Hardware User's Manual

LE12106

Single Channel Digital Stimulator

References:
LE12106 (76-0055)

Version:
V12/062015

Panlab | Harvard Apparatus

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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 bio hazardous 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 INSTALATION

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.

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.

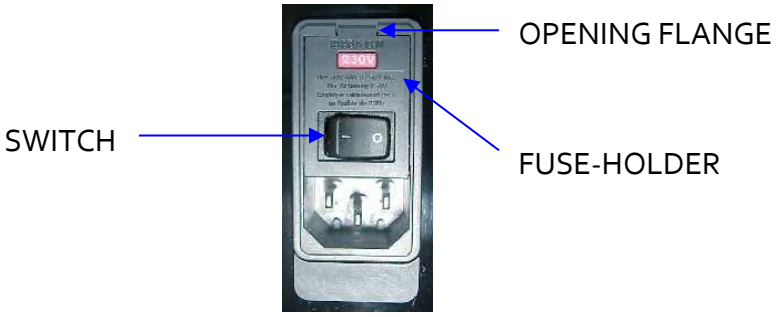


Figure 1. Power inlet, main switch and fuse holder.

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.

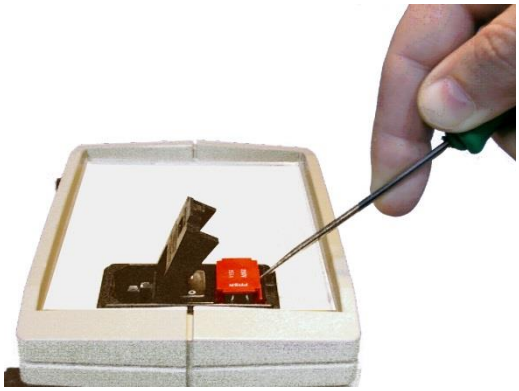


Figure 3. Extract fuse-holder.

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 12106 Digital Stimulator is a microprocessor-based instrument, which provides a wide range of stimulations with single/repetitive pulses of selectable constant voltage/current. The LE 12106 is composed of one TIME base and one Power Unit.

A carefully designed and self–explanatory set of front panel controls facilitates full control of the stimulation parameters, and makes this model ideal for mid-range applications.

Figure 6. LE 12106 Digital Stimulator.

The OUTPUT of the stimulation pulses is electrically floating from Ground. That is, it does not refer to ground. To avoid the appearance of parasite signals and frequencies (50 or 60 Hz), some precautions must be observed. For example, do not "connect" the stimulated subject to Ground or to a metallic surface in contact with the subject.

Clearly, it is not strictly necessary to take the aforementioned precautions. The nature of the external electric conditions determines whether interference appears. Otherwise, BNC connectors have their negative connected to Ground to monitor the signal if necessary.

WARNING: Do not touch the electrodes when the stimulator is working, you may receive electrical shock.

