

# Hardware User's Manual

---

## Modular operant box



### References:

LE1002 (76-0151), LE1005 (76-0152), LE1002XX and LE1005XX,  
LINKBOX01 (76-0156)

### Publication:

PB-MF-MAN-018-REV1.0

---

#### Limitation of Liability

PANLAB does not accept responsibility, under any circumstances, for any harm or damage caused directly or indirectly by the incorrect interpretation of what is expressed in the pages of this manual.








Some symbols may have more than one interpretation by professionals unaccustomed to their usage.

PANLAB reserves the right to modify, in part or in total, the contents of this document without notice.

---

## 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 65°C	
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 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.

## 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.

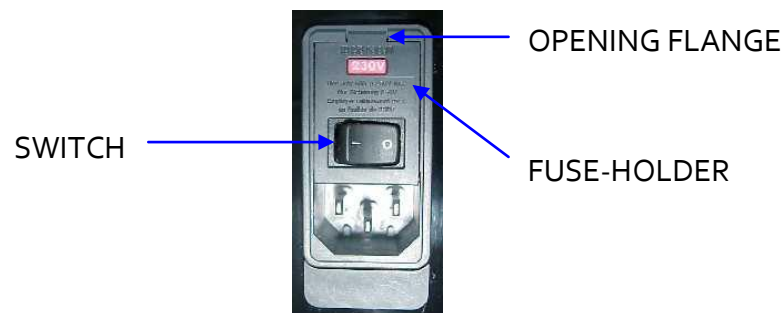


Figure 1. Power inlet, main switch and fuse holder.

### FUSE REPLACEMENT

In case of an over-voltage or other incident in the AC net making it impossible to turn on the equipment, 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.

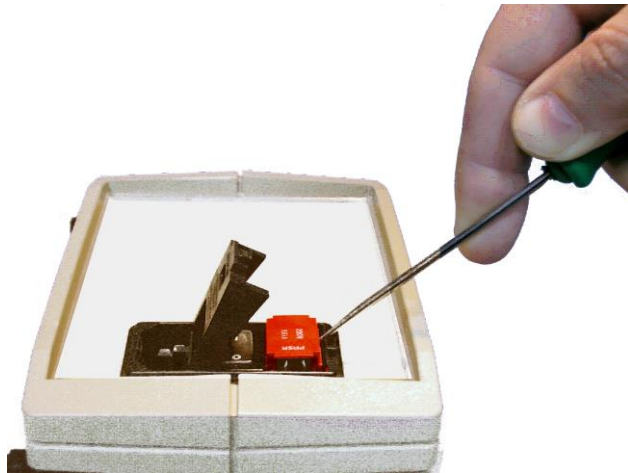


Figure 3. Extract fuse-holder.

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



CORRECT



INCORRECT

Figure 4. Fuses position.

- 5 Insert again fuse-holder, both possible positions are correct because power supply is universal.
- 6 If the fuses blow again unplug the equipment and contact technical service.



WARNING

For electrical safety, never open the equipment. The power supply has dangerous voltages.

## 5. TABLE OF CONTENTS

---

<b>1. SYMBOLS TABLE</b>	<b>2</b>
<b>2. GOOD LABORATORY PRACTICE</b>	<b>2</b>
<b>3. UNPACKING AND EQUIPMENT INSTALLATION</b>	<b>3</b>
<b>4. MAINTENANCE</b>	<b>5</b>
<b>5. TABLE OF CONTENTS</b>	<b>7</b>
<b>6. INTRODUCTION</b>	<b>9</b>
<b>7. EQUIPMENT DESCRIPTION</b>	<b>11</b>
7.1. LINK BOX 01 FRONT PANEL	11
7.2. LINK BOX 01 REAR PANEL	12
7.3. EXPERIMENTATION CAGE	13
<b>8. MODULES</b>	<b>14</b>
8.1. LEVER LE100X-65	14
8.2. RETRACTABLE LEVER LE100X-64	14
8.3. LIGHT LE100X-67	14
8.4. VARIABLE LIGHT LE100X-677	15
8.5. ACOUSTIC STIMULUS LE100X-90	15
8.6. VARIABLE ACOUSTIC STIMULUS LE100X-42	16
8.7. ADJUSTABLE ACOUSTIC STIMULUS BY SOFTWARE LE100X-41	17
8.8. WHITE NOISE GENERATOR LE100X-43	18
8.9. SIX TONES GENERATOR LE100X-44	18
8.10. PELLET DISPENSER LE100X-50	18
8.11. DROP DISPENSER LE100X-60	19
8.12. DROP DISPENSER WITH LIGHT CONTROLLED BY SOFTWARE AND DETECTION LE 100X-58	19
8.13. SPOON LIQUID DISPENSER LE100X-61	20



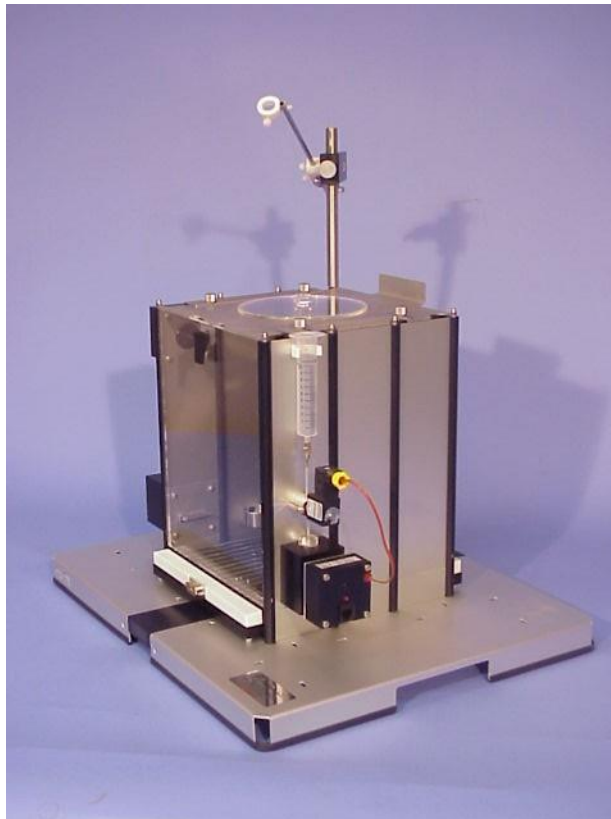
8.14.	MECHANICAL DETECTOR LE100X-33	20
8.15.	PHOTOELECTRIC DETECTOR LE100X-51	21
8.16.	NOSE POKE LE 100X-73	21
8.17.	SHOCKER LE100-26	21
8.18.	INFUSION PUMP LE1020	22
8.19.	MANUAL BUTTON	22
8.20.	Y CONNECTOR	22
8.21.	ACTIVITY WHEEL LE100X-82	23
8.22.	CHAIN RESPONSE LE100X-83	23
8.23.	ELECTRICAL LICKS DETECTION LE100X-70	24
8.23.1.	MODULE CONNECTION	24
8.23.2.	SPECIFICATIONS:	25
8.24.	INTRACRANIAL STIMULATOR LE12705	25
<b>9.</b>	<b>EQUIPMENT CONNECTION</b>	<b>26</b>
9.1.	SEVERAL CAGES CONNECTION	27
9.2.	ELECTRICAL LICK METER CONNECTION	29
<b>10.</b>	<b>TROUBLESHOOTING</b>	<b>31</b>
<b>11.</b>	<b>PREVENTIVE MAINTENANCE</b>	<b>32</b>
<b>12.</b>	<b>TECHNICAL SPECIFICATIONS</b>	<b>33</b>

## 6. INTRODUCTION

---

The LE 1002 – LE 1005 is a modular operant chamber system designed for working with rats, mice and pigeons. Its modular design allows easy adaptation to any kind of experiment. It is also possible to add or remove modules depending on the needs of the experimenter.

