Hardware User’s Manual

Modular operant box

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

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Limitation of Liability

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1. SYMBOLS TABLE

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

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning about operations that must not be done because they can damage the equipment</td>
<td>![Warning symbol]</td>
</tr>
<tr>
<td>Warning about operations that must be done, otherwise the user can be exposed to a hazard.</td>
<td>![Warning symbol]</td>
</tr>
<tr>
<td>Protection terminal ground connection.</td>
<td>![Ground symbol]</td>
</tr>
<tr>
<td>Warning about a hot surface which temperature may exceed 65ºC</td>
<td>![Temperature symbol]</td>
</tr>
<tr>
<td>Warning about a metal surface that can supply electrical shock when it’s touched.</td>
<td>![Electrical shock symbol]</td>
</tr>
<tr>
<td>Decontamination of equipments prior to disposal at the end of their operative life</td>
<td>![Biohazard symbol]</td>
</tr>
<tr>
<td>Waste Electrical and Electronic Equipment Directive (WEEE)</td>
<td>![WEEE symbol]</td>
</tr>
</tbody>
</table>

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.

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.

![Fuse Replacement Diagram]

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.

3 Extract fuse holder using the screwdriver.

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

![Experimentation Cage](image)

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 7th bar).
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.](image)

- **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

- **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.

![Figure 8. Link Box 01 Rear Panel.](image-url)
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.](image)

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

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

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

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.](image)

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.](image)

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.
The Variable Acoustic Stimulus in 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.

<table>
<thead>
<tr>
<th>Nº</th>
<th>DESCRIPTION</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alternate tones 800/970 Hz at 1/4 sec.</td>
<td>11111</td>
</tr>
<tr>
<td>2</td>
<td>Sweeping 800/970 Hz at 7 Hz</td>
<td>11110</td>
</tr>
<tr>
<td>3</td>
<td>Sweeping 800/900 Hz at 1 Hz</td>
<td>11101</td>
</tr>
<tr>
<td>4</td>
<td>Continuous at 2.850 Hz</td>
<td>11100</td>
</tr>
<tr>
<td>5</td>
<td>Sweeping 2.400-2.850 Hz at 7 Hz</td>
<td>11011</td>
</tr>
<tr>
<td>6</td>
<td>Sweeping 2.400-2.850 at 1 Hz</td>
<td>11010</td>
</tr>
<tr>
<td>7</td>
<td>Slow Whoop</td>
<td>11001</td>
</tr>
<tr>
<td>8</td>
<td>Sweeping 1.200-500 Hz at 1 Hz</td>
<td>11000</td>
</tr>
<tr>
<td>9</td>
<td>Alternate tones 2.400/2.850 2 Hz</td>
<td>10111</td>
</tr>
<tr>
<td>10</td>
<td>Intermittent tone 970 Hz at 1 Hz</td>
<td>10110</td>
</tr>
<tr>
<td>11</td>
<td>Alternate tone 800/970 Hz at 1 Hz</td>
<td>10101</td>
</tr>
<tr>
<td>12</td>
<td>Intermittent tone 2.850 Hz at 1 Hz</td>
<td>10100</td>
</tr>
<tr>
<td>13</td>
<td>970 Hz at 1/4 s On / 1 s Off</td>
<td>10011</td>
</tr>
<tr>
<td>14</td>
<td>Continuous at 970 Hz</td>
<td>10010</td>
</tr>
<tr>
<td>15</td>
<td>554 Hz for 100 ms and 440 Hz for 400 ms</td>
<td>10001</td>
</tr>
<tr>
<td>16</td>
<td>Intermittent, 660 Hz, 150 ms On/150 ms Off</td>
<td>10000</td>
</tr>
<tr>
<td>17</td>
<td>Intermittent, 660 Hz for 1.8 s On/1.8 s Off</td>
<td>01111</td>
</tr>
<tr>
<td>18</td>
<td>Intermittent, 660 Hz for 6.5 s On/13 s Off</td>
<td>01110</td>
</tr>
<tr>
<td>19</td>
<td>Continuous 660 Hz</td>
<td>01101</td>
</tr>
<tr>
<td>20</td>
<td>Alternate 554/440 Hz at 1 Hz</td>
<td>01100</td>
</tr>
<tr>
<td>21</td>
<td>Intermittent, 660 Hz at 1 Hz</td>
<td>01011</td>
</tr>
<tr>
<td>22</td>
<td>Intermittent, 2.850 Hz, 150 ms On/100 ms Off</td>
<td>01010</td>
</tr>
<tr>
<td>23</td>
<td>Sweeping 800-970 Hz at 50 Hz</td>
<td>01001</td>
</tr>
<tr>
<td>24</td>
<td>Sweeping 2.400-2.850 Hz at 50 Hz</td>
<td>01000</td>
</tr>
<tr>
<td>25</td>
<td>Intermittent, 970 Hz, 500 ms On/500 ms Off</td>
<td>00111</td>
</tr>
<tr>
<td>26</td>
<td>Intermittent, 2.850 Hz, 500 ms On/500 ms Off</td>
<td>00110</td>
</tr>
<tr>
<td>27</td>
<td>Continuous at 4 kHz</td>
<td>00101</td>
</tr>
<tr>
<td>28</td>
<td>Alternate tones 800/970 at 2 Hz</td>
<td>00100</td>
</tr>
</tbody>
</table>
8.7. ADJUSTABLE ACOUSTIC STIMULUS BY SOFTWARE LE100X-41

