

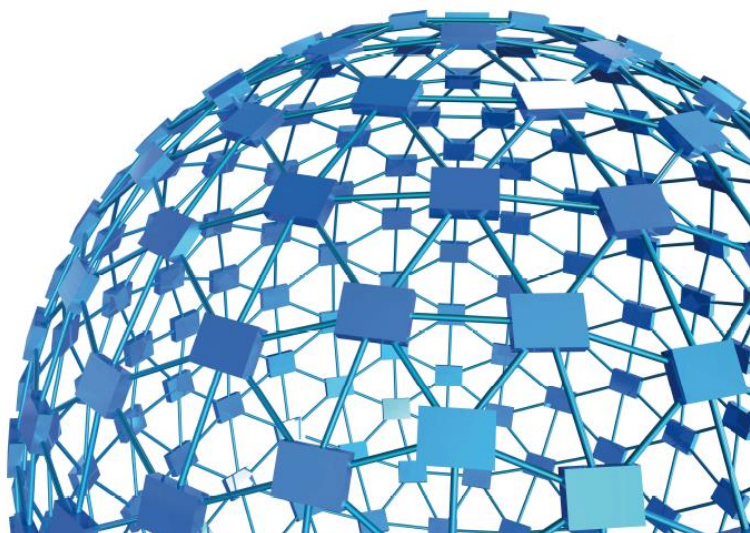


ugo basile®

TRANSFORMING IDEAS
INTO INSTRUMENTS

instruction manual

Rodent Treadmill NG
Cat. No. 47300



UGO BASILE S.R.L.

sales@ugobasile.com / service@ugobasile.com www.ugobasile.com

UGO BASILE S.R.L.

Via Di Vittorio, 2
21036 GEMONIO, VA, ITALY
Phone: +39 0332 744574

sales@ugobasile.com / service@ugobasile.com
www.ugobasile.com

instruction manual

**Rodent Treadmill NG
Cat. No. 47300**

Serial No.

SAFETY CONSIDERATIONS

ALTHOUGH THIS INSTRUMENT HAS BEEN DESIGNED WITH INTERNATIONAL SAFETY STANDARD, THIS MANUAL CONTAINS INFORMATION, CAUTIONS AND WARNINGS WHICH MUST BE FOLLOWED TO ENSURE SAFE OPERATION AND TO RETAIN THE INSTRUMENT IN SAFE CONDITIONS.

SERVICE AND ADJUSTMENTS SHOULD BE CARRIED OUT BY QUALIFIED PERSONNEL, AUTHORIZED BY UGO BASILE ORGANIZATION.

ANY ADJUSTMENT, MAINTENANCE AND REPAIR OF THE OPENED INSTRUMENT UNDER VOLTAGE SHOULD BE AVOIDED AS MUCH AS POSSIBLE AND, WHEN INEVITABLE, SHOULD BE CARRIED OUT BY A SKILLED PERSON WHO IS AWARE OF THE HAZARD INVOLVED.

CAPACITORS INSIDE THE INSTRUMENT MAY STILL BE CHARGED EVEN IF THE INSTRUMENT HAS BEEN DISCONNECTED FROM ITS SOURCE OF SUPPLY.

Rodent Treadmill

Cat. No. 47302 for Rats
Cat. No. 47303 for Mice



General

"Exercise is a multifactorial activity that affects virtually every organ and tissue in the body. Not only does exercise contribute many health benefits, but lack of exercise is implicated in many chronic health problems."

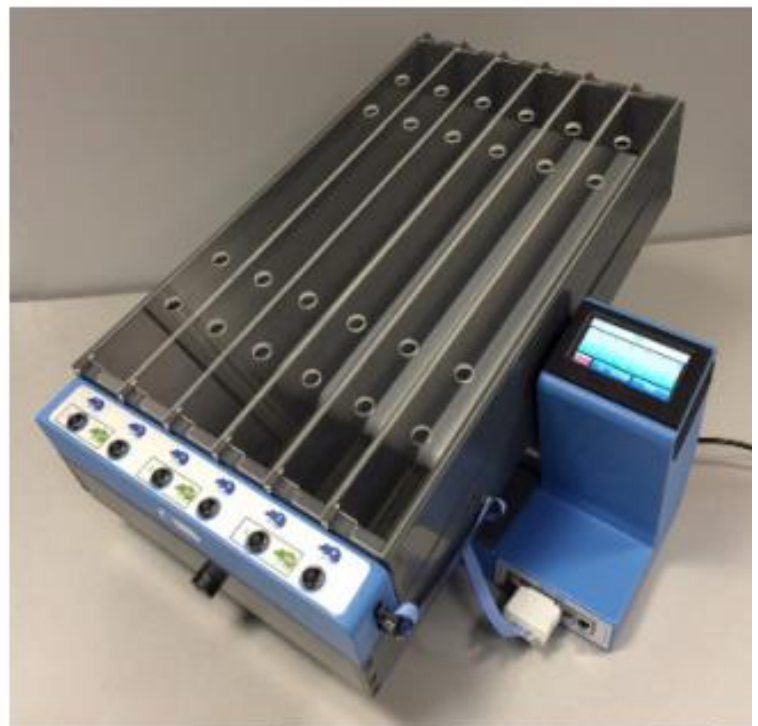
"As evidence continues to accumulate concerning the impressive range of health benefits that exercise confers, biomedical researchers have increasingly become interested in conducting systematic studies of exercise to further define those benefits"

(from Resource Book for the Design of Animal Exercise Protocols, APS, Feb 2006)

Ugo Basile introduces an original TREADMILL for rats and mice. The same device is suitable for tests on either rats or mice, by simply replacing the lane assembly.

Our model incorporates a shock grid at the back of the treadmill to deliver a mild electric shock, when an aversive stimulus is required.

The running-lane assembly can be manually tilted from -25° to +25°.



- MEASURES ENDURANCE , DISTANCE, SPEED
- SAME DEVICE TO TEST RATS & MICE
- COMPACT AND USER-FRIENDLY:
test settings & monitoring controlled by the attached electronics and managed on the touch-screen.



Main Features

- **SPEED:** from 3 to 100m/min, in steps of 1m/min
- **MODES:** constant, accelerating, custom ramps
- **SLOPE:** positive (uphill) or negative (downhill), from -25 to +25°
- **SHOCK:** from 0 to 2mA (in 0.1mA steps), included
- **CONTROLS:** 4"3 touch-screen to set and monitor the test
- **X-PAD SOFTWARE:** brand new, user-friendly version, to set the experiment and manage the results
- **DETECTION:** via incorporated electronic circuit automatically detects speed & absolute and relative distances



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CHECK-LIST

- 47302 Rat Treadmill**
 47303 Mouse Treadmill
 47300 Combo Package Rat&Mouse

CLIENTE / CUSTOMER _____

Ordine No. / Order No. _____ Data / Date ____ / ____ / ____

UB code	CAT.No.	47302	47303	47300	DESCRIPTION	DESCRIZIONE	✓	
	47301	1	1	1	MAIN UNIT: TAPIS –ROULANT	UNITÀ BASE TAPIS-ROULANT		
	47300-002	1		1	RAT LANE ASSEMBLY WITH TRANSPARENT LID	ASSIEME CORSIE RATTO CON COPERCHIO		
	47300-003		1	1	MOUSE LANE ASSEMBLY WITH TRANSPARENT LID	ASSIEME CORSIE TOPO CON COPERCHIO		
E-WP 008		1	1	1	MAINS CABLE	EUROPE	CAVO RETE	EUROPA
E-WP 008-1						U.S.A.		U.S.A.
E-FT 021		1	1	1	SET OF 2 FUSES (T5A 5X20)	SET DI 2 FUSIBILI (T5A 5X20)		
E-AU 041 USB pen-drive	47300-302				MANUAL	MANUALE		
	X-PAD				SOFTWARE	SOFTWARE		
OPTIONAL								
	47300-013				6-LANE ASSEMBLY, WITHOUT LID, FOR TETHERED MICE)	ASSIEME 6 CORSIE PER TOPI CABLATI, SENZA COPERCHIO		

DATE / /	Serial No.	IMBALLATO DA / PACKED BY	
Set for			
<input type="checkbox"/> 115V 50 Hz	<input type="checkbox"/> 230V 50 Hz	<input type="checkbox"/> 115V 60 Hz	<input type="checkbox"/> 230V 60 Hz

IMPORTANT/IMPORTANTE:

Check the shipment for completeness immediately after receipt: should you find any discrepancy, please fill in the following part and transmit it to our fax no. **+39 0332 745488**

Al ricevimento della merce controllate che la spedizione sia completa: in caso di discrepanza, completate il formulario di seguito riportato ed **inviatelo** al nostro fax no. **0332 745488**

FROM: Name	Company/Institution
DATE	REF.

NOTE

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Rodent Treadmill NG

Cat. 47300

1 GENERAL

“Exercise is a multifactorial activity that affects virtually every organ and tissue in the body. Not only does exercise contribute many health benefits, but lack of exercise is implicated in many chronic health problems.