The system is composed of 2 elements: an experimentation cage and the Link Box 01. It sends and receives signals to and from the computer using serial port RS-232.



**Figure 5. Experimentation Cage.**

The experimentation cage has 2 accesses (front and upper). This facilitates animal handling and cage cleaning. Both cage side walls have guides where modules can be inserted.

There is a grid on the floor, which can be removed for cleaning. The bars are grouped in sets of 6 to administer shock to the animal (the sequence begins again in the 7<sup>th</sup> bar).



Figure 6. Link Box 01.

Link Box 01 contains the electronic circuit that controls the modules and the power supply that feeds them. It has telephonic connectors to control up to 8 different modules.

## 7. EQUIPMENT DESCRIPTION

### 7.1. LINK BOX 01 FRONT PANEL

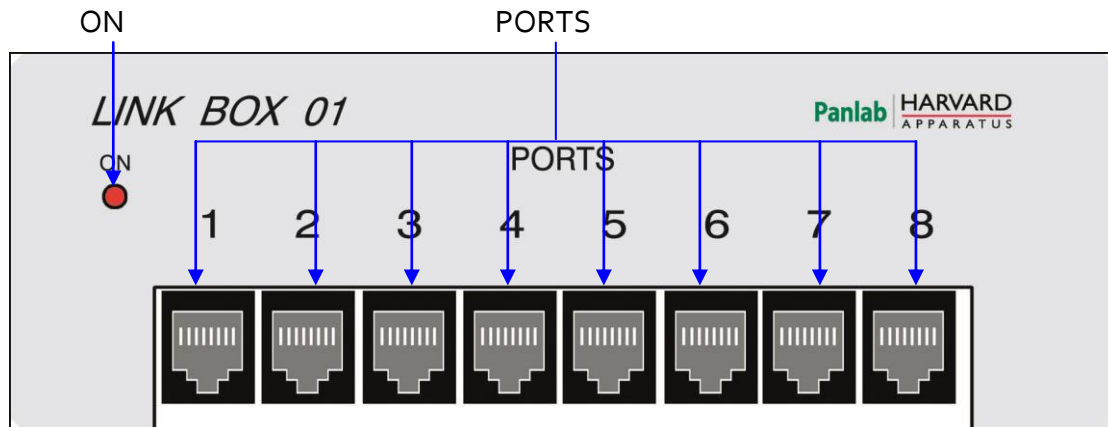


Figure 7. Link Box 01 Front Panel.

- **ON:** Led that confirms that the equipment is on.
- **PORTS:** Link Box 01 has 8 ports to control up to 8 different modules.

## 7.2. LINK BOX 01 REAR PANEL

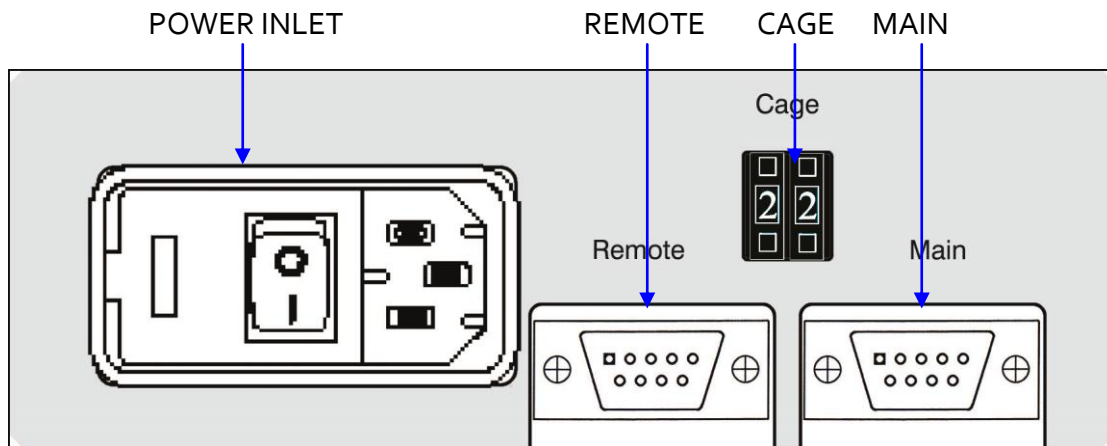


Figure 8. Link Box 01 Rear Panel.

- **POWER INLET:** Power inlet, main switch and fuse holder.
- **REMOTE:** DB9 connector that connects Link Box 01 to the MAIN connector of the next control unit. This connector remains free if the Link Box 01 is the last unit.
- **MAIN:** DB9 connector that connects the Link Box to the REMOTE connector of the previous control unit. If the Link Box is the first unit, it is connected to the computer serial port.
- **CAGE:** Cage identifier with which the program recognises the cage. The maximum number of cages is 40. The valid numbers range is from 00 to 39. Never set 2 cages with same number.

### 7.3. EXPERIMENTATION CAGE

---

The experimentation cage has a front and an upper opening. The animal can be handled through these two openings. There is a grid on the floor to administer shock to animal. Bars are repeated in groups of 6 (there are 6 independent bars and the sequence begins again as of the 7th) so that the animal cannot stay isolated by touching the same bar.



Figure 9. Experimentation Cage.

There is a tray under the grid to collect the animal excrements. It can be removed for easy cleaning.

Both side walls have guides to insert modules. This equipment is modular and different configurations can be prepared depending on the needs of the experimenter.

## 8. MODULES

### 8.1. LEVER LE100X-65

**TYPE:**  
Input

**FUNCTION:**  
Response

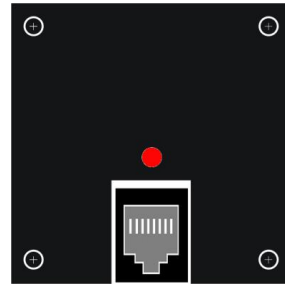


Figure 10. Lever.

The lever is an input module from the experimentation cage to **Link Box 01**. The experimentation animal can press it to obtain a positive reinforcement.

### 8.2. RETRACTABLE LEVER LE100X-64

**TYPE:**  
Input/Output

**FUNCTION:**  
Response

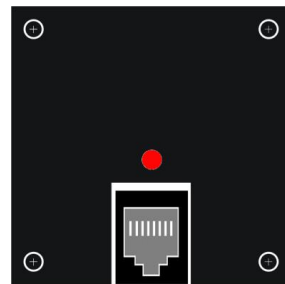


Figure 11. Retractable Lever.

The retractable lever is an input and output module from the experimentation cage to the **Link Box 01**. The experimentation animal can press it (input) to obtain a positive reinforcement. The lever can be hidden (output) to keep the animal from pressing it.

### 8.3. LIGHT LE100X-67

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

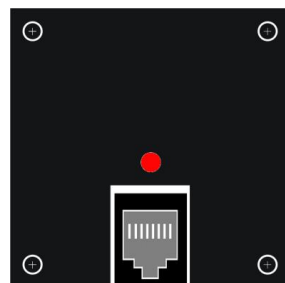
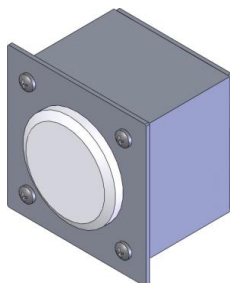


Figure 12. Light.