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 16. Adjustable Acoustic Stimulus by Software.

Figure 17. Volume vs. Frequency, parameter (sound units).
8.8. WHITE NOISE GENERATOR LE100X-43

**TYPE:** Output

**FUNCTION:** Stimulus

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

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

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

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

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

![Activity Wheel Diagram]

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

![Chain Response Diagram]

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

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 μA).

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

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:** 0ºC to +50ºC
- **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

![Intracranial stimulator](image)

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 200μA 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.

![Equipment Connection Diagram]

Figure 36. Example of equipment connection.

The following module configuration is used in this example:
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:

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

*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 1st 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.](image)

- 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.
<table>
<thead>
<tr>
<th></th>
<th>FROM</th>
<th>TO</th>
<th>CABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Link Box MAIN</td>
<td>PC Com Port</td>
<td>RS-232</td>
</tr>
<tr>
<td>2</td>
<td>LE100-26 Shock</td>
<td>Grid</td>
<td>DB9 to DIN6</td>
</tr>
<tr>
<td>3</td>
<td>Link Box Port n¹</td>
<td>LE100-26 External Time</td>
<td>Telephonic to green banana 2mm</td>
</tr>
<tr>
<td>3</td>
<td>Link Box Port n²</td>
<td>LE100-26 GND</td>
<td>Telephonic to black banana 2mm</td>
</tr>
<tr>
<td>4</td>
<td>Link Box Port m²</td>
<td>Lick meter box</td>
<td>Wires</td>
</tr>
<tr>
<td>5</td>
<td>Lick meter box</td>
<td>Bottle</td>
<td>Red banana 2mm</td>
</tr>
<tr>
<td>6</td>
<td>Lick meter box</td>
<td>DB9 coupling connector</td>
<td>Black banana 2mm</td>
</tr>
</tbody>
</table>

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

¹ The number of port will be determined by the configuration of the file “jaulas.box”.
² The number of port will be determined by the configuration of the file “jaulas.box”.

---

*Modular operant box*  
*PB-MF-MAN-018-REV1.0*
## 10. TROUBLESHOOTING

This table features instructions to solve the most frequent problems.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The equipment does not start up.</td>
<td>• Check the condition of the fuses.</td>
</tr>
<tr>
<td></td>
<td>• Check that the serial port to which you have connected the <strong>Link Box 01</strong> is the same that the one selected in the program <strong>Packwin</strong>.</td>
</tr>
<tr>
<td></td>
<td>• If you work with several cages check the connections MAIN-REMOTE (see Figure 37).</td>
</tr>
<tr>
<td></td>
<td>• Check the ID number of the <strong>Link Box 01</strong> is the same that the one of the cage selected in the program <strong>Packwin</strong>.</td>
</tr>
<tr>
<td></td>
<td>• If you work with several cages verify that no two ID numbers are repeated, since the program <strong>Packwin</strong> would be unable to identify cages properly.</td>
</tr>
<tr>
<td></td>
<td>• The valid ID numbers range is from 00 to 39, if you select a number outside this range the cage will not work correctly.</td>
</tr>
<tr>
<td>None module does not work</td>
<td>• Be sure to connect each module in the port that match according to the configuration file <strong>jaulas.box</strong>. If you plug a module into a port that does not match, it will not work.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td>A module fails</td>
<td>• If a module does not work and you want to check if the fault is in the port of the <strong>Link Box 01</strong>, you can change the module of port if it is a module of the same type as that defined by the file <strong>jaulas.box</strong> 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.</td>
</tr>
</tbody>
</table>
## 11. PREVENTIVE MAINTENANCE