As evidence continues to accumulate concerning the impressive range of health benefits that exercise confers, biomedical researchers have increasingly become interested in conducting systematic studies of exercise to further define those benefits”.¹

Fatigue is a common and frequently poorly-understood symptom in many diseases and disorders. New preclinical assays of fatigue may help to improve current understanding of fatigue-like behavior in rodents and many other exercise paradigms and study future treatment of fatigue.

Ugo Basile introduces an original TREADMILL for rodents: the same device is suitable for tests on either rats or mice, by simply replacing the lane assembly.

The 47300 Treadmill is a compact and user-friendly device: test settings & monitoring are managed by the attached control unit. It measures endurance, distance (absolute and relative) and speed.

1.1 Principle of Operation

Treadmills are rolling belts (tapis-roulants) with presettable speed and adjustable uphill and downhill inclination (slope), enabling forced exercise training and accurate testing of fatigue in lab animals.

“Treadmill running has been used extensively over the past decades to study behavioral, physiological, biochemical, and, more recently, molecular responses to both acute exercise stress and chronic exercise training. Although investigators have used a wide variety of species (...) for treadmill running studies, they have used rodents in most of these studies.

Treadmill running has the distinct advantage over other forms of exercise, including spontaneous wheel running and swimming, that the total amount of external work done by the rat can be easily calculated”¹

¹ from Resource Book for the Design of Animal Exercise Protocols, APS, Feb 2006

2 INSTRUMENT DESCRIPTION

Our Treadmill consists of a main unit, incorporating the drive, the shocker, the running belt and the control unit with 4"3 touch-screen.

The assembly also incorporates a shock grid, positioned at the bottom of the ramp, made of 3mm bars, spaced 8mm apart.

Two different lane assemblies are available, to provide the ideal running tracks for either rats or mice: replacing the lane assembly is extremely easy.

The whole hardware, except the lane assembly, is the same for both rats and mice: animal selection is quickly done when switching on the device, see paragraph 5.1-Animal Selection.

The running surface can be manually tilted from -25° to +25°.



Figure 1 "Mouse Lane-Assembly"

The device features an auto-cleaning tool, see paragraph 5.9.5, and a pan to collect droppings, see paragraph 6.3.4.

Our treadmills are designed for optimal performance under conditions of intensive use.

2.1 Running Belt

Rodents running on the treadmill must be able to maintain good traction while walking or running, to prevent slipping. The running surface of the 47300 consists of an easy-to-clean alimentary-grade white belt, providing suitable grip.

The walking surface is not porous and is soft enough to eliminate toenail and foot problems that may arise from daily bouts of exercise training.

This specially selected material make the treadmills easy to clean and disinfect and require minimal maintenance, see paragraphs 6.2-Cleaning.

2.2 Rat Lane-Assembly

The rat assembly, a structure which is quickly and easily fitted to the main unit, consists of 15cm high external walls and inside partitions, to divide the running belt into 3 lanes, each 45x11cm. Each lane is provided with a transparent lid.

Removing and replacing the lane assembly is an easy job: see paragraph 6.3.1.

2.3 Mouse Lane-Assembly

The Mouse assembly, similar to the rat device, has different dimensions: walls and partitions are 7cm high, and the running belt is divided into 6 lanes, each 45x5.5cm. Each lane is provided with a transparent lid.

A special lane assembly for tethered mice (47300-013) is also available: each lane 45x5.5, height 15cm, without lid, see paragraph 8.1.

2.4 Shocker Circuit and Shock Grid

“Treadmill running may be construed as a form of forced exercise in which the animal does not have a choice of participating in the activity. Because of this, noxious stimuli (e.g., electric shock and bursts of high-pressure air) may be needed to motivate the animals to exercise”¹

Our model incorporates as standard a shocker to deliver a mild electric shock, when an aversive stimulus is required, via deliver the shock grid positioned at the bottom of the walking slope.

The shock circuit is incorporated in the main unit. Shock intensity and frequency can be preset via the attached controller module (from 0 to 2mA, 1, 2 or 3Hz), as well as the cut-off number of shocks. **The setting is common to all lanes.**

The grid attached at the bottom of the running belt delivers the foot-shock and also functions as detection circuit.

The assembly incorporating the grid, its circuit, and the array of START buttons can be easily removed for cleaning: see paragraph 6.3.4.

The same grid also functions as detection system: the controller detects absolute and relative distances, which are recorded together with speed.

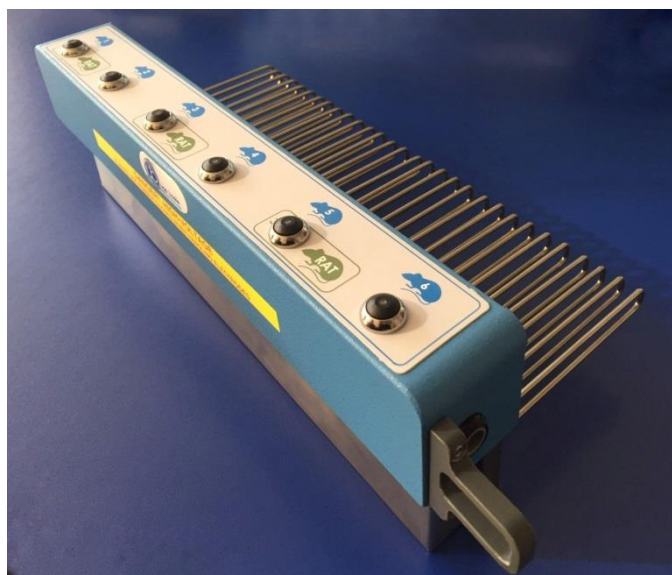


Figure 2 “Grid Assembly”

2.5 Controller with Touch-Screen

The controller is part of the main unit, attached to the tapis-roulant.

It incorporates a 4”3 touch-screen, for basic setting and monitoring, via an intuitive panel.

The picture shows the main menu.

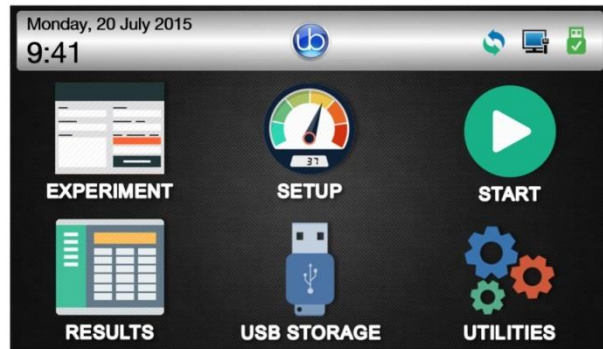
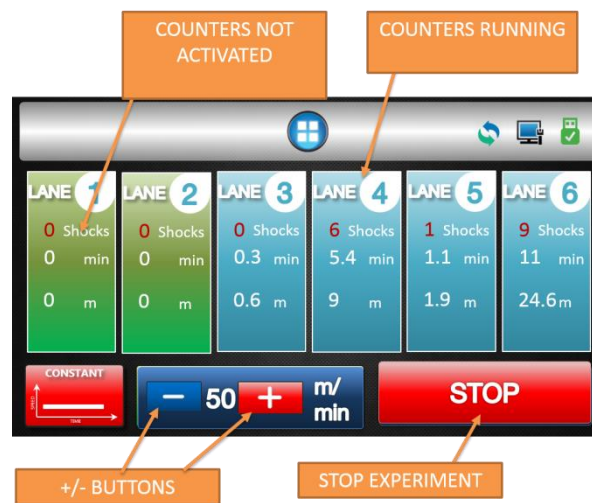


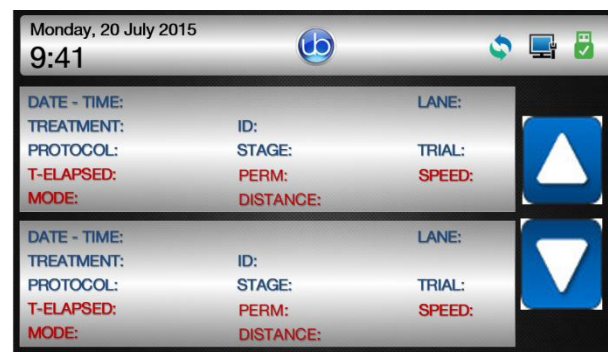
Figure 3 “Main Menu”

During the test, the touch-screen indicates the number of shocks received, the elapsed time, and the walked distance.

When the test is started the lane background colour, which is normally green, becomes light blue.



The test results for each section, can be browsed in a condensed view.



The brand new **X-PAD** software, included as standard, provides a user-friendly interface to set the experiment and a powerful tool to manage the results easily on one’s PC. Data exchange from the instrument to the PC is done via the USB flash drive provided.

See also paragraphs 2.6-Experimental Configuration and 2.7-Data Collection and Management.

2.5.1 Notes on Resistive Touch-Screens

If you have in mind the sensitivity to touch of your tablet or smart-phone, you might think the controller touch screen does not react promptly, and you have to press down harder.