The light is an output module which can be used to stimulate the experimentation animal.

#### 8.4. VARIABLE LIGHT LE100X-677

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

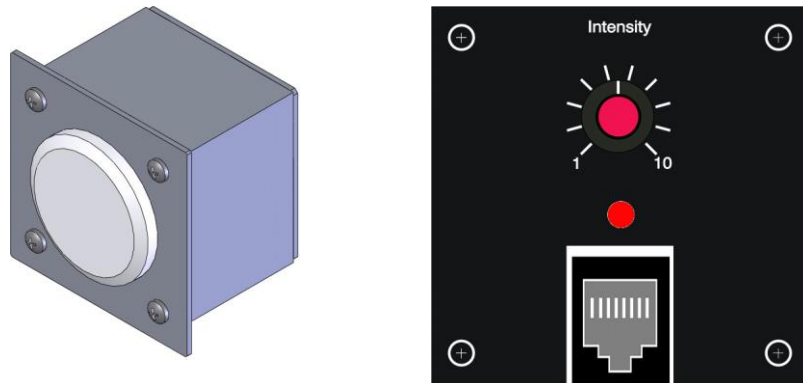


Figure 13. Variable light.

The variable light is an output module which can be used to stimulate the experimentation animal. The light intensity can be modified with the potentiometer labelled **Intensity**.

#### 8.5. ACOUSTIC STIMULUS LE100X-90

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

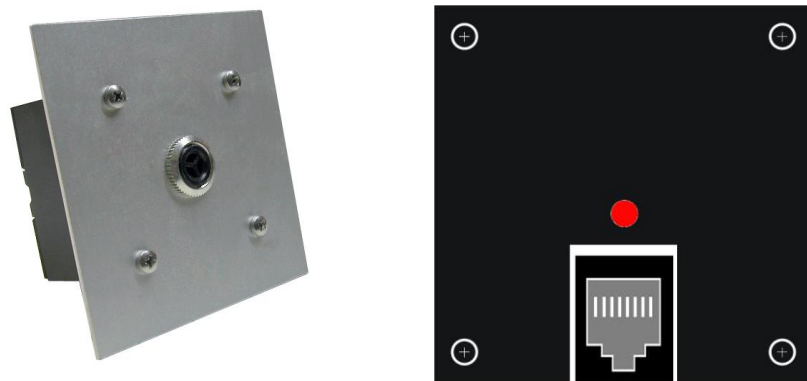


Figure 14. Acoustic Stimulus.

The acoustic stimulus is an output module which can be used to stimulate the animal with a fixed frequency of 3 kHz. The sound volume cannot be modified.



## 8.6. VARIABLE ACOUSTIC STIMULUS LE100X-42

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

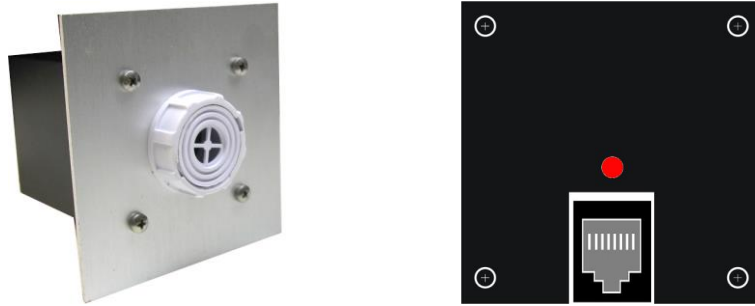


Figure 15. Variable Acoustic Stimulus.

The Variable Acoustic Stimulus is an output module which can be used to stimulate the experimentation animal. It has a 5-channel digital selector that makes it possible to choose among 28 different tones. The equipment is shipped with a fixed frequency setting of 2850 Hz. The sound volume can be adjusted with a potentiometer. It is shipped with a setting of 85 dB at 40 cm distance with the pure tone of 2850 Hz. To access tone and volume controls, remove the rear lid and extract the black side box. The tones and digital selector settings to choose them are listed in the next table.

Nº	DESCRIPTION	CODE
1	Alternate tones 800/970Hz at ¼ sec.	11111
2	Sweeping 800/970 Hz at 7 Hz	11110
3	Sweeping 800/900 Hz at 1 Hz	11101
4	Continuous at 2.850 Hz	11100
5	Sweeping 2.400-2.850 Hz at 7 Hz	11011
6	Sweeping 2.400-2.850 at 1 Hz	11010
7	Slow Whoop	11001
8	Sweeping 1.200-500 Hz at 1 Hz	11000
9	Alternate tones 2.400/2.850 2 Hz	10111
10	Intermittent tone 970 Hz at 1 Hz	10110
11	Alternate tone 800/970 Hz at 1 Hz	10101
12	Intermittent tone 2.850 Hz at 1 Hz	10100
13	970 Hz at 1/4s On / 1s Off	10011
14	Continuous at 970 Hz	10010
15	554 Hz for 100 ms and 440 Hz for 400 ms	10001
16	Intermittent, 660 Hz, 150 ms On/150 ms Off	10000
17	Intermittent, 660 Hz for 1.8 s On/1.8 s Off	01111
18	Intermittent, 660 Hz for 6.5 s On/13 s Off	01110
19	Continuous 660 Hz	01101
20	Alternate 554/440 Hz at 1 Hz	01100
21	Intermittent, 660 Hz at 1 Hz	01011
22	Intermittent, 2.850 Hz, 150 ms On/100 ms Off	01010
23	Sweeping 800-970 Hz at 50 Hz	01001
24	Sweeping 2.400-2.850 Hz at 50 Hz	01000
25	Intermittent, 970 Hz, 500 ms On/500 ms Off	00111
26	Intermittent, 2.850 Hz, 500 ms On/500 ms Off	00110
27	Continuous at 4 kHz	00101
28	Alternate tones 800/970 at 2 Hz	00100

## 8.7. ADJUSTABLE ACOUSTIC STIMULUS BY SOFTWARE LE100X-41

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

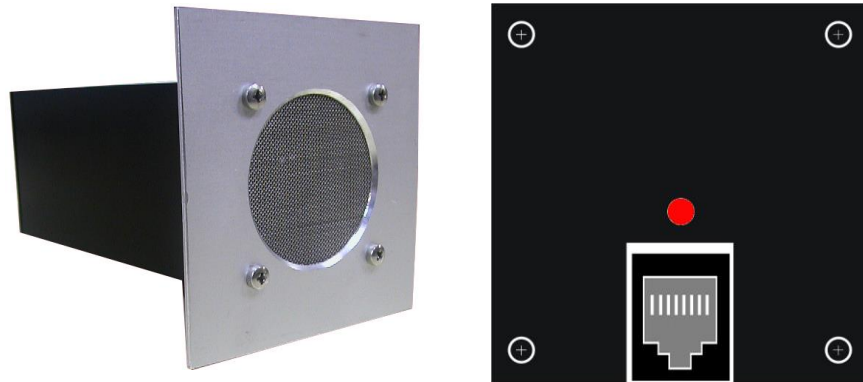


Figure 16. Adjustable Acoustic Stimulus by Software.

The Adjustable Acoustic Stimulus by software has a range of frequencies between 100 Hz and 20 kHz. Its volume is also adjustable. Both parameters (volume and frequency) are set through the **PackWin** software.