7. EQUIPMENT DESCRIPTION

7.1. CONTROL UNIT FRONT PANEL

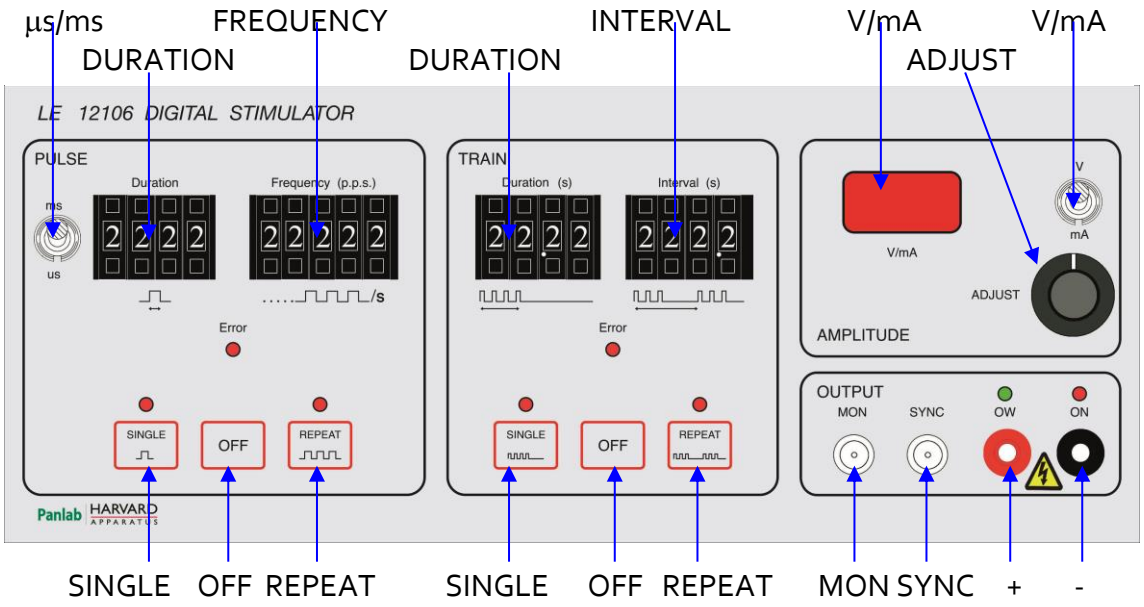


Figure 7. LE 12106 Front Panel.

- **µs/ms:** Two-position switch that modifies the pulse duration selected in the duration decimal selector.
- **Pulse Duration:** Decimal selector with a range between 0001 and 9999. It is used to set pulse duration. The value is modified by the switch labelled µs/ms.
- **Frequency:** Decimal selector with a range between 00001Hz and 99999Hz. It is used to set the frequency for repetitive pulses.
- **Pulses Single:** By pressing this button a pulse of the selected duration is given.
- **Pulse Off:** The system exits from the Frequency mode when this button is pressed.
- **Pulse Error:** If the parameters are not correct, this red led comes on for a few seconds when the Pulse Repeat button is pressed. This error occurs when the frequency period is lower than pulse duration (T=1/f).
- **Pulse Repeat:** When this button is pressed, repeated pulses are given at the selected frequency with the selected pulse duration if the selected parameters are correct. Otherwise the error led turns on.

- **Train Duration:** Decimal selector with a range between 00.01s and 99.99 s. It is used to set the duration of a train of pulses at the selected frequency with the selected pulse duration.

- **Train Interval:** Decimal selector with a range between 000.1s and 999.9s. It is used to set the interval at which a train of pulses will be repeated when the Train Repeat button is pressed.

- **Train Single:** When this button is pressed, a train of pulses is given during the selected time at the selected frequency with the selected pulse duration, if parameters are correct. Otherwise, the Train Error led will turn on for a few seconds.

- **Train Error:** Red led that comes on if parameters are not correct when Train Single or Train Repeat buttons are pressed.

- **Train Repeat:** When this button is pressed, a train of pulses is given at the selected interval if parameters are correct. Otherwise, the Train Error led will come on for a few seconds.

- **Train Off:** When this button is pressed the system exits from Train or Repeat Train mode.

- **V/mA Display:** This displays the amplitude of the voltage or current pulses, the range is between 0 and 100.

- **V/mA switch:** A 3-position switch to select the mode (voltage/current) and reset the Overload protection:
    - Upper position: Sets the system in voltage mode.
    - Middle position: Resets overload protection when overload occurs in voltage mode, the OV led comes on and the system will not give output until it is reset.
    - Lower Position: Sets the system in current mode.

- **Adjust:** Potentiometer that sets the amplitude of voltage/current between 0 and 100.

- **ON:** Red led that turns on when the output is active.

- **OW:** Green led that turns on in voltage mode when overload appears. At that time, output is blocked until it is reset with the V/mA switch in the central position.

- **Output +:** Output positive terminal.

- **Output -:** Output negative terminal.

- **MON:** This BNC connector gives a TTL signal (5V amplitude) with the same pulse duration and frequency as the output signal. It is used to monitor the pulses with an external instrument.