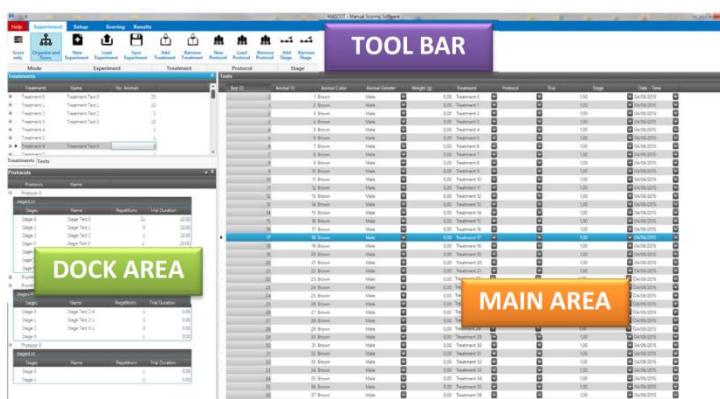
This is because we employ a resistive touch-screen (while most smart phones use a capacitive screen); the resistive screens are better for our application because of

- High resistance to dust and water
- Better use with gloved hand or stylus (because the conductive technology is dependent on the conductive nature of human body, it doesn't work if the user is wearing gloves).

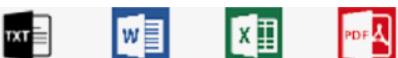

2.6 Experimental Configuration

Via the new **X-PAD** software, the operator can easily organize the experiment on her/his PC, and upload it to the Treadmill via the USB flash drive provided.

Treatments, protocols, stages, animals, and various test features (speed, mode, revolution, etc.) can be quickly defined and saved for future use.



Configurations are easily:

- exported to **Text, Excel** or **Pdf** reports 
- saved to cloud to **DropBox, OneDrive, GoogleDrive** 

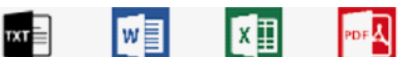
2.7 Data Collection and Management

A basic version of the collected data can be viewed on the touch-screen; when transferred to PC via USB drive, test results appear in full version.

The software automatically classifies the data, combining configuration settings with test results. The user can add information, before or after the test.

Results appear in a tree-like structure, where columns can be dragged and dropped to customize the layout.

Data are quickly:

- exported to **Text, Excel** or **Pdf** reports 
- saved to cloud to **DropBox, OneDrive, GoogleDrive** 

2.8 Treadmill Features

The main features of the new model are:

- **SPEED**: adjustable in the range 3-100m/min, in steps of 1 m/min

- **MODE:** constant, ramp (accelerating), multi-step ramp
- **SHOCK:** 0 to 2mA, 1, 2 or 3Hz
- **SLOPE:** uphill or downhill, manual tilting, from -25° to +25°, in steps of 5°
- **CONTROLS:** 4"3 touch-screen to set and monitor the test
- **SOFTWARE:** **X-PAD** brand new, user-friendly version, to set the experiment and manage the results
- **DETECTION:** via grid at the bottom of the running belt

3 INSTALLATION

3.1 Unpacking & Preliminary Check

Check the contents of the shipment for completeness, packing list to hand, and visually inspect the instrument as soon you take it out of the packaging. Use the supplied **Check List**.

If the instrument is damaged, inform the carrier immediately, notifying our company. If after having tested it, the instrument fails to meet rated performances, please contact our after sales service, see paragraph 6.6-Customer Support.



The 47300 is shipped in a dedicated wooden crate: we suggest to store the crate and the dedicated packaging material for stocking and possible future shipment.



Protect the environment!

If necessary, dispose of packaging properly, according to existing and applicable waste management rules and regulations.

3.2 Notes on the Instruction Manual

The Instruction Manual included in the package (on the USB pen drive) is necessary for the correct installation and operation of the instrument.

We recommend reading the manual with attention, as it is essential for the correct installation and operation of the instrument.

Please save the manual, ready to be consulted by the qualified personnel who use the instrument. Print it, only if necessary.

Our Instruction Manuals are available as free download on our web. For any additional information and/or assistance, you are welcome to contact our Service Department (see paragraph 6.6-Customer Support), specifying the serial number of your instrument.

3.3 General Safety Instructions

The following guidelines must be followed to ensure safe operation.

- ! **DO NOT** attempt to open or perform any service work
- ! **DO NOT** connect up human subjects



3.4 Assembling the Instrument

The Treadmill is shipped assembled: position it on a stable, sturdy, and reasonably flat bench or table surface. It is a heavy device: please remember this when lifting it!

3.5 Before Applying Power

Consider the Power Module (see figure 3), positioned left on the back panel, which encompasses – from left to right - the mains switch, the inlet connection of the mains cord, and the fuse holder/voltage selector.



Figure 4, "Power Module"

3.5.1 Mains Switch

This two-pole toggle switch, which complies with international safety standards, is lighted when the instrument is **ON**.

3.5.2 Fuse Holder

The fuse holder comprises two fuses, one on the live, and the other on the neutral. Use (T5A) timed fuses for operation at both 115 or 230 Volts.

For fuse replacement, please refer to paragraph 6.1-Electrical.

3.5.3 Mains Cord

It is a standard cable, Cat. # E-WP008. Make sure your power outtake is provided with a reliable ground connection.

3.6 Intended Use

The Treadmill is intended for investigation use on laboratory animals only.

3.7 Additional Safety Consideration

- 1) Use original accessories and spare parts only, see also paragraph 8-ORDERING INFORMATION.

- 2) immediately disconnect and replace damaged mains cord.
- 3) do not obstruct a comfortable access to the power module.
- 4) do not operate in hazardous environments or outside prescribed environmental limitations (i.e. +10c° / +40c°, 95% max. relative humidity, non-condensing), see also paragraph 7-47300 SPECIFICATIONS.
- 5) do not spray any liquid on the connectors and on the geared motor.

UGO BASILE DOES NOT ACCEPT ANY RESPONSIBILITY FOR PROBLEMS OR HARM CAUSED TO THINGS OR PERSONS, ARISING FROM:

- incorrect electrical supply;
- incorrect installation procedure;
- incorrect or improper use or, in any case, not in accordance with the purpose for which the instrument has been designed and the warnings stated in the instruction manual supplied with the instrument;
- replacement of original components, accessories or parts with others not approved by the manufacturer;
- servicing carried out by unauthorized personnel.

3.8 Connections

Connect the mains cord to a power outlet, **provided with a reliable earth connection.**

The connection module, located on the front panel encompasses the following connectors, from left to right:

- The upper and lower **USB ports** enable data exchange by plugging in a USB pen drive to upload experiment data from the XPad software or to save and transfer experiment data from the device as .csv file.
- **I/O** this D-SUB 1 5 connector provides TTL outputs for latency and temperature, see paragraph **5.10.1**
- **COM** this USB-B 2.0 allows communication to the PC (for Ugo Basile use, programming and debug)
- **ETH** the Ethernet connector will be used for remote diagnosis and Internet access used for standard operation.

3.8.1 Hard Disk

The device hard disk is now embedded in the inside electronics and does not require an external USB anymore (unlikely previous instrument versions)

3.9 Installation of X-PAD Software

The **X-PAD** software is saved on the USB Flash Drive provided with the instrument: download it on the Hard Disk of your PC.

4 PRELIMINARY

4.1 Placing the Animal on the Running Surface

We recommend that **the belt is set in motion before placing the mice in position**, or by the time the last mouse is in place, the first may well be facing the wrong direction.

In constant speed mode, start the motion at the selected speed and then place the mice/rats, one by one, in their respective lanes, at the same time starting the related counters to zero, by the corresponding button.

Experience and patience will teach the ideal technique: as in most behavioural devices, the man/animal interface is not less important than the animal/machine one, and requires some patience and gentle handling to be perfected.

Speaking about animal/machine interface, rodents running on the treadmill must be able to maintain good traction while walking or running, to prevent slipping. The running surface of the 47300 consists of an easy-to-clean alimentary-grade white belt, providing suitable grip; the walking surface is not porous and is soft enough to eliminate toenail and foot problems that may arise from daily bouts of exercise training.

This specially selected material make the treadmills easy to clean and disinfect, and require minimal maintenance, see also paragraph 6.2. This type of belts usually wear well, with minimal breakage, and rarely need to be replaced during the lifetime of the treadmill.

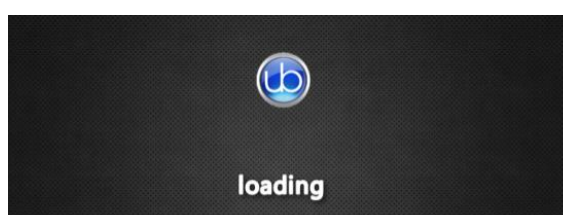
4.2 Acclimation

The Treadmill is basically an exercise machine, which does not require the animal to learn a specific task. A proper training phase is therefore not required.

However, it advisable to carry out an acclimation period with low and constant speed, in order for the naïve mouse to familiarize with the running belt: each mouse is placed into its section for a short period, before starting the actual test.

5 OPERATION

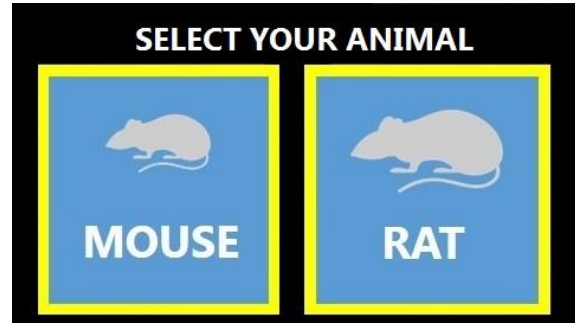
Switch on the Treadmill: the instrument performs a CPU check, which might take up to 60 seconds, during which the display will show:



5.1 Animal Selection

When the Treadmill is switched on, the first page that shows up is the one requiring the selection of the animals on test.