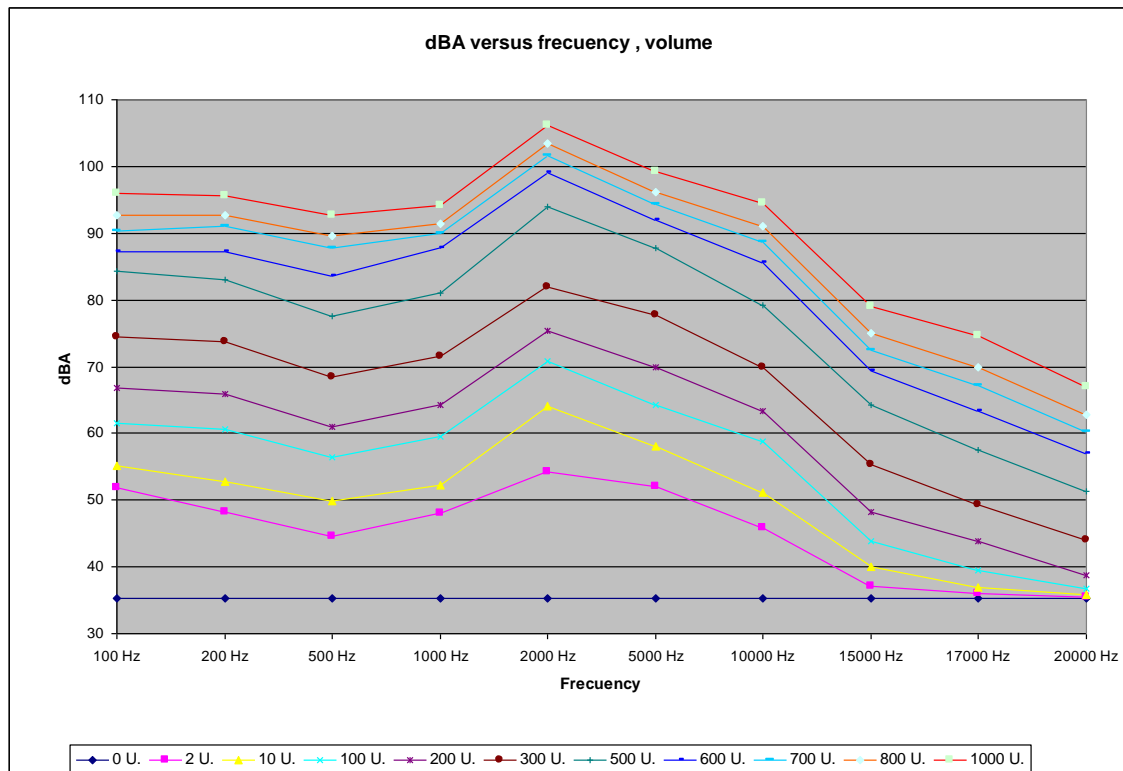


Figure 17. Volume vs. Frequency, parameter (sound units).

### 8.8. WHITE NOISE GENERATOR LE100X-43

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

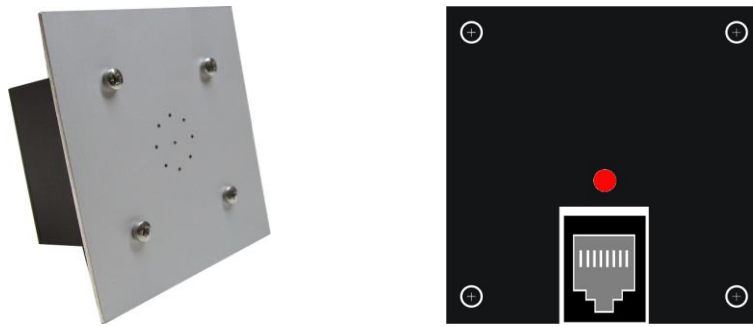


Figure 18. White noise generator.

The sound that contains all frequencies is known as white noise. The white noise generator is an acoustic stimulus that generates this kind of sound.

### 8.9. SIX TONES GENERATOR LE100X-44

**TYPE:**  
Output

**FUNCTION:**  
Stimulus

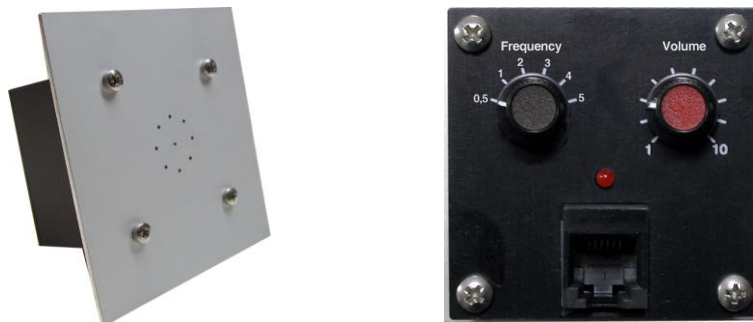


Figure 19. Six Tones generator.

The Six Tones Generator is an acoustic stimulus in which either volume or frequency can be set (there are 6 fixed frequencies that can be selected by means of a rotary 6-position selector, 500Hz, 1kHz, 2kHz, 3kHz, 4kHz y 5kHz).

### 8.10. PELLET DISPENSER LE100X-50

**TYPE:**  
Output

**FUNCTION:**  
Positive reinforcement

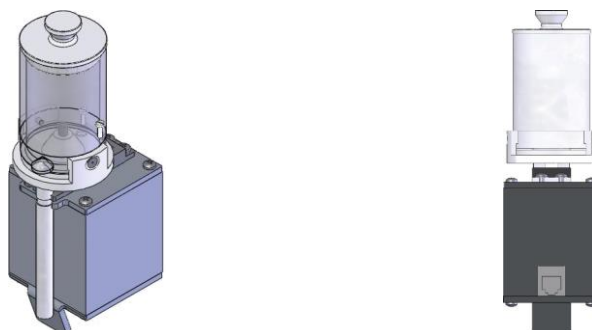


Figure 20. Pellet dispenser.

The Pellet dispenser is a positive reinforcement that gives one pellet to the experimentation animal if it correctly answers the experimental protocol.

### 8.11. DROP DISPENSER LE100X-60

**TYPE:**  
Output

**FUNCTION:**  
Positive reinforcement

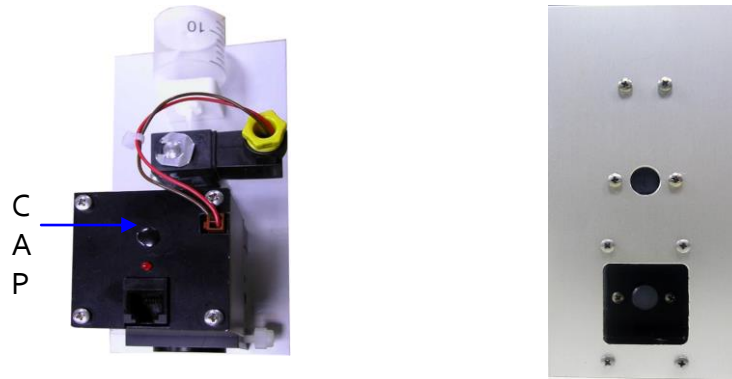


Figure 21. Drop dispenser.

The Drop dispenser is a positive reinforcement mechanism that gives one drop of drink to the experimentation animal if it correctly answers the experimental protocol.

The module comes factory set for the drop falls during 50ms. This setting can be changed if desired, there is a hidden potentiometer with a circular plastic cap, if we lift the cap and turn the knob clockwise the time will increase, if on the contrary we turn the knob counter clockwise the time will decrease.

