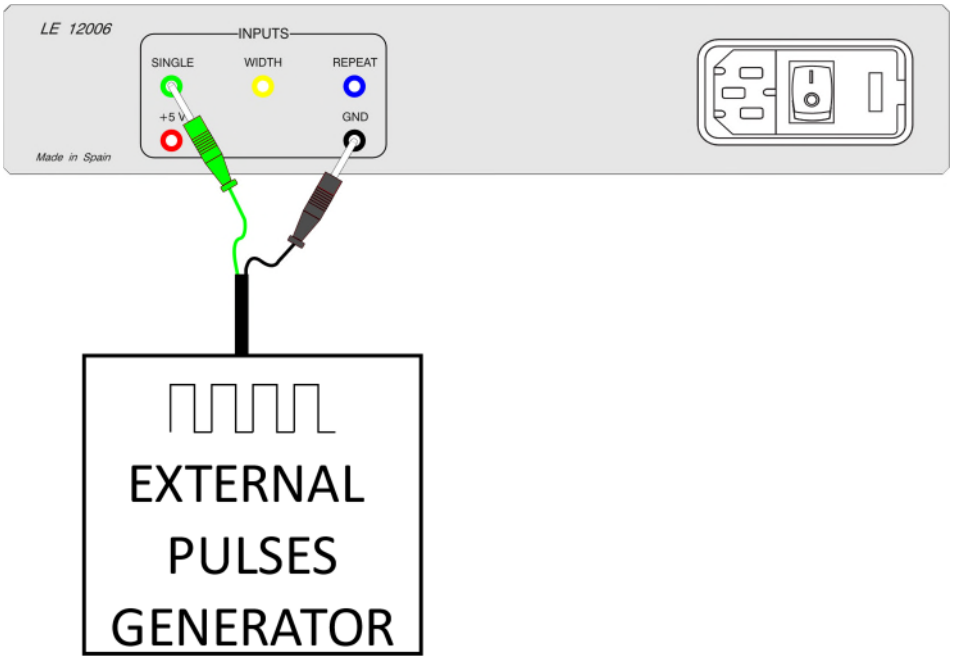


Figure 10. Single Pulse control.

8.2.2. Repeat Pulse

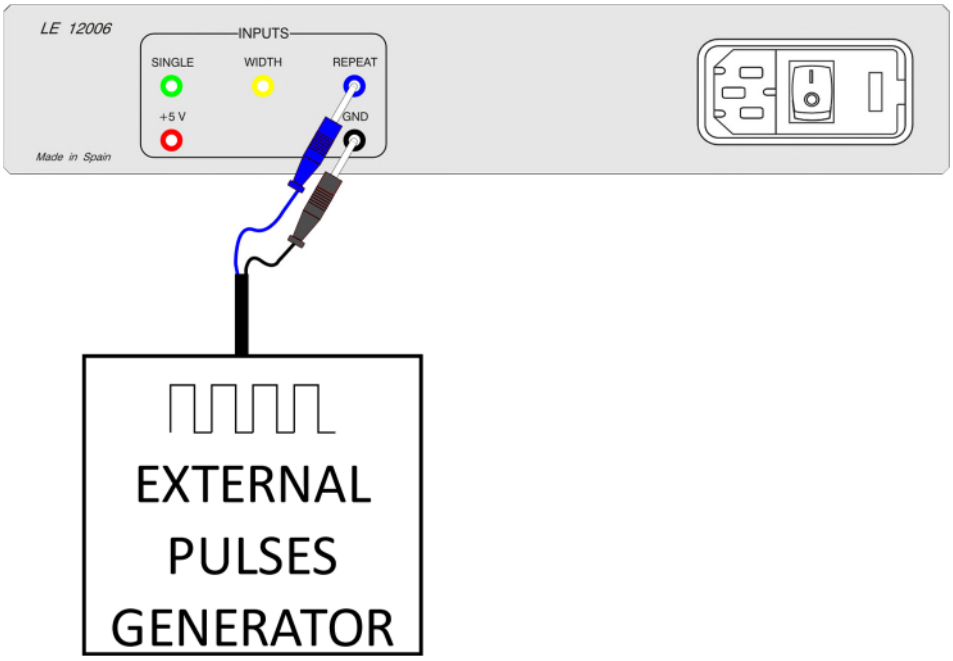


Figure 11. Train of pulses control.