- **SYNC:** This BNC connector gives a 50ms TTL pulse when the Pulse Repeat button is pressed.

7.2. CONTROL UNIT REAR PANEL

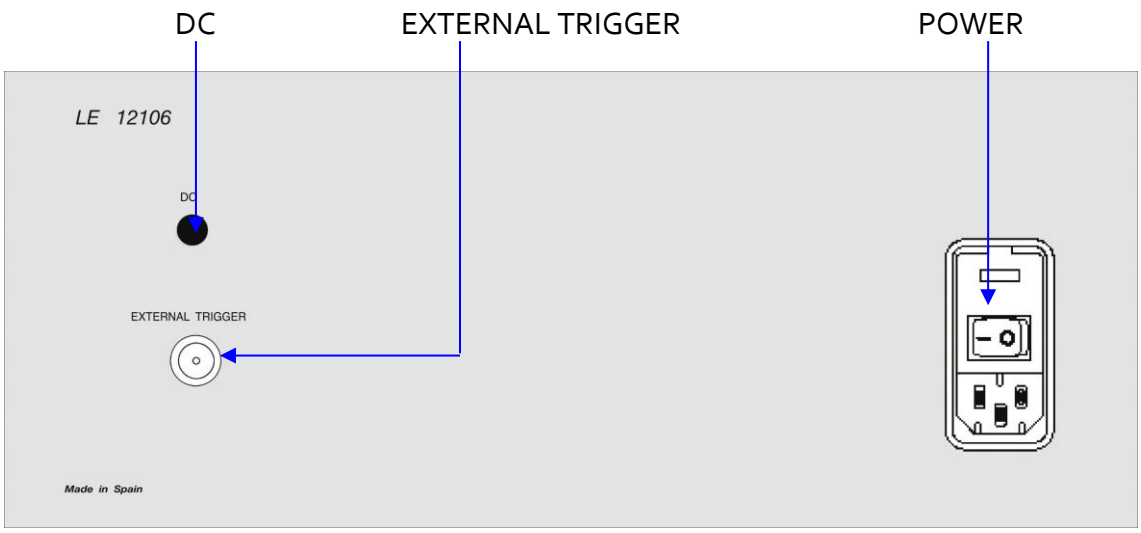


Figure 8. LE12106 Rear panel.

- **External Trigger:** When a TTL signal is applied to this BNC connector, the system gives pulses at the selected frequency and with the selected pulse duration. It has the same function as the Pulse Repeat button but only when the TTL signal is on.

- **DC:** This button generates output, which remains constant while the button is being pressed.

- **Power:** Main switch, fuse holder and power inlet.