Since the whole hardware, except the lane assembly, is the same for both rats and mice, it's important to specify which animals the device is going to deal with.




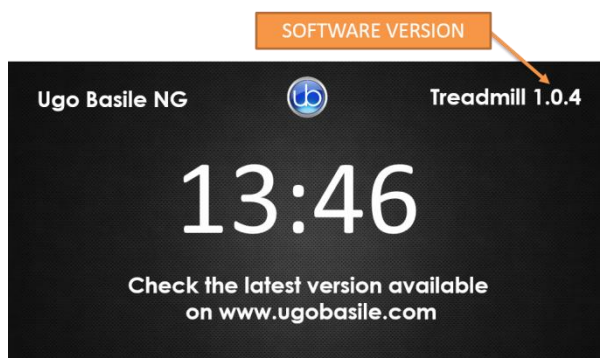
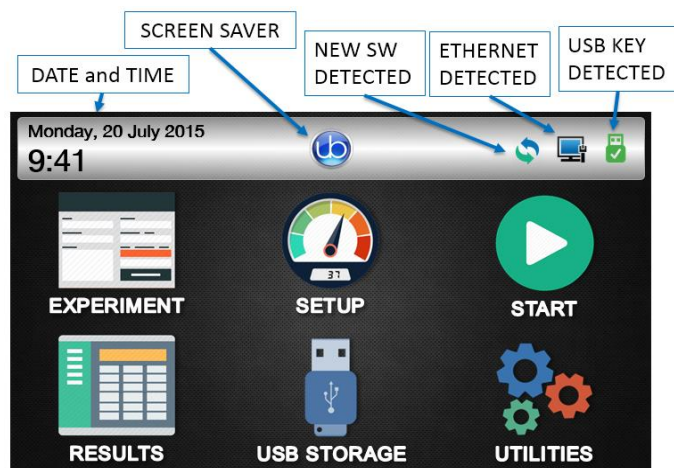
After the selection, it will not be possible to go back to this page unless the Treadmill is switched off and then on again.

5.2 Home Page


The test is managed by the 4"3 touch-screen.

This is how the Home Page looks like.

 From the Home Page, the logo button on the tool-bar, opens the "screen-saver" window



This window displays current date and time, and the version of the software on-board.

From any other menu, the logo button  always brings back to the Home page.

5.2.1 System Icons



NEW SOFTWARE DETECTED: if this icon is present, a new version of SW has been detected on the USB Key.



ETHERNET DETECTED: an Ethernet connection has been detected



USB KEY DETECTED: if this icon is present, a USB has been detected on the

USB port.

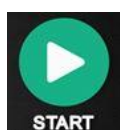
5.2.2 Home Page Icons



In the **EXPERIMENT** page, it is possible to enter information about the test, including treatment, protocol, stage, trial, see paragraph 5.3.



Speed and Mode are defined from the **SET-UP** page, see paragraph 5.4



goes to **START** Page, see paragraph 5.5



goes to **RESULTS** Page, see paragraph 5.6



goes to **USB STORAGE** Page, see paragraph 5.8



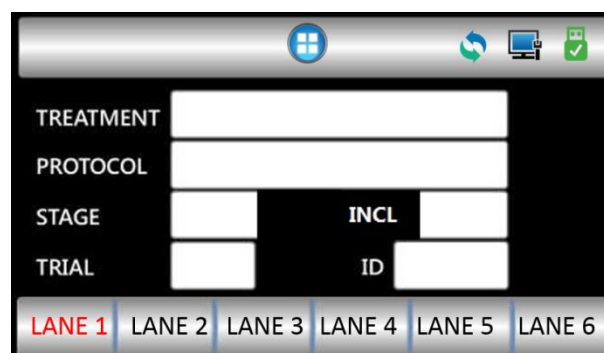
goes to **UTILITIES** Page, see paragraph 5.9

5.3 Experiment

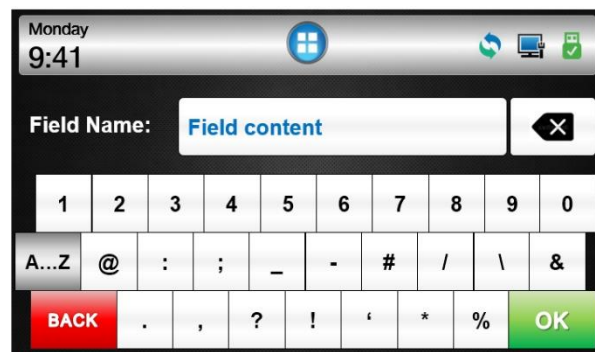
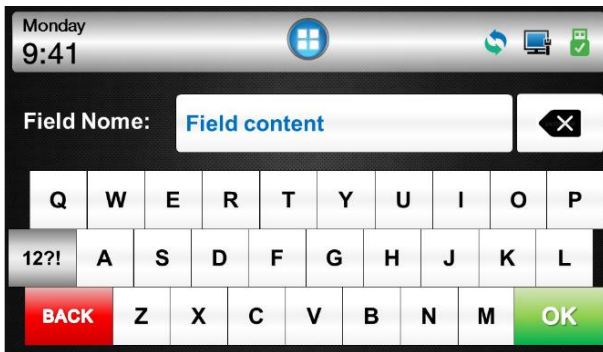
Entering this section the user will find two different layouts depending on the animals that have been previously selected:

- 6 distinct tabs for the mice
- 3 tabs for the rats

In this phase the user can fill manually the experiment tags lane by lane (**Treatment, Protocol, Stage, Inclination, Trial, ID**).



TREATMENT					
PROTOCOL					
STAGE			INCL		
TRIAL			ID		
LANE 1	LANE 2	LANE 3	LANE 4	LANE 5	LANE 6



Enter a maximum of 12 characters in each field. TREATMENT, PROTOCOL, STAGE, INCLINATION and TRIAL are text boxes, where it's possible to enter an information.

All the information boxes are independent for each lane: select another lane and enter the related data. Repeat the same process for each lane.

In the RESULT table the entered information will be matched with the test results. Of course, the user may choose not to enter any information and leave the fields empty.



The Home Page icon brings back to the home page.




NOTE:

Whenever data are entered on the virtual keyboard, it is possible to use an external QWERTY keyboard instead, connected to the device's upper USB port, see also paragraph **Errore. L'origine riferimento non è stata trovata.**

5.4 Set-Up

The parameters that characterize an experiment are set in this page: **Settings**, **Speed** (including **Mode**) and **Shock**.



Having selected the Speed and mode, press  to go back to the Home page.

5.4.1 Settings

The user chooses the thresholds cut-off which lead to the end of a test, if the animal does not end it earlier.

In other words, the test is concluded when one of the following parameters is reached within a single trial:

- The **number of shocks** an animal can receive
- The **maximum distance** run
- The **maximum time** elapsed

Each value can be preset from 0 to 999.




5.4.2 Speed

In the second section, the selection among the speed mode and the appropriate set point(s) has to be done. The user may choose among the **CONSTANT**, **RAMP**, **CUSTOM RAMP**, modes, by depressing the related button at the page bottom.

5.4.3 Constant Speed

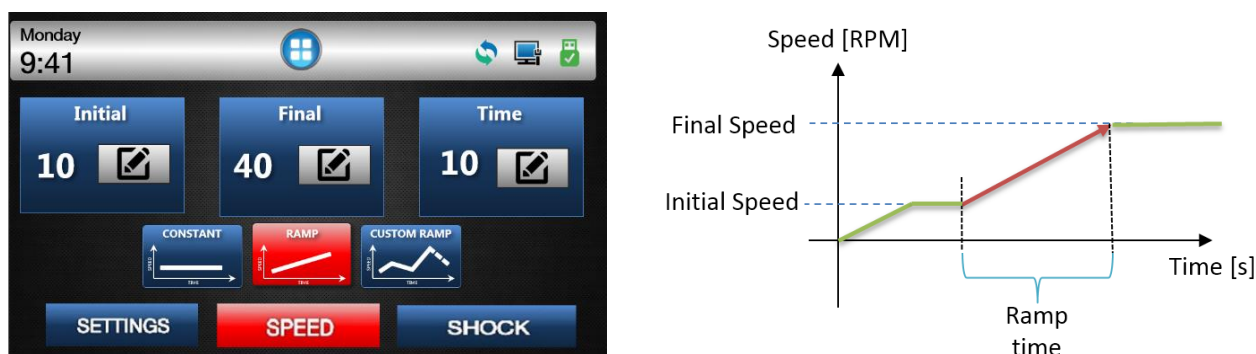
With **Constant Speed** mode, the belt rotates CCW at a speed which remains constant, for the duration of the test.



Depress the icon  to activate the numeric keyboard, and enter a speed between **3 and 100 m/min**. Confirm by **“OK”**.

