

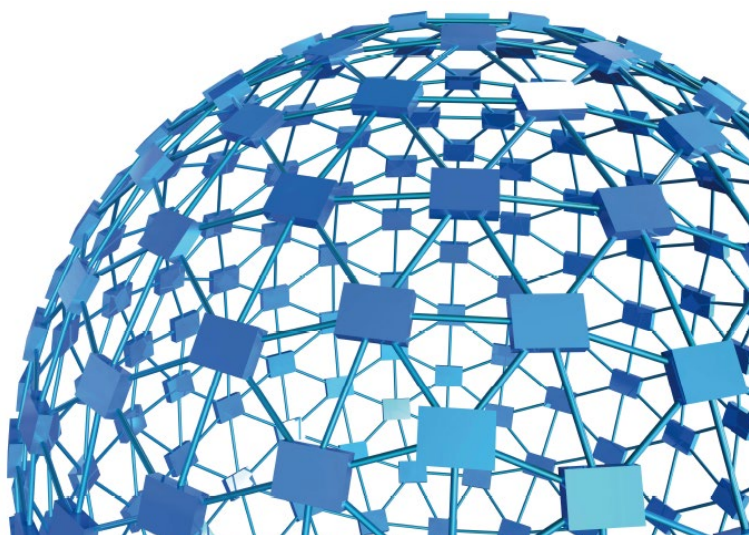


ugo basile®

TRANSFORMING IDEAS  
INTO INSTRUMENTS

# instruction manual

**Multi-Maze System**  
**Cat. No. 41500**



**UGO BASILE S.R.L.**

[sales@ugobasile.com](mailto:sales@ugobasile.com) / [service@ugobasile.com](mailto:service@ugobasile.com) [www.ugobasile.com](http://www.ugobasile.com)

**UGO BASILE S.R.L.**

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

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

## **instruction manual**

**Multi-Maze System**  
**Cat. No. 41500**

**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.**

## MULTI-MAZE SYSTEM

Cat. No. 41500

*Spatial memory is the ability to create a mental geographical map of the surroundings and to navigate the environment accordingly (Ref). In humans, for example, spatial memory allows one to easily find the way to the right office in a large building.*

*While the definitions of working and reference memory may be subtle and can be debated among scholars, briefly, working memory is the ability to keep track of which offices we have already visited while looking for someone, while reference memory allows us to remember which of the many rooms is Mary's office.*

*In rodent studies, spatial memory can be tested by placing animals in mazes composed of 3 or more radially arranged walkways (arms) and observing either spontaneous exploratory behavior or reward-based navigation.*

The new **MULTI-MAZE** Cat. No. **41500**, for mouse or rat, will help the researcher to conduct fully automated memory experiments such as:

- Assessing **spatial memory**
- Testing basic **working memory**
- Discriminating working from reference memory
- Evaluating impairments in the working memory

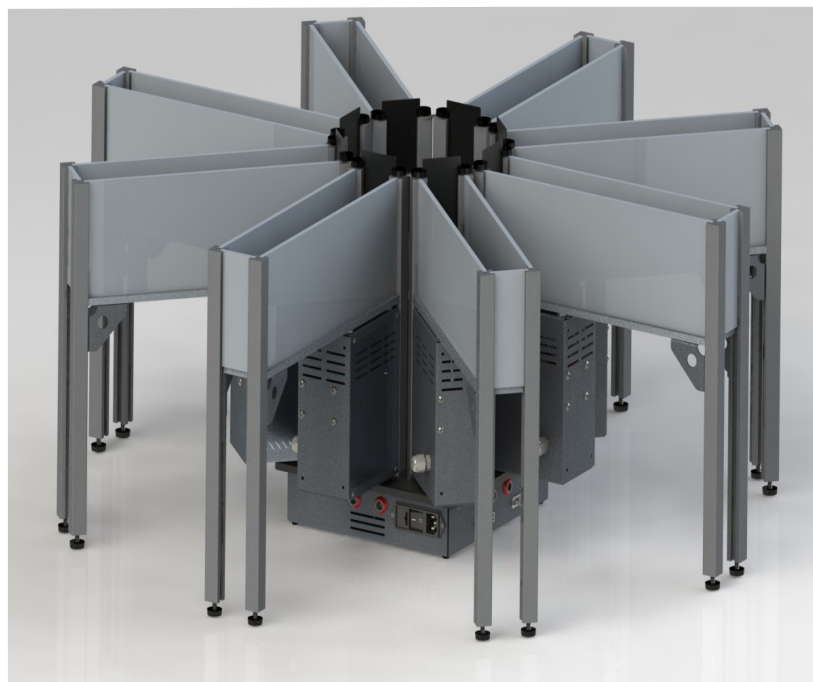
The electronic unit features USB interface, 8 independent TTL inputs and integration with videotracking software.