### 8.12. DROP DISPENSER WITH LIGHT CONTROLLED BY SOFTWARE AND DETECTION LE 100X-58

**TYPE:**  
2 Outputs / 1 Input

**FUNCTION:**  
Positive reinforcement,  
Stimulus and Detector



Figure 22. Drop dispenser with light controlled by software and detection.

This is a combination of 3 modules:

- 1 Drop dispenser.
- 1 Light controlled by **PackWin** software with 3 light intensities.
- 1 Photoelectric detector.

**8.13. SPOON LIQUID DISPENSER LE100X-61**

---

**TYPE:**  
Output

**FUNCTION:**  
Positive  
reinforcement

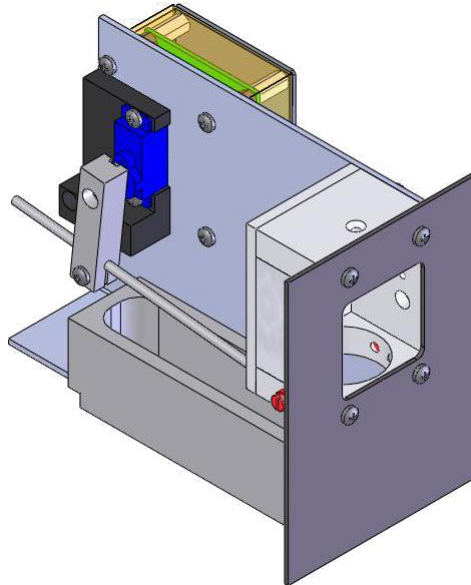


Figure 23. Spoon liquid dispenser.

The Spoon liquid dispenser is a positive reinforcement that gives one drop of drink to the experimentation animal if it correctly answers the experimental protocol.

**8.14. MECHANICAL DETECTOR LE100X-33**

---

**TYPE:**  
Input

**FUNCTION:**  
Detector

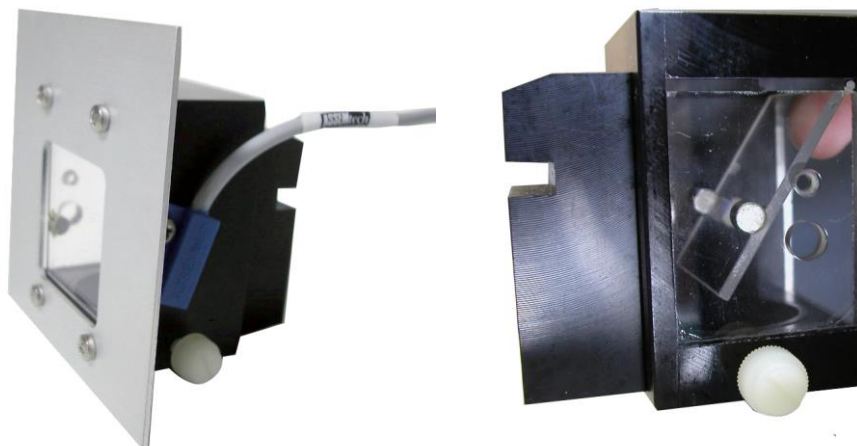


Figure 24. Mechanical detector.

The mechanical detector works together with the feeder/drinker. It detects by means of a magnetic switch when the animal places its head in the feeder/drinker to access the positive reinforcement.

### 8.15. PHOTOELECTRIC DETECTOR LE100X-51

**TYPE:**  
Input

**FUNCTION:**  
Detector

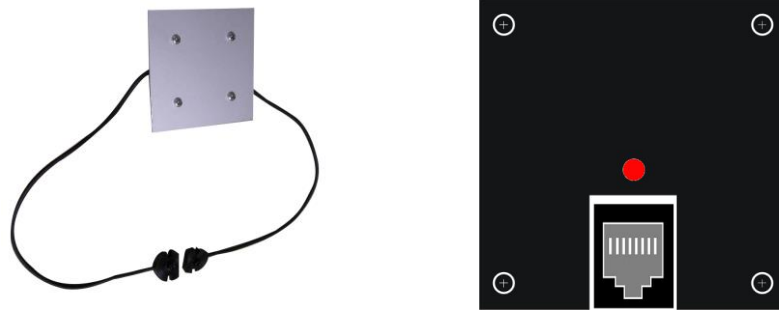


Figure 25. Photoelectric detector.

The photoelectric detector works together with the feeder/drinker. It uses an infrared beam to detect when an animal places its head in the feeder/drinker to access the positive reinforcement.

### 8.16. NOSE POKE LE 100X-73

**TYPE:**  
Input

**FUNCTION:**  
Detector

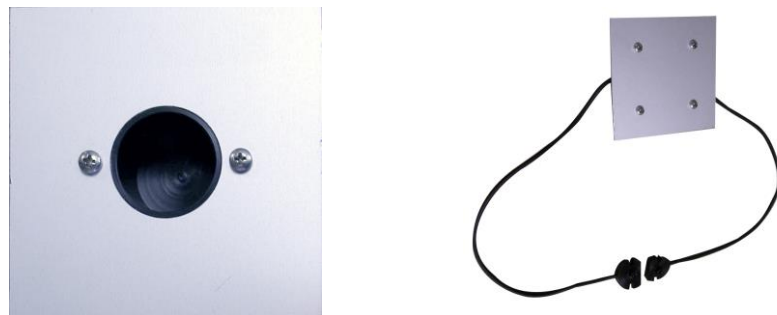


Figure 26. Nose poke.

The Nose Poke is a hole that works together with a photoelectric detector. It detects when the animal introduces its head in the hole.

### 8.17. SHOCKER LE100-26

**TYPE:**  
Output

**FUNCTION:**  
Negative  
reinforcement



Figure 27. Shocker.

This is negative reinforcement that supplies an electrical shock to the animal through the electrical grid in the floor of the cage, when it incorrectly answers the experimental protocol.

## 8.18. INFUSION PUMP LE1020

**TYPE:**  
Output

**FUNCTION:**  
Positive reinforcement

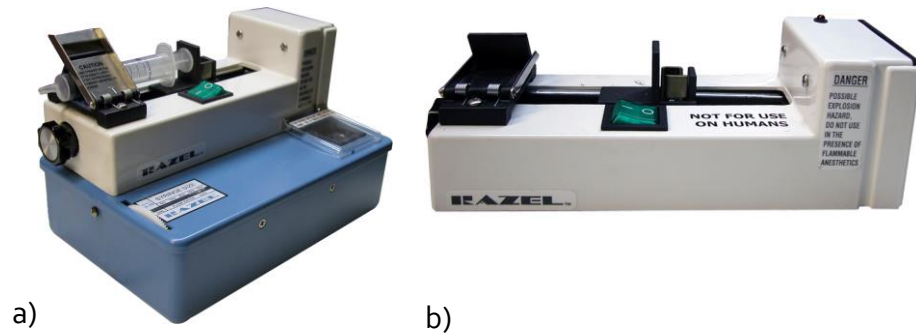


Figure 28. Infusion pump: a) Rat, b) Mouse.

If an animal correctly answers the experimental protocol, as a reward, it can receive an injection of drug in its brain by means of a swivel.

## 8.19. MANUAL BUTTON

**TYPE:**  
Input

**FUNCTION:**  
Reinforcement activation



Figure 29. Manual Button.

The experimenter pushes a manual button when a positive or negative reinforcement is to be administered to the animal.

## 8.20. Y CONNECTOR

**TYPE:**  
Connector

**FUNCTION:**  
Ports expander



Figure 30. Y Connector.