8. EQUIPMENT CONNECTION

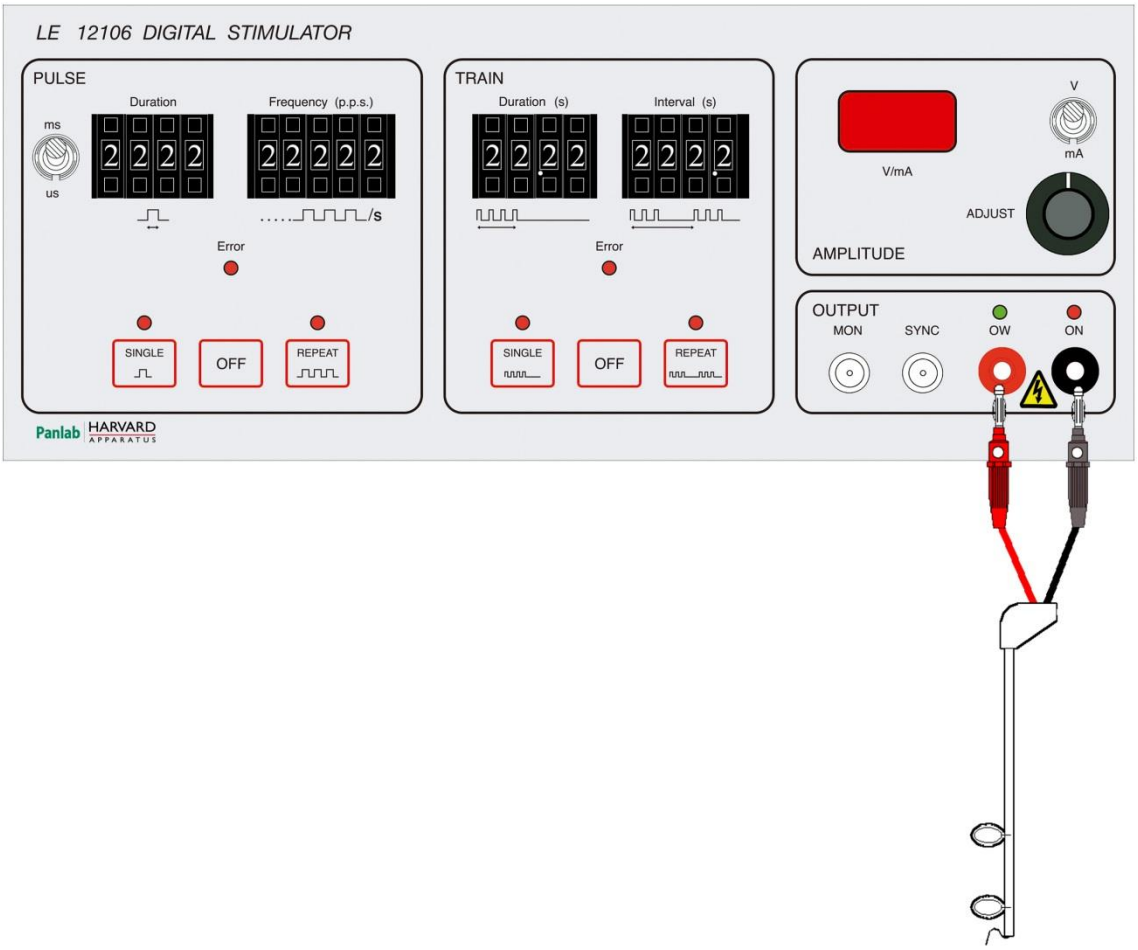


Figure 9. LE 12106 connections.

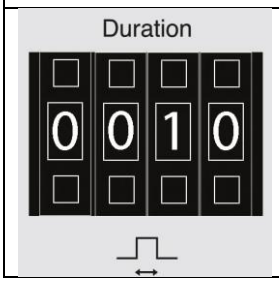
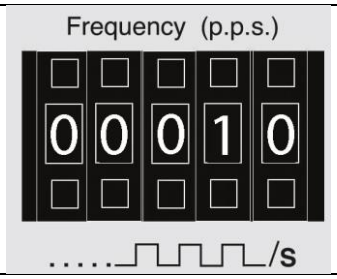
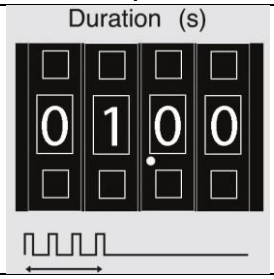
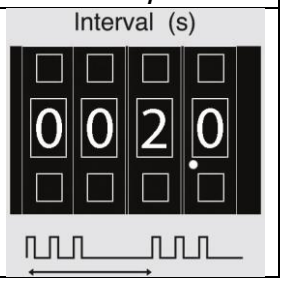
Simply connect the electrode to both positive and negative outputs. The MON output can be used if it is desired to monitor pulses. The SYNC TTL output can be used as a synchronism signal for Repeat Pulse. The External Trigger input can be used for remote activation with a TTL signal.

9. WORKING WITH THE EQUIPMENT

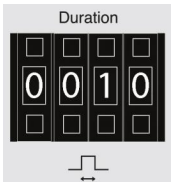
9.1. TIME BASE

To illustrate the manner of working with the time base, an example is shown to clarify settings and the results attained when different buttons are pressed.