The proprietary sliding doors retract in the maze floor, ensuring unobstructed animal tracking, while guaranteeing smooth, silent, totally automated up/down movements.

All the animal mazes manufactured by Ugo Basile, feature high-contrast colors and non-reflective coatings, providing optimal results with any videotracking software.

Surface texture was selected for best rodent's comfort.

Our mazes are constructed of sturdy, easy to clean materials, making them the most reliable mazes on the market.



### VERSATILE MULTI-MAZE FULLY CONFIGURABLE AS:

- Y-Maze
- T-Maze
- 8-Arm Radial Maze

Optimized for  
Video-Tracking

Ideal for  
Optogenetics tests

Easily customizable

AVAILABLE  
FOR  
**MOUSE  
OR RAT**

### Main Features

- New proprietary modular system
- Doors slide underneath the floor
- Smooth and silent operation
- Easily cleanable
- Manual or PC-driven operation modes (via TTL or USB connection)
- Interchangeable walls for egocentric or allocentric spatial memory tests (low profile walls are optional)
- Different colors or textures available on request
- Different arm length available on request



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## CHECK-LIST – MULTI MAZE 41500

### Mouse

- ☐ 41503  
☐ 41504  
☐ 41508

### Rat

- ☐ 41513  
☐ 41514  
☐ 41518

3-Arm configuration, for Y-maze test  
3-Arm configuration, for T-maze test  
8-Arm Radial Maze configuration

CLIENTE / CUSTOMER \_\_\_\_\_

Ordine No. / Order No. \_\_\_\_\_ Data / Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

UB code	CAT.No.	✓	DESCRIPTION	41503	41504	41508	41513	41514	41518
	41500-001		CENTRAL UNIT – MOUSE	1	1	1			
	41510-001		CENTRAL UNIT - RAT				1	1	1
	41153-010		CONTROLLER	1	1	1	1	1	1
	41500-002		MOUSE ARM, WITH AUTOMATED DOOR	3	3	8	3	3	8
	41500-012		RAT ARM, WITH AUTOMATED DOOR	3	3	8	3	3	8
	41500-003		MOUSE "START" COMPARTMENT		1				
	41500-003		RAT "START" COMPARTMENT					1	
	41504-320		BLANK WALL FOR MOUSE T-MAZE		1				
	41514-320		BLANK WALL FOR RAT T-MAZE					1	
M-LM 948-F			Y-MAZE CENTRAL ARENA - MOUSE	1	1	1			
M-LM 949-F			T-MAZE CENTRAL ARENA - MOUSE	1	1	1			
M-LM 961-F			8-ARM RADIAL CENTRAL ARENA - M			1			
			Y-MAZE CENTRAL ARENA - RAT				1	1	1
			T-MAZE CENTRAL ARENA - RAT				1	1	1
			8-ARM RADIAL CENTRAL ARENA - RAT						1
CU4			WRENCH	1	1	1	1	1	1
E-AU 041 USB PEN- DRIVE	41153-050		COMMUNICATION SOFTWARE						
	41500-302		INSTRUCTION MANUAL	1	1	1	1	1	1
	52010-326		USB CABLE 5 METERS	1	1	1	1	1	1
	41153-011		CONTROL UNIT FLAT CABLE	1	1	1	1	1	1
	52010-326		USB CABLE 5 METERS	1	1	1	1	1	1
E-WP 008			MAINS CABLE	1	1	1	1	1	1
E-WP 008-1				1	1	1	1	1	1
E-FT 012			1.6A FUSE	2	2	2	2	2	2

DATE     /     /	Serial No.	IMBALLATO DA / PACKED BY
Universal Input 85-264 VAC, 50-60Hz		

### 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

FROM: Name	Company/Institution
DATE	REF.

### NOTES

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# Multi-Maze System

Cat. 41500

## 1 GENERAL

Mazes are used extensively by researchers interested in studying the spatial learning and spatial memory of animals.

The new 41500 MULTI-MAZE for MOUSE or RAT, will help the researcher to conduct fully automated memory experiments such as:

- Assessing spatial memory
- Testing basic working memory
- Discriminating working from reference memory
- Evaluating impairments in the working memory

Different types of mazes are used to assess memory. It is believed that performance of animals in one type of maze cannot be generalized to other mazes because all mazes require animals to utilize a different set of skills.