When more than 8 modules are needed in a cage, the Y connector can be used to connect two modules in a port, but one of them must be of the input type and the other one must be of the output type (for example, a Lever and a Light).



### 8.21. ACTIVITY WHEEL LE100X-82

---

**TYPE:**

Input

**FUNCTION:**

Response

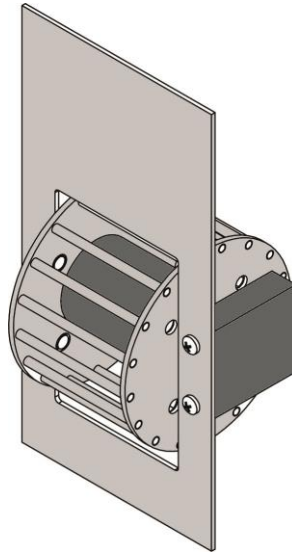


Figure 31. Activity wheel.

The activity wheel is an input module from the cage to the **Link Box 01**. The wheel has four magnets, one for each quarter of turn; each time a magnet passes the magnetic sensor provides a pulse. The animal can turn the wheel to get such positive reinforcement.

### 8.22. CHAIN RESPONSE LE100X-83

---

**TYPE:**

Input

**FUNCTION:**

Response

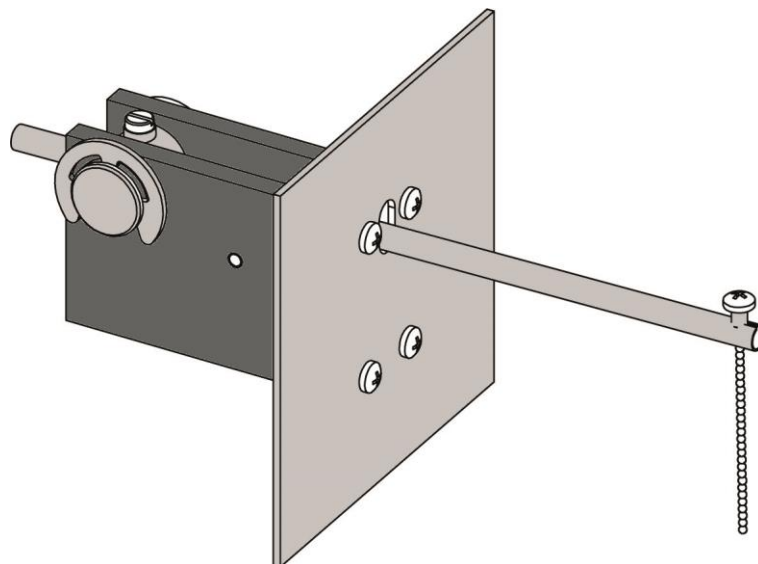


Figure 32. Chain response.

The chain response is an input module from the cage to the **Link Box 01**. The animal can pull the chain to get such positive reinforcement.



### 8.23. ELECTRICAL LICKS DETECTION LE100X-70

---

**TYPE:**

Input

**FUNCTION:**

Response

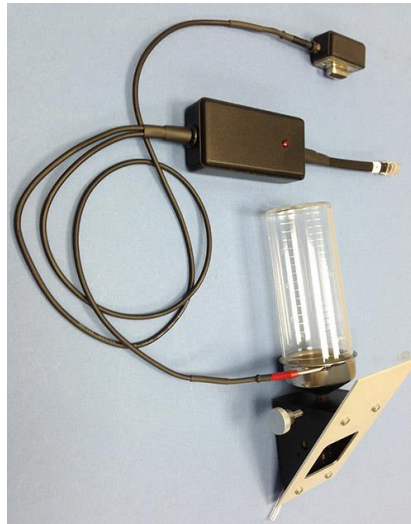


Figure 33. Electrical lick meter.

The module LE100X-70 allows the detection and counting of the number of licks produced by rats and mice. It reflects the animal's drinking behaviour. For this, it uses a standard cage associated with a grid floor. A highly sensitive electronic circuit connected between the bottle and the floor of the grid allows detection when the animal closes the circuit. The current detection is not perceptible by the animal (less than  $0.4 \mu\text{A}$ ).

Each lick will produce an output pulse, thus allowing the counting of these licks. The module is connected to a Linkbox 01 module that interfaces with the computer and thus allowing the execution of complex programs for drinking studies.

It allows the simultaneous application of shocks in the grid by using a stimulator module (shocker), while operating the module LE100X-70.

#### 8.23.1. MODULE CONNECTION

- 1) Connect the coupling connector on the grid of the cage



Figure 34. Coupling connector.

- 2) Connect the black banana to the coupling connector
- 3) Connect the red banana to the bottle
- 4) Connect the telephonic connector to the port of the Linkbox 01 determined by the configuration file "jaulas.box".

### 8.23.2. SPECIFICATIONS:

Voltage:	5V DC
Maximum Power:	0.5 W
Working temperature:	0°C to +50°C
Detection High Impedance:	1.5MΩ
Pulse Output:	>= 40 ms
Dispenser Volume:	100ml
Lick detection current:	< 0.4 μA
Dimensions:	78x40x22 mm
Weight:	62 gr.

### 8.24. INTRACRANIAL STIMULATOR LE12705

**TYPE:**  
Output

**FUNCTION:**  
Stimulator

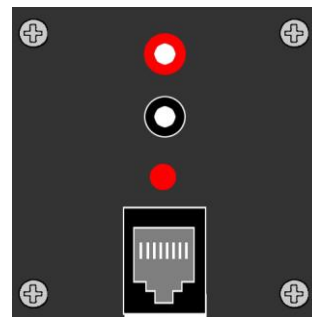
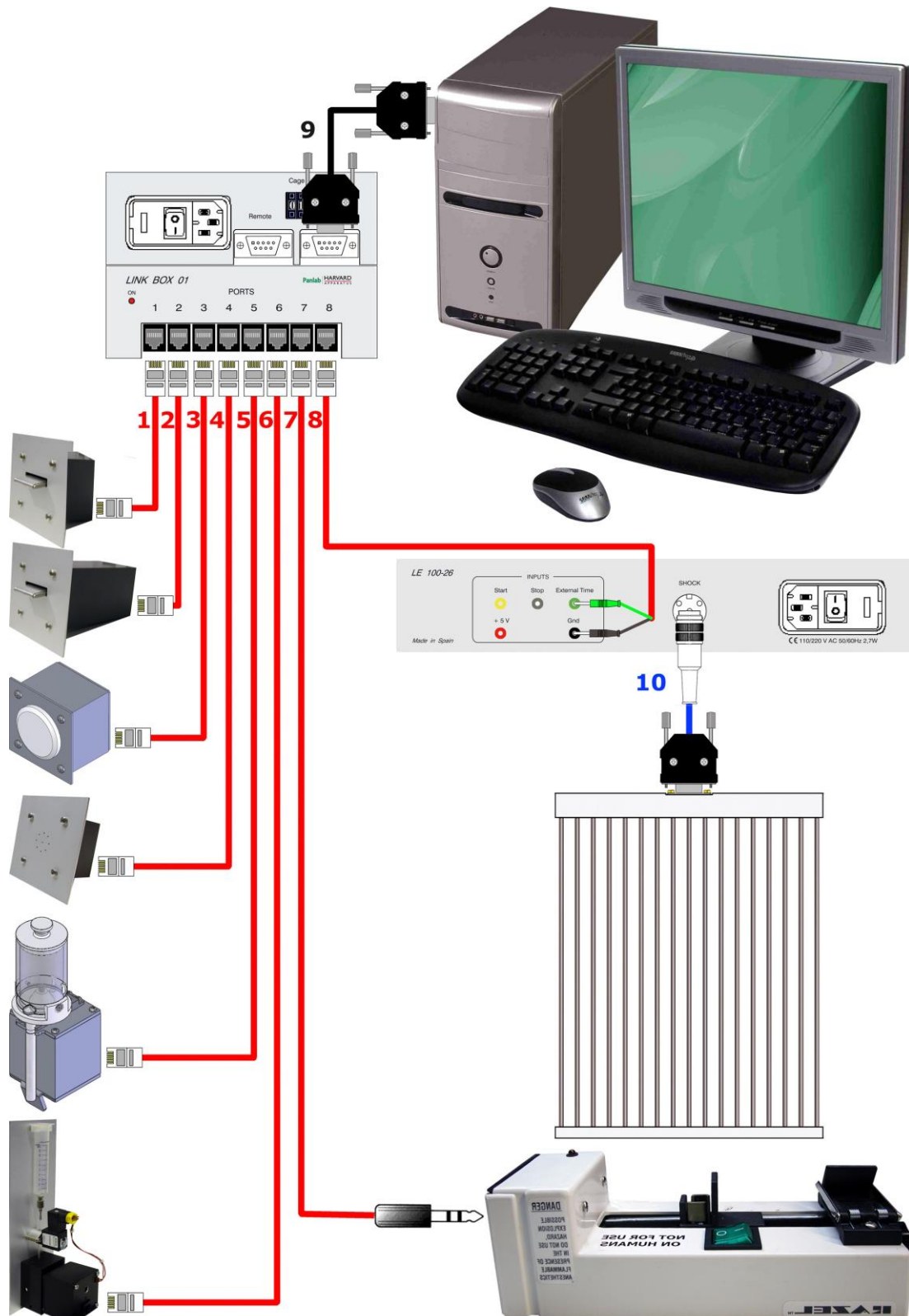