5.4.4 Accelerated/Decelerated Speed

This mode allows testing the subjects with an **increasing/decreasing** speed. It is necessary to set the initial and final speed, and the ramp (the time the rotor takes to go from the initial to the final speed).



Depress the icon  to activate the numeric keyboard to enter:

- **Initial speed:** between **3** and **100 m/min**
- **final speed:** between **3** and **100 m/min**
- *if the initial speed is lower than the final speed, the speed will be accelerating: on the contrary a decelerated speed is obtained by setting an initial speed higher than the final one)*
- **ramp:** from 1s to 999s (acceleration limits: maximum 100m/min)

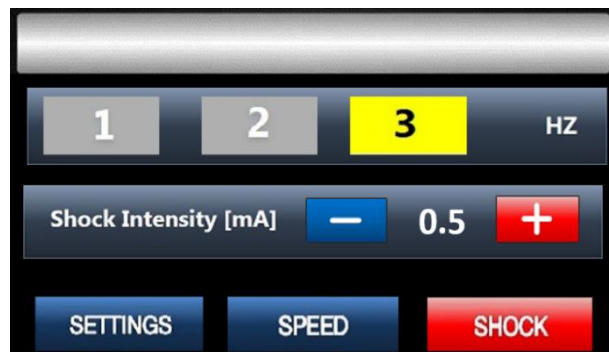
5.4.5 Custom Ramp

This feature is not controlled on the touch-screen, and is to be set on the PC. The related button is not active. For instruction, please refer to the X-PAD manual.

5.4.6 Shock

The last section defines the shock stimulus which will be delivered during the trial, setting both the frequency (1/2/3Hz) and the intensity (0-2.0 mA).

The frequency will determine the number of shocks per second the animal will receive, 1, 2 or 3 shocks per second.



IMPORTANT:

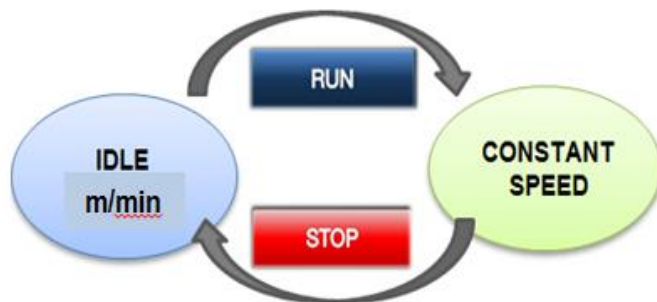
The different shock frequency will also impact the capability to detect short-distance shock events, see parag. 5.7-Important Note On Shock Frequency.

5.5 Start Button

5.5.1 Starting at Constant Speed

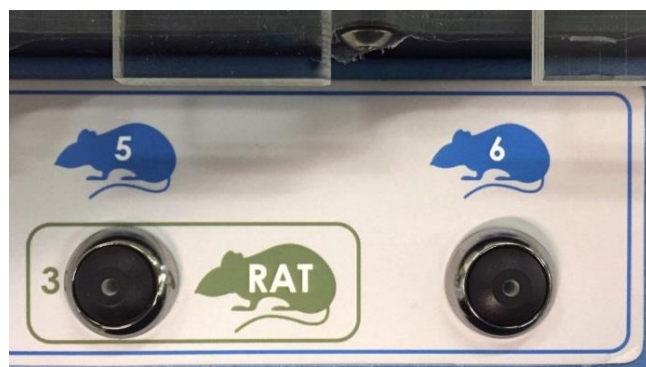
In the constant speed mode, during **IDLE** state, the motor and the counters are disabled.

Pressing the **START** button, activates the motor. The motor stops and the counters are disabled by pressing the **STOP** button.



As the walking surface is a single belt (not separate for each lane), when the motor is started all the lanes will be moving at the same time, at the same speed.

After positioning the animal on the related lane, the test proper is started by pushing the related **START** button/s (1 to 6 for mice, 1, 3 and 5 for rats), which start **the counters for each individual lane**.



The test proceeds until one of the conditions entered in **SETTING** is met (number of shocks, distance, time, see paragraph 5.4.1), or if the animal rests on the activated electrified grid for more than 10 seconds.

The data are saved and will appear in the **RESULT** table.

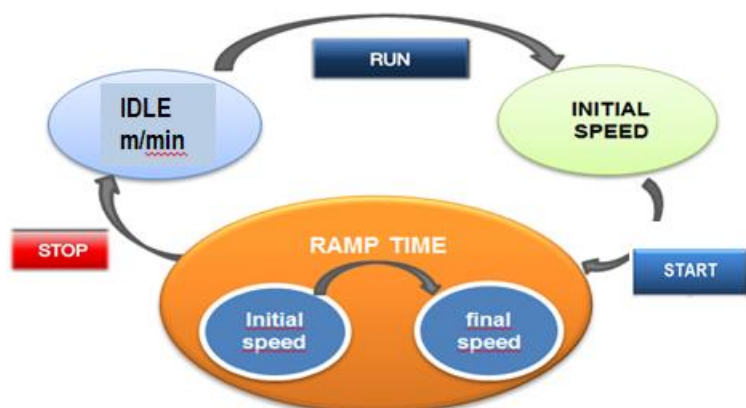
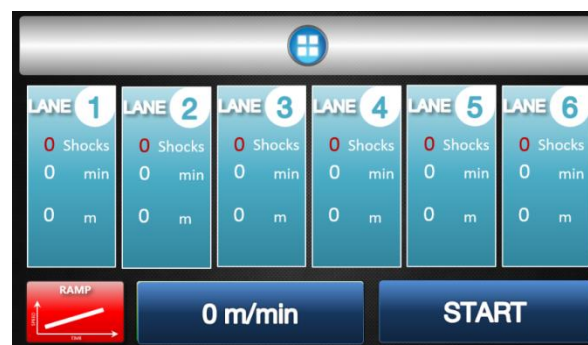


Please note the **-** and **+** buttons at the bottom of the panel: these enable the user to increase or decrease the speed even while the test is running.

In constant speed mode, when the test in a specific lane is over, a fresh mouse can be positioned and a new test started.

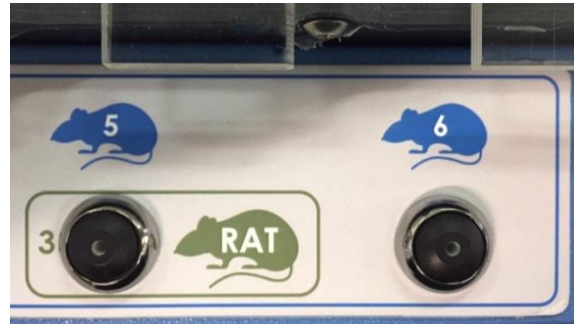
5.5.2 Starting a Ramp

In the accelerating mode, when the **START** button is depressed, the Treadmill will pass from the **IDLE** state (motor and counters disabled), to the **initial speed**.



The test proper is started by the **START** button, which should be pressed as soon as the initial speed is reached.

In the RAMP mode, the individual lane buttons are not active, as the test starts simultaneously in all lanes (to guarantee that the whole ramp is exploited correctly).



The test proceeds until one of the conditions entered in the Setting is met (number of shocks, distance, time), or if the animal rests on the activated electrified grid for more than 10 seconds.

As soon as the FINAL SPEED is reached, the belt will keep rotating at constant speed and the timers will continue counting.

When the test is over, the related counters stop and the display shows the lane with a blue backdrop; the data are saved and will appear in the RESULT table.

The motor and the counters will stop by pressing the STOP button at any time during the experiment.




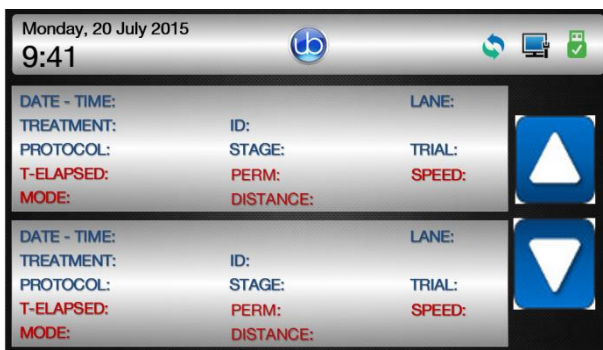
Press  to return to the Home page.



5.6 Results

Data are saved in the internal memory and they can be scrolled on the touch-screen. Reach the results section by depressing the “RESULTS” icon from the home page.



The home page is reached from any menu, but depressing the  button



Scroll through the results by the UP  and DOWN  arrows.

As in the example, all the Experiment-related information entered by the user appear near the blue headings

- **DATE-TIME**

- **LANE**
- **TREATMENT**
- **ID**
- **PROTOCOL**
- **STAGE**
- **TRIAL**

The test results appear under the red headings:

- **T-ELAPSED (Time)**
- **PERM (Permanence)**
- **SPEED**
- **MODE**
- **DISTANCE**

Results can then be saved on the USB flash drive, and uploaded on the PC for further processing, see paragraph 5.8.1. When transferred to PC via USB drive, test results appear in extended version.

5.6.1 *How to Export, Interpret and Erase the Experimental Data*

During the experiments on the treadmill, at each contact of the animal with the corresponding shock grid, the device saves in the internal memory a set of data which characterize the recorded event.