8.2.3. Complex pulse pattern

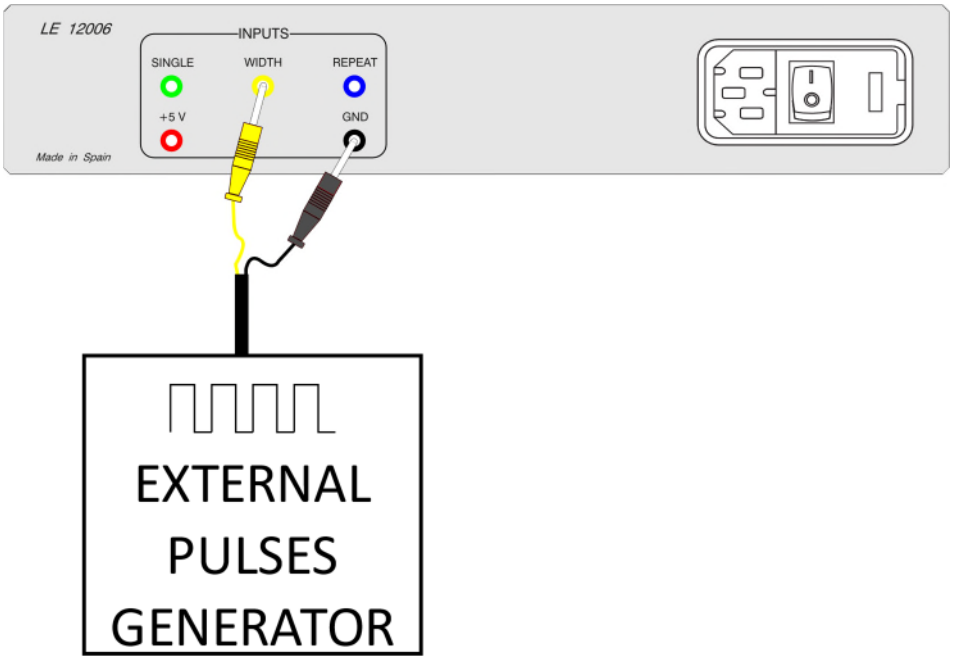


Figure 12. Complex pulse pattern control.

9. WORKING WITH THE EQUIPMENT

9.1. BASIC CONCEPTS

To clarify concepts like pulse width, pulse amplitude and frequency a typical waveform is shown below.

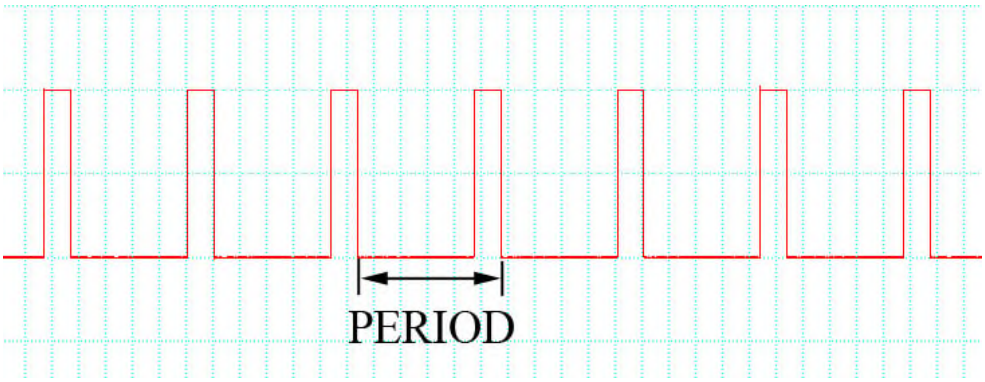


Figure 13. Period.

In a repetitive, periodic waveform the **period** is the time that the waveform takes to be repeated. The **frequency** is the inverse of the **period**.