Figure 1 “8-Arm Configuration”



The unique modular system of the new Ugo Basile MULTI-MAZE, will enable the user to set-up an electronically controlled maze to test the mouse in different environment, combining one of the different arenas provided, and the required number of arms, each provided with an electronically controlled independent door, in the following configurations

- Y-Maze
- T-Maze
- 8-Arm Radial Maze

## 1.1 Y- and T-Maze

In behavioral science, a Y- or a T-maze are used in animal cognition experiments. Shaped like the letter Y or T, it provides the subject, with a straightforward choice.

Y- and T-mazes are used to study how the memory and spatial learning function, by applying various stimuli. Different tasks such as left-right discrimination and forced alternation are mainly used with rodents to test reference and working memory.

## 1.2 8-Arm Radial Maze

The radial arm maze was designed by Olton and Samuelson in 1976 (Olton, D.S.; Samuelson, R.J.: "Remembrance of places passed: Spatial memory in rats". *Journal of Experimental Psychology: Animal Behavior Processes* 2 (2): 97–116, 1976) to measure spatial learning and memory in rats. It consists of eight equidistantly spaced arms, radiating from a small central arena.

Two types of memory that are assessed during the performance in this task are reference memory, when the animal only visit the arms of the maze which contains the reward, and working memory, when the animal enter each arm a single time.

The design ensures that the animal is always forced to return to the central platform before making another choice, always having eight possible options. An automated radial maze features an electronically and/or software controlled door at the arena side of each arm.

## 1.3 Ugo Basile Multi-Maze: Principle of Operation

The new Ugo Basile MultiMaze relies on an original electromechanical control, which ensures reliable, quick operation and very little noise.

The proprietary doors sliding underneath the floor make it the best solution for videotracking and optogenetics tests; the sliding doors in fact retract in the maze floor, ensuring unobstructed animal tracking, while guaranteeing smooth, silent, totally automated up and down movements.

Its interchangeable arms, and the availability of different profiles, allow egocentric or allocentric spatial memory tests to be carried out easily.

The electronic unit features USB interface, 8 independent TTL inputs and integration with videotracking software.



## 2 INSTRUMENT DESCRIPTION

All the animal mazes manufactured by Ugo Basile are designed with high-contrast colors and non-reflective coatings, providing optimal results with any video-tracking software.

Ugo Basile mazes are constructed of sturdy and easy to clean materials, making them the most reliable mazes on the market.

Surface texture was selected for best rodent's comfort.

The new Multi-Maze introduces a new concept: the door-controlling kinematics of each section is actually integral part of the arm itself, being positioned below the door area, while a control unit, positioned below the central arena, consolidates the motor control board, the interface with the external electronic unit, and the interface with the video-tracking software (ANY-maze, not included).

The corridor side walls, made of plastic material, are easily removable, for cleaning purposes. Moreover, it will be easy to switch from high profile to low profile wall (optional), according to the research needs.

Different color combinations, or different textures, are available on request. Arm length can be customized; ask for details!

### 2.1 System Components

#### 41153-010 Controller

The Control Unit enables the researcher to open and close the doors manually or via TTL signals, using the switches or the BNC connectors, located on the front panel, see also paragraph 4.1-Controls.

The mouse access to any arm can be set so that individual doors or multiple doors open and close simultaneously.

More details on the different operation modes are given in the following sections.



A two-meter long cable connects the Control Unit to the Core, to enable the operator to plan his/her schedule without disturbing the subject.