The first set of columns reports the experiment tag, which enables a precise identification: **TREATMENT**, **PROTOCOL**, **STAGE**, **TRIAL**, **ID**, see paragraph 5.3. The **DATE** column supplies date and time (with a precision in the order of seconds) at which the event was recorded.

The following columns describe the events in details:

- | | |
|------------------|--|
| LANE | indicates the lane to which the record relates |
| T-ELAPSED | the column "TIME-ELAPSED" indicates after how long after the experiment start the shock even took place |
| PERM | <p>the "SHOCK-PERMANENCE" column represents the time the animal spent on the shock grid before stepping back on the belt. If the animal stays for 10s or longer (cut-off time), the column will show 10s.</p> <p>This is an "emergency" cut-off introduced to avoid damages to the animal.</p> |
| MODE | indicates the mode active in the current experiment (Constant, Ramp, etc.) |
| SPEED | reports the speed at which the belt was running when the animal stepped on the grid (with or without shock) |

- DISTANCE** shows the distance walked by the animal from the beginning of the experiment to the moment when the animal stepped on the grid (with or without shock)
- NUMSHOCK** this counter reports the total shocks the animal received since the beginning of the trial
- INCLINATION** records the slope of the running belt during the test, if the information was entered when defining the experiment, see paragraph 5.3.

5.7 Important Note On Shock Frequency/Detection

In our model, the detection of the animal stepping on the grid at the bottom of the running surface, is carried out by the same circuit which administers the shock.

For this reason, the sampling rate is affected by the selected shock frequency (1, 2 or 3Hz).

To exemplify the above: if the frequency of 1Hz is set, the sampling rate will be 1 per second: this means that if the animal is quick enough to step over the grid twice within a second, it will be recorded as a single event. In any case, this should be a rare occurrence indeed and should not affect the correct event recording.

5.8 USB Storage




By depressing the USB icon, you will reach the USB Storage menu.



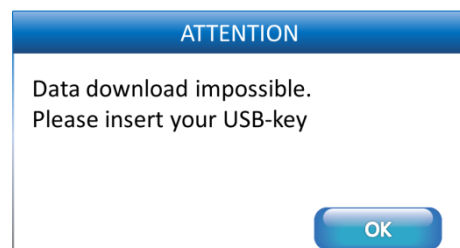
5.8.1 Save Data



By pressing this icon, it is possible to export the results on a USB-KEY.

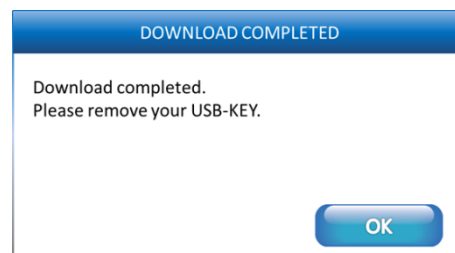
Insert in the upper USB port the USB flash drive provided with standard package. Correct insertion is confirmed by the  icon on the toolbar.

If you try to save the data without USB-KEY, the following dialog box will appear.



When the download procedure ends correctly, the following dialog box is displayed.

The file will be saved in .CSV format.

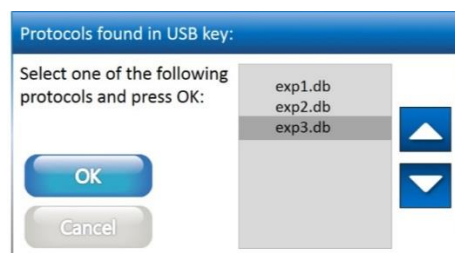


5.8.2 Load Protocol



When a USB flash drive, containing at least one protocol is connected to the device, the “LOAD PROTOCOL” button will open the following window, displaying all the loadable protocols found.

Use the arrows on the right of the screen to scroll the list up and down.



Having selected the desired protocol, if the protocol was properly loaded the confirmation box will show up, while an error box will appear if the file has been found corrupted.

After opening a protocol, the user will be able to test the animals following to the loaded protocol, combined with the information contained therein.

5.9 Utilities

The UTILITIES menu offers the following options:



5.9.1 Software Update





For software update you will receive the “**TM_Update.hex**” file by E-Mail or download it from our web site.

The file is to be saved on a USB key (FAT32 file system formatted), for example the standard Ugo Basile USB key provided with the Treadmill.

Proceed as follows:

- A. Copy the “**TM_Update.hex**” file on USB Key (file system FAT32);
- B. **Switch ON** the Treadmill

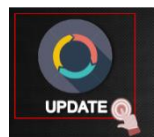
C. Insert the USB KEY containing “TM_Update.hex” file into one of the two USB ports

- If the USB key is detected, the  icon on the system bar will appear on the tool-bar
- If the system recognizes a new SW version, the  icon will appear on the toolbar.

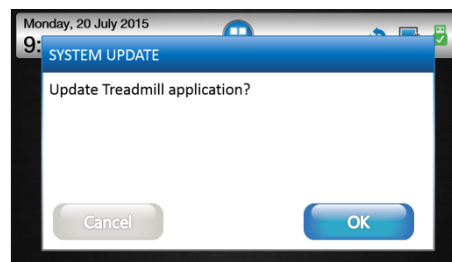


Only if the two icons are shown, it is possible to proceed with the update.

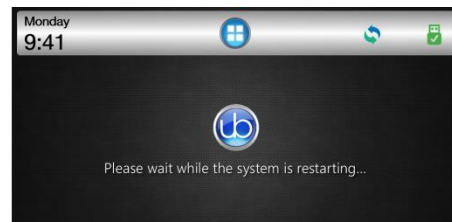
D. Select in sequence:



E. Confirm by answering **OK** to the question “Update Treadmill application?”



F. Wait about 30 seconds for the device to reboot.



IMPORTANT:

do not remove the USB Key during the updating procedure!!!

- G. Wait about 30 seconds
- H. Remove the USB key from the upper USB port (NB: do NOT remove the USB Hard disk from the lower USB port!)
- I. Press the HOME button to check the new SW version.

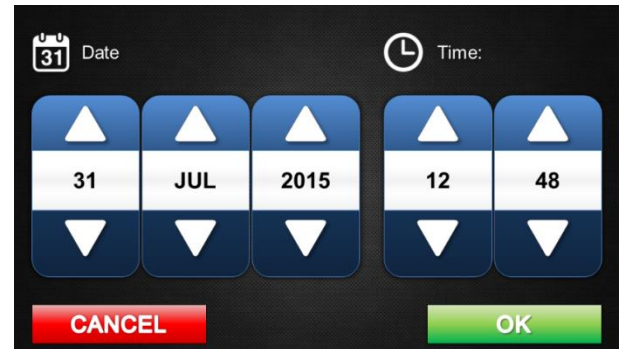


5.9.2 Setting Date & Time

Select the “**DATE-TIME**” icon



Set date and time by using the the UP ▲ and DOWN ▼ arrows, then confirm by pressing **OK**.



5.9.3 Diagnostics

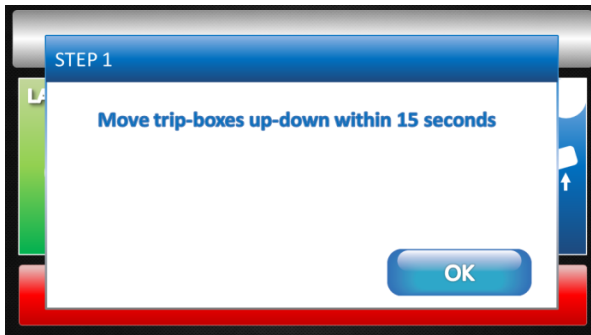


By selecting this function, the Treadmill will perform an self-diagnostics automatic test.

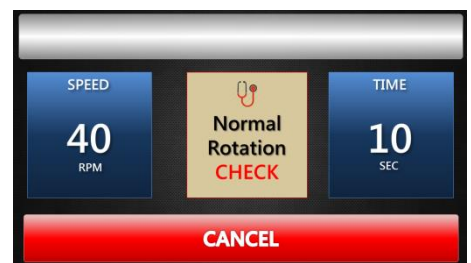


First of all, the machine tests the correct functioning of all the lane buttons.

Follow the instructions for all 6 buttons, then press **OK**.



Then the self-diagnostics checks the motor performances, in accelerating mode:



The procedure can be stopped at any time, by pressing the **SAVE REPORT TO USB** button.

When the diagnostic sequence is completed, a report can be saved to USB



5.9.4 *Reset HD*



This button resets the HD, which contains ALL THE EXPERIMENTAL DATA.

A message box will ask to confirm the action.



ATTENTION:

After confirming the procedure, it will be impossible to recover the data.

5.9.5 *Cleaning*



The cleaning option is very useful at the end of an experimental session to help the user cleaning the device. When selected it will start the motion of the carpet at a low speed (10 m/min) for 2 minutes, keeping the shock grid deactivated. A blade positioned below the running belt will remove the animal dropping. See also paragraph 6.3.

5.10 *Signal Output*

For some sophisticated application, and interface with other systems, it might be useful to obtain outputs for lane status, rotation and speed.