Frequency (Hz) = 1 / Period (s)

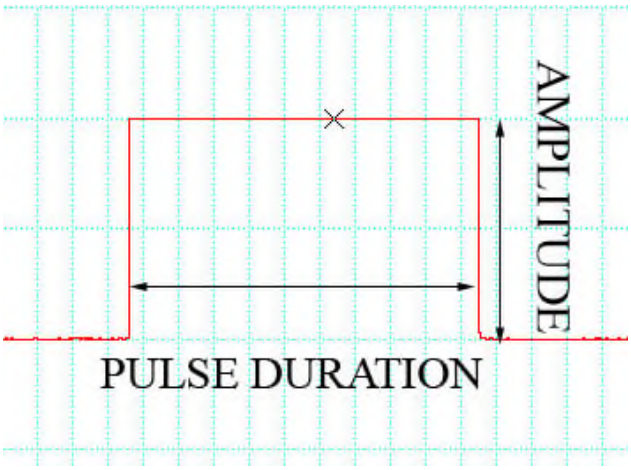


Figure 14. Pulse width and pulse amplitude.

In a square waveform, **Pulse Width** is the pulse duration and **Pulse Amplitude** is the height of the pulse.

9.2. MANUAL STIMULATION

1) Connect the electrode to the output terminals 

as it is shown in Section 8.1.

2) Select the stimulation voltage with the dial 

.

3) Set the selector 

in the middle position **OFF**.

4) Prepare the tissue to stimulate and dip it into the vessel of the organ bath surrounded by electrode terminals.

5) Turn the control unit on and the led 

will light.

6) Press the button 

the desired time to stimulate the tissue.

7) While the tissue is stimulated the led 

stays on.

8) Once the experiment is finished you should turn off the equipment, remove the tissue and clean the organ bath and the electrode.

9.3. SINGLE PULSE STIMULATION

1) Connect the electrode to the output terminals 

as it is shown in Section 8.1.

2) Select the stimulation voltage with the dial 

.

3) Set the selector 

in the middle position **OFF**.

4) Select the pulse duration with the decimal selector 

in milliseconds.

5) Prepare the tissue to stimulate and dip it into the vessel of the organ bath surrounded by electrode terminals.

6) Turn the control unit on and the led 

will light.

7) Every time you set the switch 

to the **SINGLE** momentary position, the tissue will receive only one pulse with the selected duration.

8) While the tissue is stimulated the led 

stays on.

9) Once the experiment is finished you should turn off the equipment, remove the tissue and clean the organ bath and the electrode.

9.4. REPETITIVE PULSES STIMULATION

1) Connect the electrode to the output terminals 

as it is shown in Section 8.1.

2) Select the stimulation voltage with the dial 

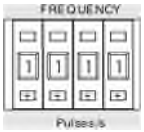
.

3) Set the selector 

in the middle position **OFF**.

4) Select the pulse duration with the decimal selector 

in milliseconds.

5) Select the frequency of the pulses with the decimal selector 

in hertz (pulses per second)

6) Prepare the tissue to stimulate and dip it into the vessel of the organ bath surrounded by electrode terminals.

7) Turn the control unit on and the led 

will light.

8) While you set the selector 

to the **REPEAT** position, tissue will receive pulses of the selected duration at the selected frequency.

9) Every time the tissue is stimulated the led 

will stay on.

10) Once the experiment is finished you should turn off the equipment, remove the tissue and clean the organ bath and the electrode.

9.5. ELECTRODE CLEANING

After each experiment the electrode must be cleaned to remove traces of salts attached to it, to clean it you can dip it in distilled water and with a soft brush remove residual salts attached to it being careful in order not to damage the terminals of the electrode.

You can also use an ultrasonic bath to remove salts remaining attached to the electrode.

10. TROUBLESHOOTING

This table features instructions to solve the most frequent problems.

PROBLEM	SOLUTION
The equipment does not start up.	• Ensure that the voltage of mains is the same as that selected in the fuse holder. • Check the condition of the fuses.
There are not output pulses.	• Make sure the selector REPEAT /OFF/SINGLE is not in the OFF position. • Make sure the value selected in the WIDTH selector is different from o.oms. • Make sure the value selected in the FREQUENCY selector is different from oo.oo Hz. • Check that the VOLTAGE knob selects a value greater than o.o V. • When you operate the stimulator from the rear panel make sure the connections are correct and that the external pulse generator is running.
OUTPUT led does not light.	• Make sure the selector REPEAT /OFF/SINGLE is not in the OFF position. • Make sure the value selected in the WIDTH selector is different from o.oms. • Make sure the value selected in the FREQUENCY selector is different from oo.oo Hz. • When you operate the stimulator from the rear panel make sure the connections are correct and that the external pulse generator is running.