**41500-002** Standard Arm, for Mouse, provided with automated door, and standard profile (12cm h). 35cm length.

**41500-012** Standard Arm, for Rat, provided with automated door, and standard profile (30cm h) 60cm length.

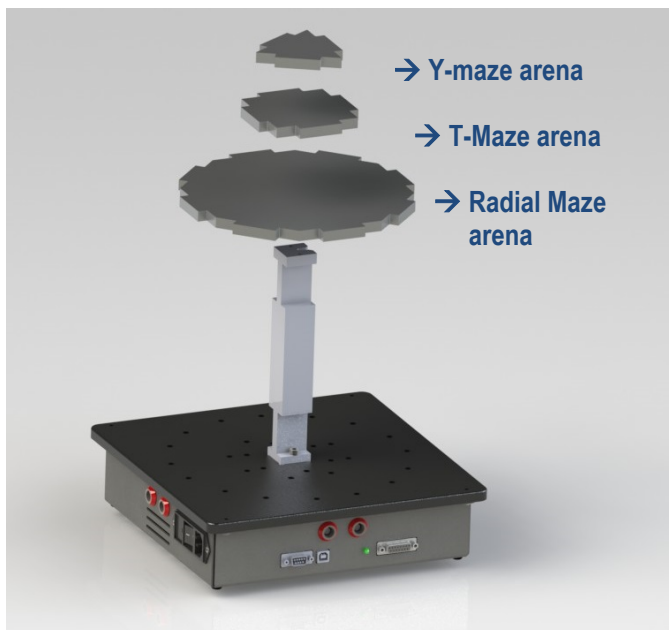


**41500-001** Multi-Maze Main Unit, for Mouse, incorporating support base, motor controls and interface to external unit

**41510-001** Multi-Maze Main Unit, for Rat, incorporating support base, motor controls and interface to external unit

The picture also shows the three available central arenas:

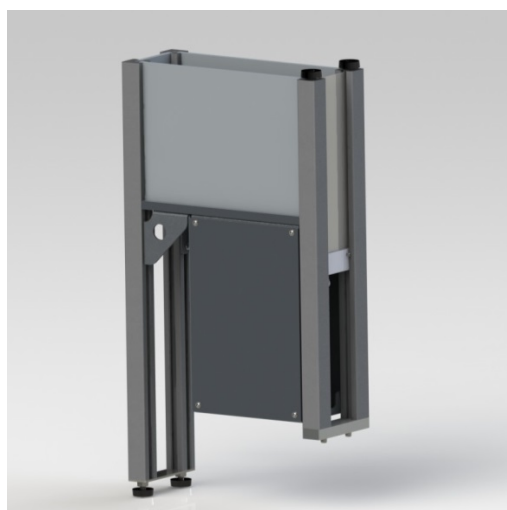
- Y-Maze Arena
- T-Maze Arena
- 8-Arm Radial Maze Arena



**41500-003** “Start” compartment for T-Maze, provided with automated door, and standard profile (12cm h).

**41500-013** “Start” compartment for T-Maze, provided with automated door, and standard profile (30cm h).

**NOTE:** this component is included only in the T-Maze configuration.



See paragraphs 2.2, 0 and 2.4.

## 2.2 41503 / 405113 Y-Maze Configuration

The Y-maze are configured as follows:

### Mouse:

- 1 **41500-001** Central Control Unit
- 3 **41500-002** Mouse Arm, with automated door
- 1 **41153-010** Electronic Unit (8 TTL outputs)
- 1 **M-LM 948-F** Y-Maze Arena

### Rat:

- 1 **41510-001** Central Control Unit
- 3 **41500-012** Rat Arm, with automated door
- 1 **41153-010** Electronic Unit (8 TTL outputs)
- 1 **Y-Maze Arena**

**NOTE:** this package also includes the T-Maze Arena and the 41504-320 Blank Wall.  
See paragraph 2.1-System Components.



**Figure 2 “Y-Maze Configuration”**

## 2.3 41504 / 41514 T-Maze Configuration

The T-maze configurations include:

### Mouse:

- 1 **41500-001** Central Control Unit
- 3 **41500-002** Mouse Arm, with automated door
- 1 **41153-010** Electronic Unit (8 TTL outputs)
- 1 **41500-003** “Start” compartment (mouse) with automated door
- 1 **M-LM 949-F** T-Maze Arena
- 1 **41504-320** Blank Wall

### Rat:

- 1 **41510-001** Central Control Unit
- 3 **41500-012** Rat Arm, with automated door
- 1 **41153-010** Electronic Unit (8 TTL outputs)
- 1 **41500-013** “Start” compartment (rat) with automated door
- 1 **T-Maze Arena**
- 1 **41514-320** Blank Wall



**Figure 3 “Y- Configuration”**

**NOTE:** this package also includes the Y-Maze Arena

See paragraph 2.1-System Components.

## 2.4 41508 / 41518 8-Arm Radial Maze Configuration

The 8-Arm Radial Maze configurations include the following components (see paragraph 2.1-System Components):

### Mouse:

- 1 **41500-001** Central Control Unit
- 8 **41500-002** Mouse Arm, with automated door
- 1 **41153-010** Electronic Unit (8 TTL outputs)
- 1 **M-LM 961-F** 8-Arm Arena



*Figure 4 “Y- Configuration”*

### Rat:

- 1 **41510-001** Central Control Unit
- 8 **41500-002** Rat Arm, with automated door
- 1 **41153-010** Electronic Unit (8 TTL outputs)
- 1 8-Arm Arena

**NOTE:** this package also includes the Y-Maze and T-Maze Arenas, as well as the 41504-320 (mouse) or 41514-320 (rat) Blank Wall.