Figure 35. Intracranial stimulator.

The intracranial stimulator delivers electrical stimuli directly into the brain of the animal by means of electrodes implanted in the skull of the test subject. The intensity of the electrical stimulus varies from 0 to 200 μA and is controlled via software. The module has two interchangeable fronts for both rats and mice cages.

## 9. EQUIPMENT CONNECTION

The next figure features an example of equipment connection.



**Figure 36. Example of equipment connection.**

The following module configuration is used in this example:

PORT	MODULE
1	Lever
2	Retractable lever
3	Light
4	Sound
5	Pellet dispenser
6	Drop dispenser
7	Infusion pump
8	Shocker

The module configuration is associated to the file "jaulas.box" of the **PackWin** software. Contact **Panlab** to obtain the modified "jaulas.box" file to change the module configuration associated with each port.

The next table features the cables and connections necessary for the example:

	FROM	TO	CABLE
1	Link Box Port 1	Lever	Telephonic
2	Link Box Port 2	Retractable lever	Telephonic
3	Link Box Port 3	Light	Telephonic
4	Link Box Port 4	Sound	Telephonic
5	Link Box Port 5	Pellet dispenser	Telephonic
6	Link Box Port 6	Drop dispenser	Telephonic
7	Link Box Port 7	Infusion pump	Telephonic to stereo jack
8	Link Box Port 8*	LE100-26 External Time	Telephonic to green plug
8	Link Box Port 8*	LE100-26 GND	Telephonic to black plug
9	Link Box MAIN	PC Com Port	RS-232
10	LE100-26 Shock	Grid	DB9 to DIN6

\*This cable has a telephonic connector on one side and 2 plugs, one green and the other black, on the other.

### 9.1. SEVERAL CAGES CONNECTION

Observe the following rules when working with more than one cage:

- A computer can control up to 40 cages.
- Cages are connected in series mode (connecting REMOTE connector of each control unit with the MAIN connector of the next control unit).
- The MAIN connector of the 1<sup>st</sup> cage is connected to the computer serial port.
- The REMOTE connector of the last cage is kept free.
- Valid cage identifiers go from 00 to 39.
- Never set 2 cages with same identifier.

- It is not necessary to order identifiers when connecting cages, (imagine a system with 3 cages with the following identifiers: 00, 01 and 02. All the following configurations will be valid 00-01-02, 00-02-01, 01-00-02, 01-02-00, 02-01-00 and 02-00-01).
- Modules are connected to the front panel using telephonic connectors.
- Each module is assigned to one port. Connecting the module to a different port will result in the module not working (this configuration is given by the **PackWin** file "jaulas.box").

The next figure shows an example of connection of three cages:



Figure 37. Example of connection of 3 cages with the computer.

- Connect the MAIN port of the first control unit to the computer serial port.
- Connect the REMOTE port of each control unit to the MAIN port of the next control unit.
- The REMOTE port of the last control unit is kept free.