The 15-pin D-SUB connector (see paragraph 3.8) provides different output trigger, in the form of TTL signals.

All pins, except pin 8, are TTL digital signals. Pin 8 is an analog output which provides the rotation speed.

Pins 14 and 15 are ground.

5.10.1 *Pin-Out*

Pin No.	DESCRIPTION	LEVEL LOW	LEVEL HIGH
Pin 1	LANE 1 SHOCK	NO SHOCK	SHOCK DELIVERED
Pin 2	LANE 2 SHOCK	NO SHOCK	SHOCK DELIVERED
Pin 3	LANE 3 SHOCK	NO SHOCK	SHOCK DELIVERED
Pin 4	LANE 4 SHOCK	NO SHOCK	SHOCK DELIVERED
Pin 5	LANE 5 SHOCK	NO SHOCK	SHOCK DELIVERED
Pin 6	LANE 6 SHOCK	NO SHOCK	SHOCK DELIVERED
Pin 7	EXPERIMENT STATUS	NOT RUNNING	RUNNING
Pin 8 (*)	ANALOG SPEED OUT	3m/min= 0.5V	100m/min = 10V
Pins 9 – 13	NOT USED		
Pins 14-15	GROUND		



IMPORTANT:

Please note the TTL output is not real-time. Maximum delay: 200ms.

6 MAINTENANCE

While any service of the instrument ought to be carried out by Ugo Basile personnel or by qualified personnel authorized by UGO BASILE organization, this manual section describes normal maintenance procedures which can be carried out at your facility.



UNPLUG THE MAINS CORD BEFORE CARRYING OUT ANY MAINTENANCE JOB!

6.1 Electrical

To inspect and/or replace the fuses, **disconnect the mains cable first!** Insert a miniature screwdriver in the slot indentation, see paragraph 3.5.2, and snap out the slide which houses the fuses. Use T5A fuses for operation at both 230 or 115 Volts. Snap in the fuse slide: the mechanical “*click*” ensures that it is locked.

6.2 Cleaning

The 47300 Treadmill was designed to make cleaning very easy. For general cleaning, **do not use organic solutions**, liable to impair the lane assembly, the acrylic components and touch-pad. Cotton wool and water can be used for cleaning purposes. For disinfection, use a non-alcoholic disinfectant, or H₂O₂.

Each part needing specific cleaning can be conveniently disassembled. Please see the following paragraphs and follow the instruction carefully.

6.3 Running Belt

The running surface of the 47300 consists of a white alimentary-grade belt, easy-to-clean and soft enough to provide suitable grip, but not porous.

This specially selected material is easy to disinfect and requires minimal maintenance.

The cleaning feature, in the utility menu, see paragraph 5.9.5, provides a very efficient tool to be used at the end of each experimental session.

A blade positioned below the running belt will remove the animal droppings: enhance the action of the blade by adding a moderate quantity of disinfectant on the belt during the cleaning phase.

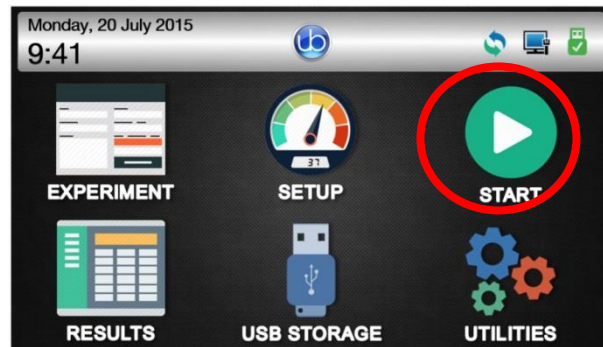


6.3.1 Aligning the Belt

Make sure that the belt is always centred to the chassis of the Treadmill. When the belt is misaligned with respect to the axis of the Treadmill, it is necessary to reset it by regulating the screws placed in the rear part of the Treadmill.

Here is a list of the steps to be followed to perform the aforementioned regulation:

1. Enter the START page and select the "RUN" button



2. Press the button "+" to increase the speed up to 20 m/min



3. Place yourself behind the Treadmill and establish whether the belt is misaligned towards left or right.
4. **If the belt drifts to the left side**, rotate the left regulation screw clockwise of a quarter of a turn and do the same for the screw on the right but counter-clockwise.
5. **If the belt drifts to the right side**, rotate the left regulation screw counter-clockwise of a quarter of a turn and do the same for the screw on the right but clockwise. See following pictures:



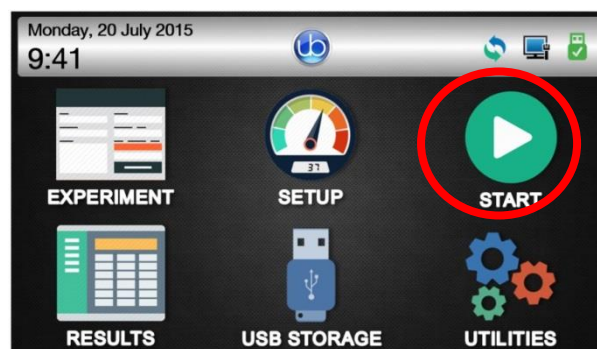
6. Observe the behaviour of the belt for at least two minutes. If necessary, repeat the operations described at points 3, 4 and 5.

6.3.2 Regulating the Belt's Strain

It is recommended to regulate the strain of the belt in case it starts slipping on the rollers. This operation is very important to lengthen the lifetime of the components of the Treadmill.

During the regulation of the strain of the belt, keep the belt itself as slow as possible.

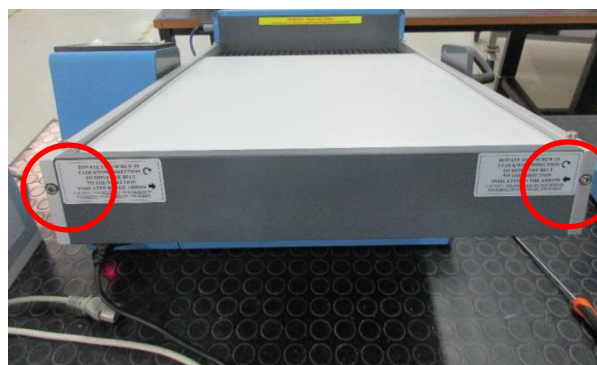
1. Enter the START page and select the "RUN" button



2. Press the button "+" to increase the speed up to 20 m/min, to check the belt strain.



3. If the belt slips then slow down the belt until it stops, rotate both screws of a quarter of a turn in clockwise sense and, if necessary, repeat points 2 and 3.



4. Finally check if, after regulating the strain, the belt is correctly aligned. If not, please refer to paragraph 6.3.1.

6.3.3 Lane Assembly

The lane assembly can be easily removed for cleaning: just lift the whole assembly with due care, by holding it via the two recessed handles provided.



Figure 5 “Removing the Lane Assembly”



Do not use organic solutions, liable to impair the acrylic components. Cotton wool and water can be used for daily cleaning.

For disinfection, use a non-organic disinfectant, or H₂O₂.

6.3.4 Drop Pan

The drop-pan positioned below the grid at the bottom of the running surface can be removed for cleaning.



Please follow the steps in sequence, to avoid any damage to the cleaning blade positioned between the belt and the drop-pan:

- A. **UNPLUG THE MAINS CORD**
- B. First remove the lane assembly as shown in the picture on paragraph 6.3.1.
- C. Detach the cable connecting the grid/button assembly to the controller

Connector

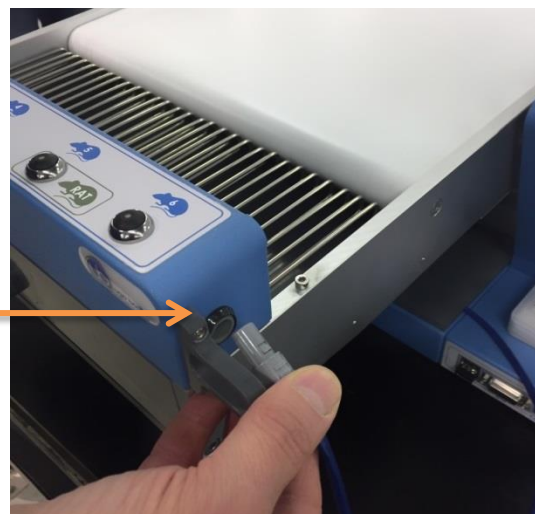


Figure 5 “Connection Module2”

D. Remove the whole grid/button assembly

Figure 6 “Removing the Lane Assembly”



E. Unlatch the drop-pan drawer, by turning the stopper, see picture



Stopper

- F. Pull-out the drawer, and the attached cleaning blade

Cleaning blade

Drop-pan

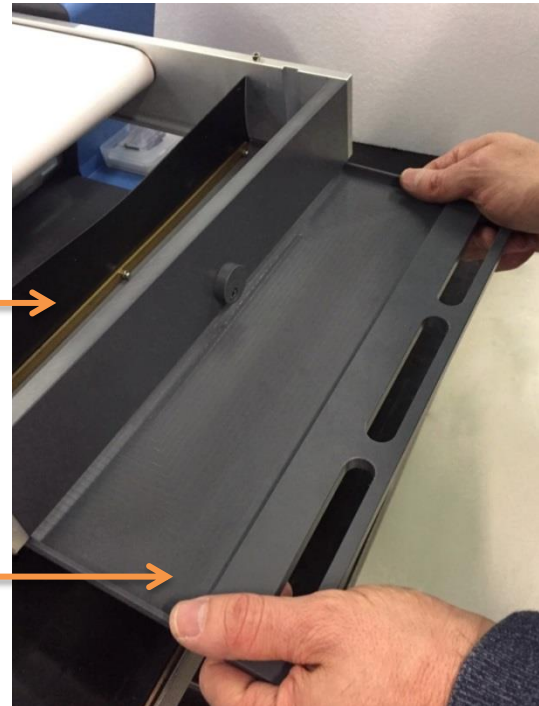


Figure 6 "Removing the Drop-Pan"

After cleaning, reposition the drop-pan by repeating the same actions in reverse order: reassemble the grid, connect the cable, re-position the lane-assembly.