## 3 INSTALLATION

### 3.1 Unpacking & Preliminary Check

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

If the instrument is damaged, inform the carrier immediately, notifying our company. If after having tested it, the Multi-Maze set-up fails to meet rated performances, please contact our after sales service, see paragraph 7.5-Customer Support.



### *Protect the environment!*

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 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 7.5-Customer Support), specifying the serial number of the instrument.

## 3.3 Recommended Operating Condition

Place the Multi-Maze in a room which is acoustically isolated or at least remote from sudden or intense noises.

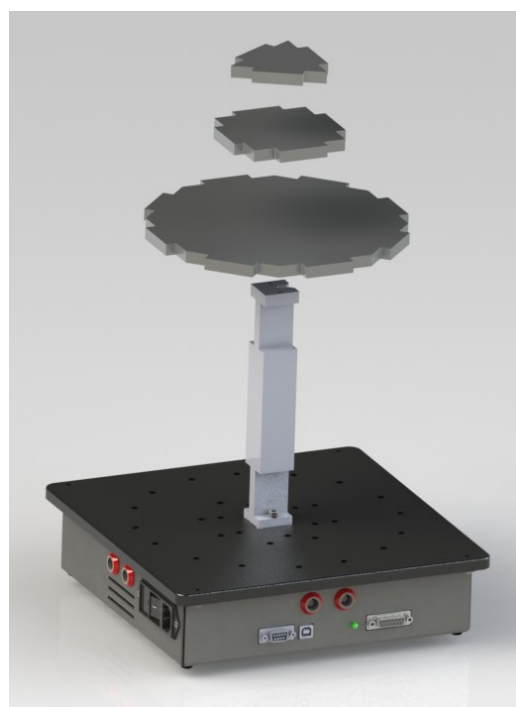
The room should not be illuminated too brightly. In particular, avoid direct light on the Maze.

Temperature is an important factor since below 18-20°C the rodents sometimes react less promptly to stimuli. Optimum temperature is 22-25°C.

## 3.4 Assembling the Instrument

Assemble the Multi-Maze Set-Up on a stable bench or table surface.

- 1) First of all, position the Multi-Maze Main Unit;
- 2) Attach the supporting column to the base, via the two screws provided.
- 3) Position the suitable arena, depending on the maze configuration, see paragraph 2.1-System Components;
- 4) Install the arms according to the chosen configuration, fitting the two pins in the correct holes on the base plate; the shape of the arena will guide you to the correct pin position;

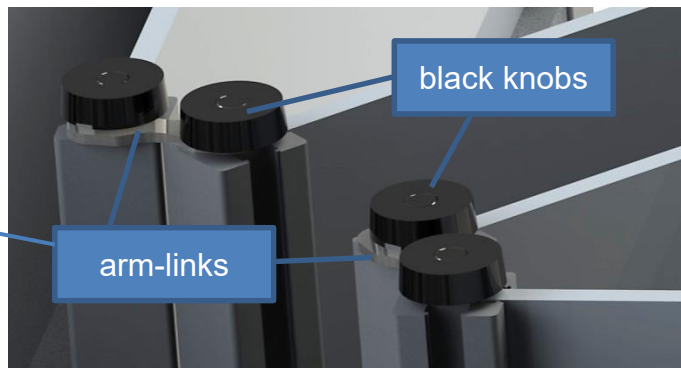


5) Remove the knurled black knobs on top of each arms;

6) Position the arm-links



across each two adjacent arms and reposition the two knobs to hold it in place.



7) For the T-maze configuration, position the “start” compartment, and the blank wall to close the space between the two horizontal arms.

8) Connect the main unit to the Controller via the flat cable provided.

9) Connect the control unit to the PC via the USB cable provided

10) Install the software from the USB key provided

### 3.5 Intended Use

The Multi-Maze Set-Up is intended for investigation use on laboratory animals only.

### 3.6 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



### 3.7 Additional Safety Consideration

- a. Place the instrument on a steady and flat surface
- b. Use original accessories and spare parts only, see also paragraph 8-ORDERING INFORMATION
- c. Do not operate the instrument in hazardous environments or outside prescribed environmental limitations (i.e. +10C°/+40C°, 60% relative humidity, non-condensing);
- d. Do not spray any liquid on the connectors.

**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

see also paragraph 7-MAINTENANCE.