11. PREVENTIVE MAINTENANCE

	EXPERIMENT
ELECTRODE CLEANING	☑
ELECTRODE CONNECTION CHECKING	☑

12. TECHNICAL SPECIFICATIONS

POWER SUPPLY	
Voltage:	115 / 230 V~
Frequency:	50 - 60 Hz
Fuses:	2 fuses 5x20mm 250mA 250V Fast
Maximum power:	20W
Conducted noise:	EN55022 /CISPR22/CISPR16 class B
OUTPUT VOLTAGE	
Voltage:	0 to 50 V
Max. current:	250mA
Selector Precision:	+/- 1.%
Linearity:	0.2%.
Load regulation:	0.2% @ 150 mA
Output power:	8W
Short-circuit able output:	Yes (5 min)
Electrical isolation:	Yes
PULSE WIDTH	
Range:	0.1 to 9.9 ms
Resolution:	0.1 ms
Precision:	0.3%.
Repetitivity:	0.06%
FREQUENCY	
Range:	0.01 pulses/s to 99.99 pulses/s
Resolution:	0.01 pulses/s
Precision:	0.12%
Repetitivity:	0.04%
BEHAVIOURAL CONDITIONS	
Operative Temperature:	10°C to +40°C
Operative Humidity:	0% to 85% RH, without condensation
Storage Temperature:	0°C to +50°C, without condensation
REAR INPUTS	
Single, Width, Repeat:	4 - 24 V, TTL Compatible
FRONT PANEL OUTPUTS	
Monitor	0 - 5 V
Output	0 - 50 V
DIMENTIONS	
Width*Heights*Depth	285mm x 70mm x 250mm
Weight:	1.75 kg

DECLARACIÓN DE CONFORMIDAD
DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITÉ

Nombre del fabricante: Manufacturer's name: Nom du fabricant:	**Panlab s.l.u.** www.panlab.com info@panlab.com
Dirección del fabricante: Manufacturer's address: Adresse du fabricant:	Energía, 112 08940 Cornellà de Llobregat Barcelona SPAIN
Declara bajo su responsabilidad que el producto: Declares under his responsibility that the product: Déclare sous sa responsabilité que le produit:	**STIMULATOR**
Marca / Brand / Marque:	**PANLAB**
Modelo / Model / Modèle:	**LE12006**

Cumple los requisitos esenciales establecidos por la Unión Europea en las directivas siguientes:
Fulfils the essential requirements established by The European Union in the following directives:
Remplit les exigences essentielles établies pour l'Union Européenne selon les directives suivantes:

2006/95/EC	Directiva de baja tensión / Low Voltage / Basse tensión
2004/108/EC	Directiva EMC / EMC Directive / Directive CEM
2012/19/EU	La Directiva de Residuos de Aparatos Eléctricos y Electrónicos (WEEE) / The Waste Electrical and Electronic Equipment Directive (WEEE) / Les déchets d'équipements électriques et électroniques (WEEE)
2011/65/EU	Restricción de ciertas Sustancias Peligrosas en aparatos eléctricos y electrónicos (ROHS) / Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (ROHS) / Restriction de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques (ROHS)
2006/42/EC	Directiva mecánica / Machinery directive / Directive mécanique

Para su evaluación se han aplicado las normas armonizadas siguientes:
For its evaluation, the following harmonized standards were applied:
Pour son évaluation, nous avons appliqué les normes harmonisées suivantes:

Seguridad / Safety / Sécurité:	**EN61010-1:2011**
EMC:	**EN61326-1:2013 Class A[1]**
Safety of machinery:	**EN ISO 12100:2010**

[1]This equipment complies with the limits for class A equipment in accordance with CISPR 11 definition and is classed as a Class A digital device, pursuant to CFR Title 47 part 15 of the FCC Rules and is intended to be used in an industrial environment.

En consecuencia, este producto puede incorporar el marcado CE:
Consequently, this product can incorporate the CE marking:
En conséquence, ce produit peut incorporer le marquage CE:

CE

En representación del fabricante:
Manufacturer's representative:
En représentation du fabricant:

Carme Canalís
General Manager
Panlab s.l.u., a division of Harvard BioScience

Cornellà de Llobregat, Spain
30/04/2014

(GB) *Note on environmental protection:*

After the implementation of the European Directive 2002/96/EU in the national legal system, the following applies:
Electrical and electronic devices may not be disposed of with domestic waste.Consumers are obliged by law to return electrical and electronic devices at the end of their service lives to the public collecting points set up for this purpose or point of sale. Details to this are defined by the national law of the respective country. This symbol on the product, the instruction manual or the package indicates that a product is subject to these regulations. By recycling, reusing the materials or other forms of utilising old devices, you are making an important contribution to protecting our environment.