<table>
<thead>
<tr>
<th></th>
<th>EXPERIMENT</th>
<th>MONTHLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAY CLEANING</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>GRID CLEANING&lt;sup&gt;3&lt;/sup&gt;</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>FOOD DISPENSER CLEANING&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>DRINK DISPENSER CLEANING&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

<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

<table>
<thead>
<tr>
<th>Power Supply</th>
</tr>
</thead>
</table>
| **Input voltage:** | Universal 100 VAC to 240 VAC  
| **Frequency:** | 50 / 60 Hz  
| **Fuse:** | 2 fuses 5x20mm 2A 250V Fast  
| **Maximum Power:** | 18 W  
| **Conducted Noise:** | EN55022 /CISPR22/CISPR16 class B  

<table>
<thead>
<tr>
<th>Environmental Conditions</th>
</tr>
</thead>
</table>
| **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  

<table>
<thead>
<tr>
<th>Ports Input/Output</th>
</tr>
</thead>
</table>
| **TTL Input level:** | Low: 0.8V max  
| **TTL Output level:** | High: 2V min  
| **Line power:** | Low: 0.5Vmax @ +24mA (sink)  
| **TTL Output level:** | High: 2.4 Vmin @ -15 mA (source)  
| **24V:** | 1.7A  
| **5V:** | 0.1A  

<table>
<thead>
<tr>
<th>Main, Remote Connector</th>
</tr>
</thead>
</table>
| **Pin:** | Function  
| 2 | Rxd  
| 3 | Txd  
| 5 | Gnd  
| 7 | Rts  
| 9 | Cts  

<table>
<thead>
<tr>
<th>Communications Output</th>
</tr>
</thead>
</table>
| **Standard Interface:** | RS232C  
| **Connector:** | Delta 9 contacts connector  
| **Transmission speed:** | 19200 bauds, 8 bits, no parity  

<table>
<thead>
<tr>
<th>Port Connector 1 to 8 (6 pins)</th>
</tr>
</thead>
</table>
| **Pin:** | Function  
| 1 | GND  
| 2 | TTL Output  
| 3 | +5V  
| 4 | TTL Input  
| 5 | TTL Output  
| 6 | +24V  

<table>
<thead>
<tr>
<th>Dimensions</th>
</tr>
</thead>
</table>
| **Width x Height x Depth:** | 160mm x 65mm x 185mm  
| **Weight:** | 0.91 kg  

---

*PB-MF-MAN-018-REV1.0 Modular operant box*
## DECLARACIÓN DE CONFORMIDAD

| Nombre del fabricante: | Panlab s.l.u. |
| Manufacturer’s name: | [www.panlab.com](http://www.panlab.com) |
| Nom du fabricant: | info@panlab.com |
| Dirección del fabricante: | Energía, 112 |
| Manufacturer’s address: | 08940 Cornellà de Llobregat |
| Adresse du fabricant: | Barcelona SPAIN |

De declara bajo su responsabilidad que el producto:

| Marca / Brand / Marque: | PANLAB |
| Modelo / Model / Modèle: | LE 1002 – LE 1005 |

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:

| Directiva de baja tensión / Low Voltage / Basse tension | Directiva EMC / EMC Directive / Directive CEM |
| 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) | 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) |
| 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:

| Seguridad / Safety / Sécurité: | EN61010-1:2011 |
| EMC: | EN61326-1:2012 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 representación del fabricante:

Manufacturer’s representative:

En représentation du fabricant:

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

Cornellà de Llobregat, Spain
19/06/2014
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 instructions 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.

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 quedarán 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 y a otras formas de reciclaje de aparatos usados, usted contribuirá de forma importante a la protección de nuestro medio ambiente.

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.

Hinweis zum Umweltschutz:

Ab dem Zeitpunkt der Umsetzung der europäischen Richtlinie 2002/96/EU in nationales Recht gilt folgendes:


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 collaterali 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 riconoscere e re-utilizzo del materiale o altre forme di utilizzo di dispositivi obsoleti, voi renderete un importante contributo alla protezione dell’ambiente.

Nota em Protecção Ambiental:

Após a implementação da directiva comunitária 2002/96/EU no sistema legal nacional, o seguinte aplica-se:

Todos os aparelhos elétricos e electrónicos não podem ser deppositos juntamente com o lixo doméstico. Consumidores estão obrigados por lei a colocar os aparelhos elétricos 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 proteção do ambiente.