### 3.8 Switching On

Switch on the 8-Arm Radial Maze by connecting the power supply to the core unit, and the core unit to the Control Unit, via the connection cable 41153-011 provided.

A power LED on the Control Unit front panel, indicates that the instrument is ON, see paragraph 4.1-Controls.

### 3.9 Connections

In order to operate the Multi-Maze, the Control Unit must be connected to the Core Unit, using the double 15-pin Sub-D connector cable Cat. No. 41153-011.

Do not connect the core unit to the PC via the USB cable until the drivers for the USB-timer and for Any-maze video-tracking have been installed from the USBCDs provided.



## 4 OPERATION

### 4.1 Controls

The figure below shows the front panel of the **Control Unit**, whose functions are described below:



Figure 5 “Control Unit Front Panel”



- 1) **POWER LED**: when illuminated, it indicates that the **Control Unit** is **connected** to the **Core Unit** and that it is powered, see paragraph 3.8-Switching On.
- 2) **THREE-POSITION SWITCH (MANUAL, BNC, USB)**: to select between operational modes, see paragraph 4.2-Operational Modes.
- 3) **TOGGLE SWITCHES** (from 1 to 8): to open/close individual doors or to select a group of doors, see paragraph 4.2.1-Manual Mode
- 4) **BNC CONNECTORS** (from 1 to 8): to open/close individual doors or groups of doors via external TTL pulses, see paragraph 4.2.2-BNC Mode
- 5) **SELECTED DOOR SWITCH**: to open/close a group of selected doors simultaneously, see paragraph 4.2.1-Manual Mode.
- 6) **ENABLE SELECTED SWITCH**: enables/disables the SELECTED DOOR switch. It must be kept in the up position, in order to open/close individual doors, see paragraph 4.2.1-Manual Mode.

## 4.2 Operational Modes

The Ugo Basile Multi-Maze can work according to one of the three operational modes, selectable by the 3-position switch, on the upper-left corner of the control unit (ref. 1, on figure 4):

- e. **Manual mode**, via a row of 8 toggle switches on the upper edge of the control unit front panel see also paragraph 4.2.1-Manual Mode;
- f. **BNC mode**, via TTL pulses, via 8 BNC connectors, see also paragraph BNC Mode-4.2.2;
- g. **USB mode**, via the USB-timer software or via the Any-maze video-tracking software (before using USB mode, the drivers for USB-timer and/or for Any-maze must be installed from the provided CDs). See also paragraph 4.2.3-USB Mode.

### 4.2.1 Manual Mode

Select this mode to drive the Radial Maze via the front panel switches (ref. 3, on figure 5). When in manual mode you can choose between two set-ups:

- a. **Single door set-up**  
Start with the ENABLE SEL. Switch (ref. 6, on figure 5) in upper position and simply switch up or down one of the 8 switches to close or open the related door individually.
- b. **Multiple-door set-up**
  - Start with the ENABLE SEL. toggle-switch in upper position. This controls the SELECTED DOOR switch and allows to open/close simultaneously selected doors.

- Choose the doors by switching into the upper position the desired 1-to-8 toggle switches, to select the group of doors which will be simultaneously operated by the SELECTED DOOR switch.
- Switch the ENABLE SEL. toggle-switch to the down position
- Switch up-down the SELECTED DOOR switch, to close/open the selected doors.

#### 4.2.2 BNC Mode

Select this mode to drive the Multi-Maze by external TTL-level pulses, via the 8 BNC connectors (ref. 4, on figure 5). Note that the accepted TTL-level signals are 0V and 5V.

Different voltage levels could cause the doors to open/close abnormally.

#### 4.2.3 USB Mode

Select this mode to drive the Multi-Maze via the video-tracking software ANY-maze (see paragraph 5-USING THE MULTI-MAZE VIA ANY-MAZE SOFTWARE) or via the USB-timer software (see paragraph 6-USING THE MULTI-MAZE WITH USB-TIMER SOFTWARE).

Notice that the **USB-timer** software allows for simple time-based operation of the doors, while **ANY-maze** allows for more complex and operant protocols, in which, for instance, the doors can be opened/closed, on the basis of the animal position and/or behavior.

## 5 USING THE MULTI-MAZE VIA ANY-MAZE SOFTWARE

### 5.1 Preliminary Steps

Before operating the Multi-Maze via **ANY-maze software**, two conditions must be fulfilled:

- 1) The ANY-maze software must be installed on the PC (a free demo copy of the software can be downloaded from [www.ub.anymaze.com](http://www.ub.anymaze.com), see also paragraph 8.5-Optional)
- 2) The Ugo Basile Multi-Maze Driver for ANY-maze, Cat. **41153-050**, must be installed on the PC.