## 9.2. ELECTRICAL LICK METER CONNECTION

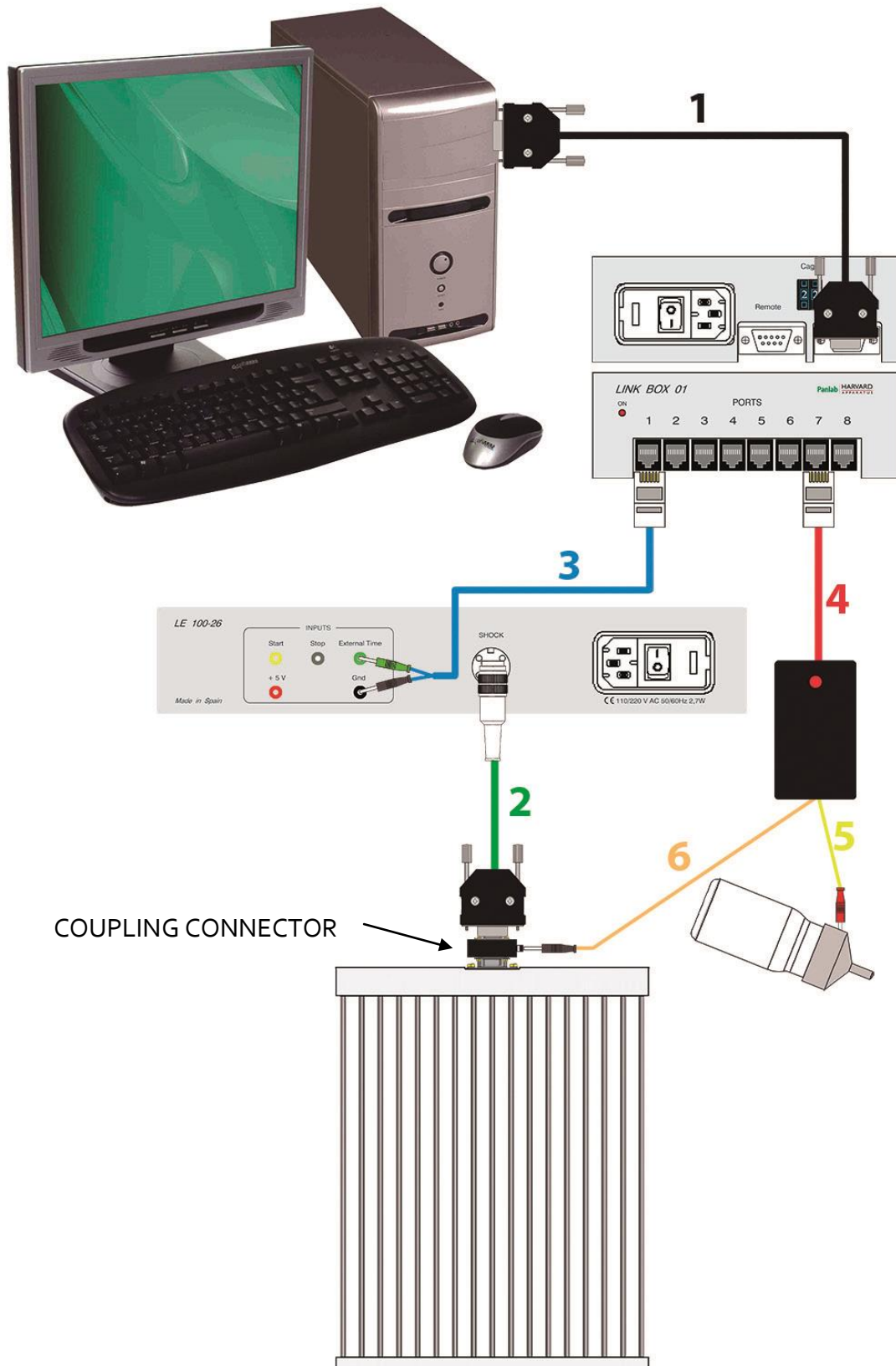


Figure 38. LE100X-70 Electrical licks meter connection.

The cables and necessary connections are listed in the following table.

	FROM	TO	CABLE
1	Link Box MAIN	PC Com Port	RS-232
2	LE100-26 Shock	Grid	DB9 to DIN6
3	Link Box Port n <sup>1</sup>	LE100-26 External Time	Telephonic to green banana 2mm
3	Link Box Port n <sup>1</sup>	LE100-26 GND	Telephonic to black banana 2mm
4	Link Box Port m <sup>2</sup>	Lick meter box	Telephonic
5	Lick meter box	Bottle	Red banana 2mm
6	Lick meter box	DB9 coupling connector	Black banana 2mm



**WARNING:** Be sure that the LE100-26 Shocker is turned off before make the connections to the electrical grid, otherwise you can receive electrical hazard.

<sup>1</sup> The number of port will be determined by the configuration of the file "jaulas.box".

<sup>2</sup> The number of port will be determined by the configuration of the file "jaulas.box".



## 10. TROUBLESHOOTING

This table features instructions to solve the most frequent problems.

PROBLEM	SOLUTION
The equipment does not start up.	<ul style="list-style-type: none"> <li>Check the condition of the fuses.</li> </ul>
None module does not work	<ul style="list-style-type: none"> <li>Check that the serial port to which you have connected the <b>Link Box 01</b> is the same that the one selected in the program <b>Packwin</b>.</li> <li>If you work with several cages check the connections MAIN-REMOTE (see Figure 37).</li> <li>Check the ID number of the <b>Link Box 01</b> is the same that the one of the cage selected in the program <b>Packwin</b>.</li> <li>If you work with several cages verify that no two ID numbers are repeated, since the program <b>Packwin</b> would be unable to identify cages properly.</li> <li>The valid ID numbers range is from 00 to 39, if you select a number outside this range the cage will not work correctly.</li> <li>Be sure to connect each module in the port that match according to the configuration file <b>jaulas.box</b>. If you plug a module into a port that does not match, it will not work.</li> <li>If you use a Y connector, never connect two input modules or two output modules in it. Always connect an input module and an output one, so it does not cross the logic signals.</li> </ul>
A module fails	<ul style="list-style-type: none"> <li>If a module does not work and you want to check if the fault is in the port of the <b>Link Box 01</b>, you can change the module of port if it is a module of the same type as that defined by the file <b>jaulas.box</b> to test it, for example a lever could be connected in place of a chain response because they are both input modules, but you could not connect a light stimulus instead of a lever because one is output, and the other input.</li> </ul>



## 11. PREVENTIVE MAINTENANCE

---

	EXPERIMENT	MONTHLY
TRAY CLEANING	<input checked="" type="checkbox"/>	
GRID CLEANING <sup>3</sup>	<input checked="" type="checkbox"/>	
FOOD DISPENSER CLEANING <sup>4</sup>		<input checked="" type="checkbox"/>
DRINK DISPENSER CLEANING <sup>4</sup>		<input checked="" type="checkbox"/>

---

<sup>3</sup> Read the LE100-26 user manual.

<sup>4</sup> If either the pellets or drink are sticky you should clean the feeder/drinker more frequently.

## 12. TECHNICAL SPECIFICATIONS

<b>POWER SUPPLY</b> Input voltage: Frequency: Fuse: Maximum Power: Conducted Noise:	Universal 100 VAC to 240 VAC 50 /60 Hz 2 fuses 5x20mm 2A 250V Fast 18 W EN55022 /CISPR22/CISPR16 class B
<b>ENVIRONMENTAL CONDITIONS</b> Operating temperature: Operating Relative Humidity: Storage temperature:	10°C to +40°C 0% to 85% RH, non-condensing 0°C to +50°C, non-condensing
<b>PORTS INPUT/OUTPUT</b> TTL Input level:  TTL Output level:  Line power:	Low: 0.8V max High: 2V min Low: 0.5Vmax @+24mA (sink) High: 2.4 Vmin @-15 mA (source) 24V 1.7A 5V 0.1A
<b>MAIN, REMOTE CONNECTOR</b> <u>Pin</u> 2 3 5 7 9	<u>Function</u> Rxd Txd Gnd Rts Cts
<b>COMUNICATIONS OUTPUT</b> Standard Interface: Connector: Transmission speed :	RS232C Delta 9 contacts connector 19200 bauds, 8 bits, no parity
<b>PORT CONNECTOR 1 to 8 (6 pins)</b> <u>Pin</u> 1 2 3 4 5 6	<u>Function</u> GND TTL Output +5V TTL Input TTL Output +24V
<b>DIMENTIONS</b> Width x Height x Depth: Weight:	160mm x 65mm x 185mm 0.91 kg

**DECLARACIÓN DE CONFORMIDAD  
DECLARATION OF CONFORMITY  
DECLARATION DE CONFORMITÉ**

Nombre del fabricante: **Panlab s.l.u.**  
 Manufacturer's name: [www.panlab.com](http://www.panlab.com)  
 Nom du fabricant: [info@panlab.com](mailto:info@panlab.com)

Dirección del fabricante: **Energía, 112**  
 Manufacturer's address: **08940 Cornellà de Llobregat**  
 Adresse du fabricant: **Barcelona SPAIN**

Declara bajo su responsabilidad que el producto: **Modular Operant Chamber**  
 Declares under his responsibility that the product:  
 Déclare sous sa responsabilité que le produit:

Marca / Brand / Marque: **PANLAB**

Modelo / Model / Modèle: **LE 1002 – LE 1005**

Cumple los requisitos esenciales establecidos por la Unión Europea en las directivas siguientes:  
 Fulfills 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:

<b>2006/95/EC</b>	Directiva de baja tensión / Low Voltage / Basse tension
<b>2004/108/EC</b>	Directiva EMC / EMC Directive / Directive CEM
<b>2012/19/EU</b>	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)
<b>2011/65/EU</b>	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)
<b>2006/42/EC</b>	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:	<b>EN61010-1:2011</b>
EMC:	<b>EN61326-1:2012 Class B</b>
Safety of machinery:	<b>EN ISO 12100:2010</b>

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:



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

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

Cornellà de Llobregat, Spain  
 19/06/2014

**(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 Verkaufsstelle 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 específicos 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.