6.3.5 Grid Assembly



UNPLUG THE MAINS CORD BEFORE CLEANING THE GRID

To assure correct operation, shock delivery and detection, the grid needs to be clean.

When necessary, it can be easily removed, following the steps outlined below:

- A. First remove the lane assembly as shown in the picture on paragraph 6.3.1.
- B. Detach the cable connecting the grid/button assembly to the controller, then remove the whole grid/button assembly as explained in paragraph 6.3.4.



- C. Hold the grid assembly as shown in the picture, in order to **keep the button array, and the electronic block away from water/liquids.**
- D. Clean the grid thoroughly, with the help of an abrasive sponge, and a suitable disinfectant.
- E. Dry carefully
- F. Reassemble by repeating the above steps in reverse order.

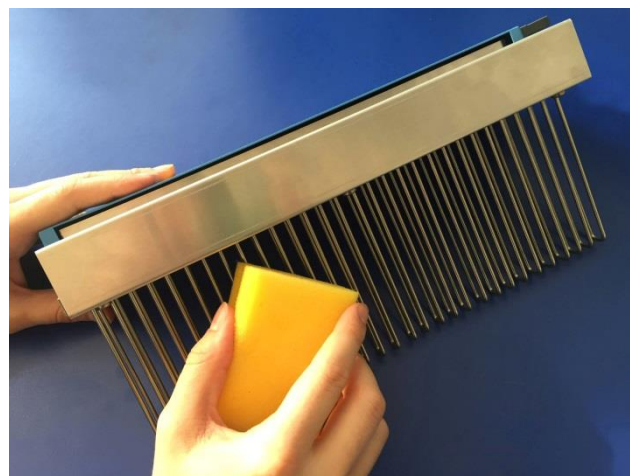


Figure 7 “Cleaning the Grid-Assembly”

6.4 Lubrication

Our Treadmills **do not require** any lubrication: all its rotating components are lubricated for life.

6.5 Long Inactivity

The instrument does not require any particular maintenance after long inactivity, except cleaning.

6.6 Customer Support

For any further information you may desire concerning the use and/or maintenance of the device, please do not hesitate to contact our **service department** (or our local distributor) either directly or via our support page <http://www.ugobasile.com/support.html> :



UGO BASILE s.r.l.

Via G. Di Vittorio 2
21036 GEMONIO – Varese, ITALY



Phone : +39 0332 744574



service@ugobasile.com
logistics@ugobasile.com
sales@ugobasile.com

Before sending any instrument to our factory for repair, please contact our logistics department to obtain a return authorization number (RMA) and shipping/packing instructions.

We may not be held responsible for damages during transport due to poor packing; whenever possible, please use the original packing.

7 47300 SPECIFICATIONS

General

Commands	4"3 touch-screen (resistive)
Read-out	on the touch-screen
Power Requirement	Universal input 85-264 VAC, 50-60Hz, 40W max.
Sound Level	80 dB ca., at maximum speed
Operating Temperature	10° to 40° C

Operation

Speed	adjustable in the range 3 to 100m/min, in steps of 1m/min
Mode	constant, ramp (accelerating), multi-step ramp (NEW!)
Slope	Manual tilting, positive (uphill) or negative (downhill) from -25° to +25°, in steps of 5°
Shocker	included
Shock	from 0 to 2mA (in 0.1mA steps), 1, 2 or 3Hz
Start/Stop	from the touch-screen
Detection	via incorporated electronic circuit
Results	Speed and distances (absolute and relative)
Data Acquisition	via dedicated X-PAD software, provided
Data Portability	by USB flash drive
TTL Output	Shock status (for each lane) and speed
Data	exported to Text, Excel or Pdf, or saved to cloud to Drop-Box, OneDrive, GoogleDrive
Configurations	exported to Text, Excel or Pdf, or saved to cloud to Drop-Box, OneDrive, GoogleDrive

Physical

Total Weight	47302 & 47303 : 22Kg – 47300 : 27Kg
Shipping Weight	47302 & 47303 : 35Kg – 47300 : 40Kg approx.
Dimensions	56(w)x67(d)x35(h)cm
Packing Dimensions	47302 & 47303 : wooden crate, 77x65x63cm
	47300 : wooden crate, 82x71x57cm

Warranty

47300 is covered by a 24-month warranty

8 ORDERING INFORMATION

47302 Rat Treadmill NG, complete with following accessories

47300-001 Tapis-Roulant with touch-screen controller and shocker

47300-002 3-Lane partition assembly for Rats, each lane 45x11x15(h)cm, with transparent cover

E-AU 041 USB pen drive, including:

47300-302 Instruction Manual

X-PAD Software Package

E-WP008 Mains Cord – Europe (or E-WP008-1 U.S.A. / E-WP008-2 U.K.)

Set of 2 fuses

47303 Mouse Treadmill NG, complete with following accessories

47300-001 Tapis-Roulant with touch-screen controller and shocker

47300-003 6-Lane partition assembly for Mice, each lane 45x5.5x7(h)cm, with transparent cover

E-AU 041 USB pen drive, including:

47300-302 Instruction Manual

X-PAD Software Package

E-WP008 Mains Cord – Europe (or E-WP008-1 U.S.A. / E-WP008-2 U.K.)

Set of 2 fuses

Working with both rats and mice? You should consider the Combination Package 47300, including both Mouse and Rat accessories:

47300 Combo Package: Mouse & Rat Treadmill NG, complete with following accessories

47300-001 Tapis-Roulant with touch-screen controller and shocker

47300-002 3-Lane partition assembly for Rats, each lane 45x11x15(h)cm, with transparent cover

47300-003 6-Lane partition assembly for Mice, each lane 45x5.5x7(h)cm, with transparent cover

E-AU 041 USB pen drive, including:

47300-302 Instruction Manual

X-PAD Software Package

E-WP008 Mains Cord – Europe (or E-WP008-1 U.S.A. / E-WP008-2 U.K.)

Set of 2 fuses

8.1 Optional

We offer a special model for tethered mice, with no lid, and higher walls:

47313 Mouse Treadmill NG, complete with standard accessories and in alternative to 47300-003:

47300-013 6-lane assembly (each lane 45x5.5, height 15cm, without lid, for tethered mice)

9 BIBLIOGRAPHY

9.1 Method Papers

- American Physiological Society: “**Resource Book for the Design of Animal Exercise Protocols**” February **2006**
- O.J. Kemi et alia: “**Intensity-Controlled Treadmill Running in Mice: Cardiac and Skeletal Muscle Hypertrophy**” J. Appl. Physiol. 93: 1301-1309, 2002
- X.Q. Wang & G.W. Wang: “**Effects of Treadmill Exercise Intensity on Spatial Working Memory and Long-Term Memory in Rats**” Life Sciences 149: 96-103, **2016**
- M. Shinozaki et alia: “**Combined Treatment With Chondroitinase ABC and Treadmillrehabilitation for Chronic Severe Spinal Cord Injury in Adult Rats**” Neuroscience Res 113: 37-47, **2016**

9.2 Papers Citing 47300

- Yuan-Hao Chen, Tung-Tai Kuo, Jen-Hsin Kao, Eagle Yi-Kung Huang, Tsung-Hsun Hsieh, Yu-Ching Chou & Barry J. Hoffer: “**Exercise Ameliorates Motor Deficits and Improves Dopaminergic Functions in the Rat Hemiparkinson’s Model**” Scientific Reports, volume 8, Article number: 3973 (2018)



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CE CONFORMITY STATEMENT

Manufacturer	UGO BASILE srl
Address	Via G. di Vittorio, 2 – 21036 Gemonio, VA, ITALY
Phone n.	+39 0332 744574
Fax n.	+39 0332 745488

We hereby declare that

Instrument	RODENT TREADMILL
Catalog number	47300 / 47302 / 47303

It is manufactured in compliance with the following European Union Directives and relevant harmonized standards

- 2014/35/UE relating to electrical equipment designed for use within certain voltage limits
- 2006/42/CE on machinery
- 2014/30/UE relating to electromagnetic compatibility
- 2011/65/UE – 2015/863/UE on the restriction of the use of certain hazardous substances in electrical and electronic equipment

Account Manager

Adriano Basile

Nome / Name

January 2017

Date

Firma / Signature