The driver is self-installing: simply follow the instruction appearing on the screen after loading the USB key provided with the Multi-Maze standard package.

Follow these steps to complete the installation:

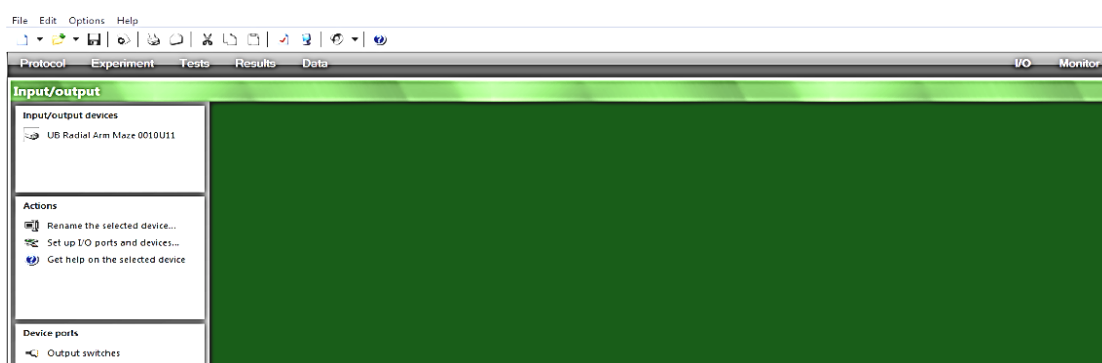
- Make sure the ANY-maze software is not running
- Connect the Multi-Maze to the PC via the USB cable
- Connect the Main Unit to the mains via the cable provided

- The Multi-Maze is switched ON by pressing the ON/OFF' button located on the back panel of the Main Unit
- The new hardware will be automatically recognized and installed

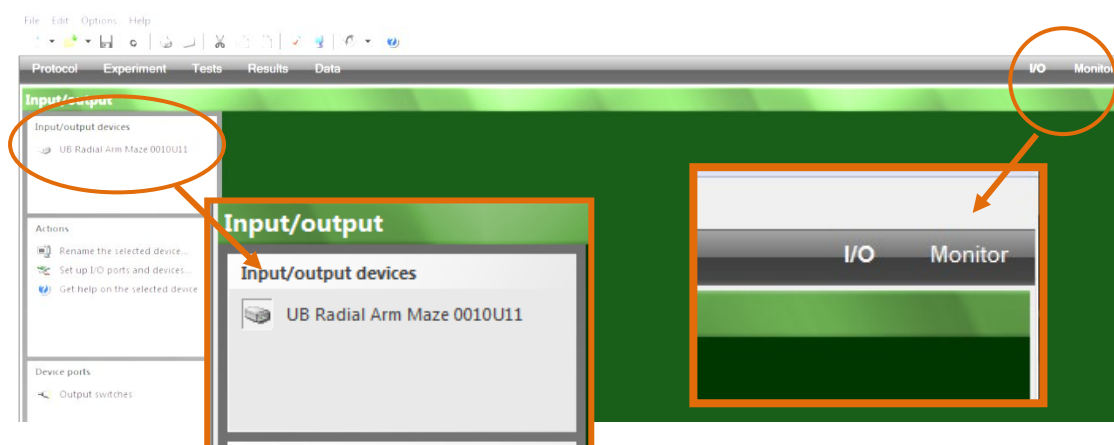
## 5.2 Operation with ANY-maze

Once the above steps described have been followed, all the necessary software and drivers are installed and the Multi-Maze can be driven by the ANY-maze software.