Assume that the decimal selectors have been set in the following way:

PULSE DURATION	FREQUENCY	TRAIN DURATION	INTERVAL
0010	00010	01,00	002,0
			

9.1.1. Pulse Single Button

When the **Pulse Single**  button is pressed, a single pulse in the output will be obtained. The duration of this pulse is given by the switch labelled **µs/ms**  and by the decimal selector labelled **Pulse Duration**  .

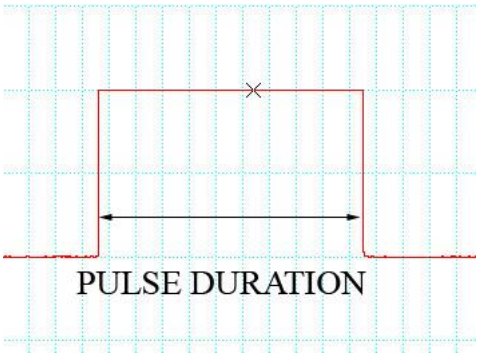


Figure 10. Single pulse.

In this example it will be 10µs or 10ms depending on the switch position.

9.1.2. Pulse Repeat Button

When the **Pulse Repeat**  button is pressed, the following is obtained:

a) A repetitive pulse at the selected frequency with the selected pulse duration, if the Period is longer than Pulse duration. To exit from this state press the **Off** button.

b) Error , if the period is shorter than pulse duration.

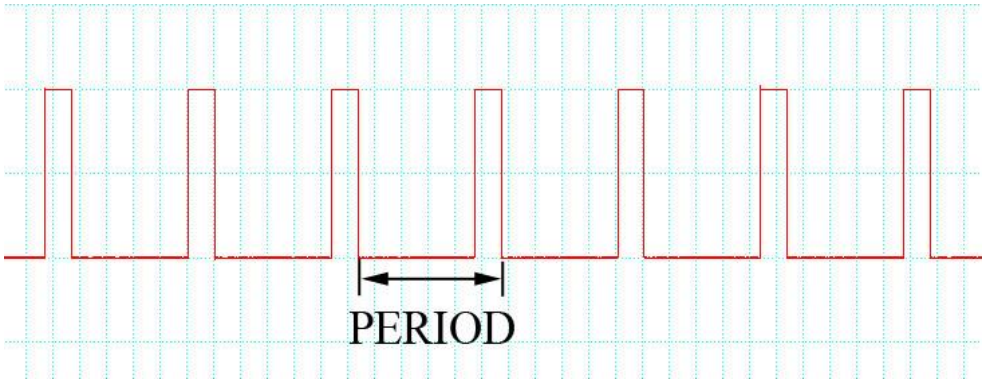


Figure 11. Repetitive Pulse.

Period is the inverse of frequency (T=1/f).

In this example, 10Hz pulses with duration of 10µs or 10ms will be obtained depending on the switch.

9.1.3. Single Train Button

When the **Single Train** SINGLE button is pressed, the following is obtained:

a) A train of pulses during the time selected in **Train Duration** with the selected **Frequency** and with the selected **Pulse Duration**, if all parameters are correct.

b) Error , if period is shorter than pulse duration.

c) Error , if train duration is shorter than period.

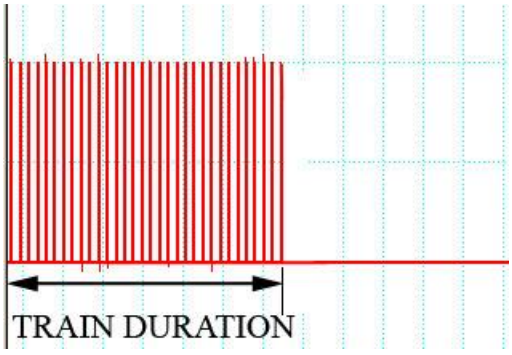


Figure 12. Train of Pulses.

To exit from this state, press OFF button or wait until the time ends, as this button only gives a single train of pulses.