(E) *Nota sobre la protección medioambiental:*

Después de la puesta en marcha de la directiva Europea 2002/96/EU en el sistema legislativo nacional, Se aplicara lo siguiente:
Los aparatos eléctricos y electrónicos, así como pilas y baterías, no se deben tirar a la basura doméstica. El usuario está legalmente obligado a llevar los aparatos eléctricos y electrónicos, así como pilas y baterías, al final de su vida útil a los puntos de recogida municipales o devolverlos al lugar donde los adquirió. Los detalles quedaran definidos por la ley de cada país. El símbolo en el producto, en las instrucciones de uso o en el embalaje hace referencia a ello. Gracias al reciclaje, a la reutilización de materiales i a otras formas de reciclaje de aparatos usados, usted contribuirá de forma importante a la protección de nuestro medio ambiente.

(F) *Remarques concernant la protection de l'environnement :*

Conformément à la directive européenne 2002/96/CE, et afin d'atteindre un certain nombre d'objectifs en matière de protection de l'environnement, les règles suivantes doivent être appliquées.
Elles concernent les déchets d'équipement électriques et électroniques. Le pictogramme "picto" présent sur le produit, son manuel d'utilisation ou son emballage indique que le produit est soumis à cette réglementation. Le consommateur doit retourner le produit usager aux points de collecte prévus à cet effet. Il peut aussi le remettre à un revendeur.En permettant enfin le recyclage des produits, le consommateur contribuera à la protection de notre environnement. C'est un acte écologique.

(D) *Hinweis zum Umweltschutz:*

Ab dem Zeitpunkt der Umsetzung der europäischen Richtlinie 2002/96/EU in nationales Recht gilt folgendes:
Elektrische und elektronische Geräte dürfen nicht mit dem Hausmüll entsorgt werden. Der Verbraucher ist gesetzlich verpflichtet, elektrische und elektronische Geräte am Ende ihrer Lebensdauer an den dafür eingerichteten, öffentlichen Sammelstellen oder an die Verkaufstelle zurückzugeben. Einzelheiten dazu regelt das jeweilige Landesrecht. Das Symbol auf dem Produkt, der Gebrauchsanleitung oder der Verpackung weist auf diese Bestimmungen hin. Mit der Wiederverwertung, der stofflichen Verwertung oder anderer Formen der Verwertung von Altgeräten leisten Sie einen wichtigen Beitrag zum Schutz unserer Umwelt.

(I) *Informazioni per protezione ambientale:*

Dopo l'implementazione della Direttiva Europea 2002/96/EU nel sistema legale nazionale, ci sono le seguenti applicazioni:
I dispositivi elettrici ed elettronici non devono essere considerati rifiuti domestici. I consumatori sono obbligati dalla legge a restituire I dispositivi elettrici ed elettronici alla fine della loro vita utile ai punti di raccolta collerici preposti per questo scopo o nei punti vendita. Dettagli di quanto riportato sono definiti dalle leggi nazionali di ogni stato. Questo simbolo sul prodotto, sul manuale d'istruzioni o sull'imballo indicano che questo prodotto è soggetto a queste regole. Dal riciclo, e re-utilizzo del material o altre forme di utilizzo di dispositivi obsoleti, voi renderete un importante contributo alla protezione dell'ambiente.

(P) *Nota em Protecção Ambiental:*

Após a implementação da directiva comunitária 2002/96/EU no sistema legal nacional, o seguinte aplica-se:
Todos os aparelhos eléctricos e electrónicos não podem ser despejados juntamente com o lixo doméstico Consumidores estão obrigados por lei a colocar os aparelhos eléctricos e electrónicos sem uso em locais públicos especficos para este efeito ou no ponto de venda. Os detalhes para este processo são definidos por lei pelos respectivos países. Este símbolo no produto, o manual de instruções ou a embalagem indicam que o produto está sujeito a estes regulamentos. Reciclando, reutilizando os materiais dos seus velhos aparelhos, esta a fazer uma enorme contribuição para a protecção do ambiente.