In this example, a train of pulses will be obtained over 1 second at 10Hz with a pulse duration of 10µs or 10ms depending on the switch.

9.1.4. Repeat Train Button

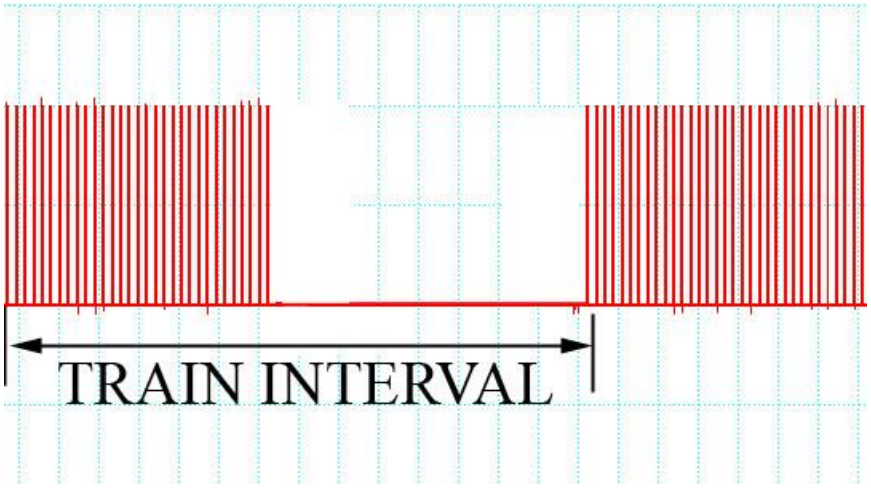


Figure 13. Repetitive Train of Pulses.

Pressing the **Repeat Train** 

makes it possible to obtain:

a) A repetitive Train of Pulses every **Train Interval** time with the selected **Train duration** at the selected frequency with the selected pulse duration if all parameters are correct.

b) 

, if period is shorter than pulse duration.

c) 

, if train duration is shorter than period.

d) 

, if Train interval is shorter than train duration.

When the system works correctly, exit from this state by pressing the 

button.

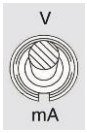
In the example, a repetitive train of pulses every 2 seconds will be obtained. The train duration will be 1 second and will have 10Hz frequency with a pulse duration of 10µs or 10ms depending on the switch.

9.2. POWER MODULE

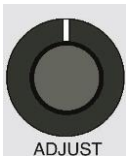
There are controls on the power module to select the kind of output (voltage or current) and the amplitude of pulses.

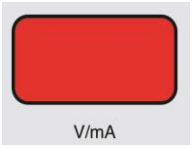
Choose voltage or current output with the **V/mA** 

switch. The central switch position is used to reset the protection (output is disabled) in voltage mode when overload occurs (current is greater than 265mA in voltage mode) and the led 

is turned on. In order to reset the output in voltage mode, you should move the switch 

from the **V** position to the cental position and then raise it again to the **V** position.

Select the amplitude of pulses from 0V to 100V or 0 mA to 100 mA with the 

potentiometer. The value of the amplitude is shown on the 

display.

There are two buttons labelled 

on the rear panel. These buttons are used to obtain a continuous output while they are being pressed in the respective power module.

9.3. 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. FREQUENCY LOWER THAN 1Hz

The minimum value in **Frequency** decimal selector is 1Hz. However, lower frequencies can be obtained by adjusting the train of pulses.

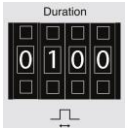
To do so, set the parameters as follows:

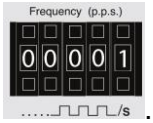
PULSE DURATION	FREQUENCY	TRAIN DURATION	INTERVAL
X	00001	01.00	T

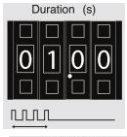
- Pulse duration: Select the necessary value. The maximum value you can select is 999ms, if you select 1000ms you will obtain a continuos voltage, but if you select a value higher than 1000ms the equipment will give error because the pulse duration is higher than the period of the value selected in **Frequency** selector.
- Frequency: Select 1Hz.
- Train Duration: Select 1 second. This means a train of pulses of only 1 pulse duration will be obtained.
- Interval: Select the period for the frequency. The necessary condition is that T be greater than 1 second.

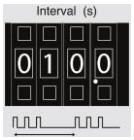
For example, if we wish to obtain 100ms pulses every 10 seconds (0,1Hz), We will proceed as follows:.

1. Set the selector 

in **ms** position.
2. Set to 0100 the pulse duration selector 

.
3. Set to 00001 the Frequency decimal selector 

.
4. Set to 01.00 the train duration decimal selector 

5. Set to 010.0 the traun unterval decimal selector 

.
6. Press **Train Repeat** 

button in order to activate pulses.
7. Press **OFF** 

button in order to stop pulses.

Using this technique, frequencies between 1Hz and 0.001001Hz can be obtained. Remember that period is the inverse of frequency T=1/f.

11. 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.
Pressing the SINCLE PULSE button will not turn on the SINGLE led.	• Check that the selector PULSE DURATION is not set to oooo. • If the switch ms/µs is in µs and the value set of PULSE DURATION is low, led light can be as short as the human eye can not appreciate.
Pressing REPEAT PULSE button the ERROR PULSE led is lit and there is no pulse output.	• Check that the period of time selected in the FREQUENCY selector is greater than the pulse duration selected PULSE DURATION.
Pressing the TRAIN DURATION button the ERROR TRAIN led lights and there is no pulse output.	• Check that the period of time selected in the FREQUENCY selector is greater than the pulse duration selected PULSE DURATION. • Ensure that the selected duration in DURATION TRAIN is greater than the selected duration in PULSE DURATION.
Pressing REPEAT TRAIN button the ERROR TRAIN led is lit and there is no pulse output.	• Check that the period of time selected in the FREQUENCY selector is greater than the pulse duration selected in PULSE DURATION. • Ensure that the selected duration in DURATION TRAIN is greater than the selected duration in PULSE DURATION. • Ensure that the selected duration in TRAIN INTERVAL is greater than the selected duration in DURATION TRAIN.
Pressing any button turns on the LED OW and do not leave power pulses.	• This occurs when in the voltage-mode the load current exceeds 265mA (current overload), you should reset the device by momentarily placing the switch V/mA at the center position and then leaving it again in the V position.

12. PREVENTIVE MAINTENANCE

	EXPERIMENT
ELECTRODE CLEANING	☑
ELECTRODE CONNECTION CHECKING	☑

13. TECHNICAL SPECIFICATIONS

POWER SUPPLY	
Input voltage:	115V/230V~
Frequency:	50 /60 Hz
Fuse:	2 fuses 5mm*20mm 1 A 250V Fast
Maximum Power:	51W
Conducted Noise:	EN55022 /CISPR22/CISPR16 class B
ENVIRONMENTAL CONDITIONS	
Operating temperature:	10°C to +40°C
Operating relative humidity:	0% to 85% RH, non-condensing
Storage temperature:	0°C to +50°C, non-condensing
TIME BASE	
Pulse Duration Range:	0001µs to 9999µs 0001ms to 9999ms
Frequency Range:	00001Hz to 99999Hz
Train Duration Range:	00.01s to 99.99s
Train Interval Range:	000.1s to 999.9s
POWER MODULE:	
Voltage Range:	0V to 100V
Voltage mode overload:	limited to 265mA
Current Range:	0mA to 100mA
Output Power	10W maximum
DIMENTIONS	
Width x Height x Depth:	340mm x 156mm x 340 mm
Weight:	9kg

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:	**DIGITAL STIMULATOR**
Marca / Brand / Marque:	**PANLAB**
Modelo / Model / Modèle:	**LE12106**

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:	**EN61010-1:2010**
EMC:	**EN61326-1:2013 Class B**
Safety of machinery:	**EN ISO 12100:2010**

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.