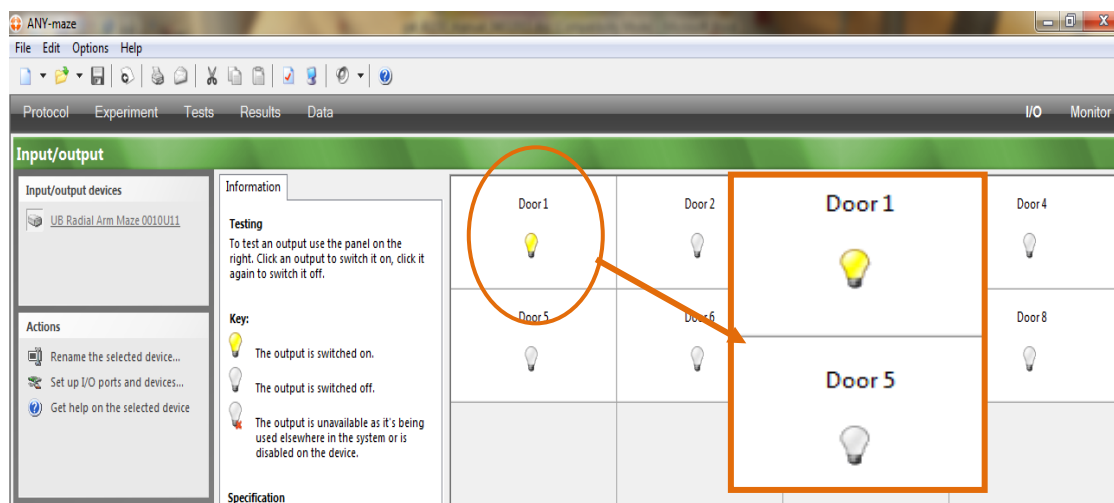
- Launch ANY-maze software and click on the I/O tab on the upper-right corner.



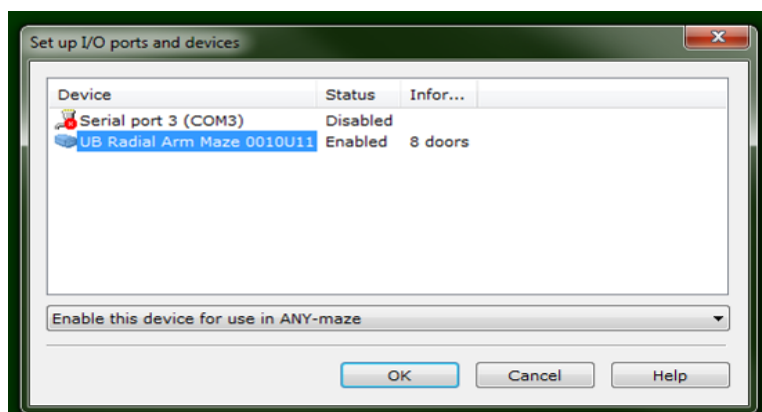
- Click on the UB Radial Arm Maze, under the Input/Output devices list in the upper/left corner and then on the Output switches, under the Device ports list.



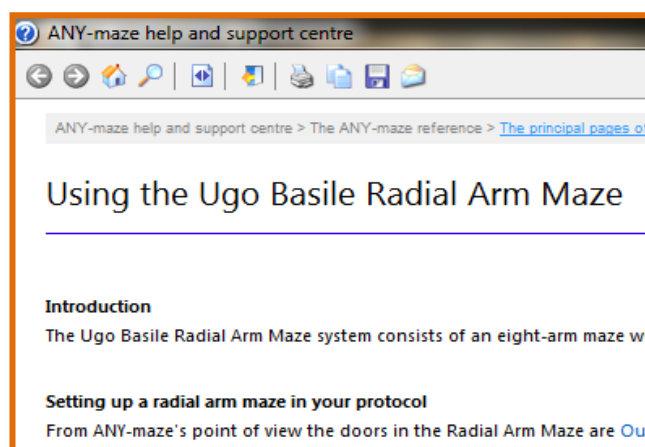
- Check door operation by clicking on the “bulb icons”. This will make the icon colour change and the door open/close.



- If the UB Radial Arm Maze does not show in the list of available devices, first make sure that it is correctly powered and connected.
- In case it still does not show up, click on Set up I/O ports and devices and make sure the Radial Arm Maze is enabled



- Once the initial check-up has been completed, a new experiment and protocol can be created, including the automatic operation of the doors.
- Refer to the ANY-maze Help section to create experiments and protocols



## 6 USING THE MULTI-MAZE WITH USB-TIMER SOFTWARE

### 6.1 Preliminary Steps

Before operating the Multi-Maze via the **USB-timer software**, follow these steps:

- 3) Install the USB-timer software on your PC, from the provided CD, by following the instructions on the screen;
- 4) Connect the Multi-Maze to the PC via the USB cable 52010-326;
- 5) Power the Multi-Maze by plugging the power supply;

The new hardware will be automatically recognized and installed

The USB-Timer is a microcontroller-based TTL generator that is embedded in the Radial Arm maze and can control the operation of the 8 doors, by simply connecting the maze to the PC via the provided USB cable. Notice that the USB-timer is only necessary if you are NOT using a Video-tracking software, such as ANY-maze, or if your video-tracking software cannot generate TTL pulses.

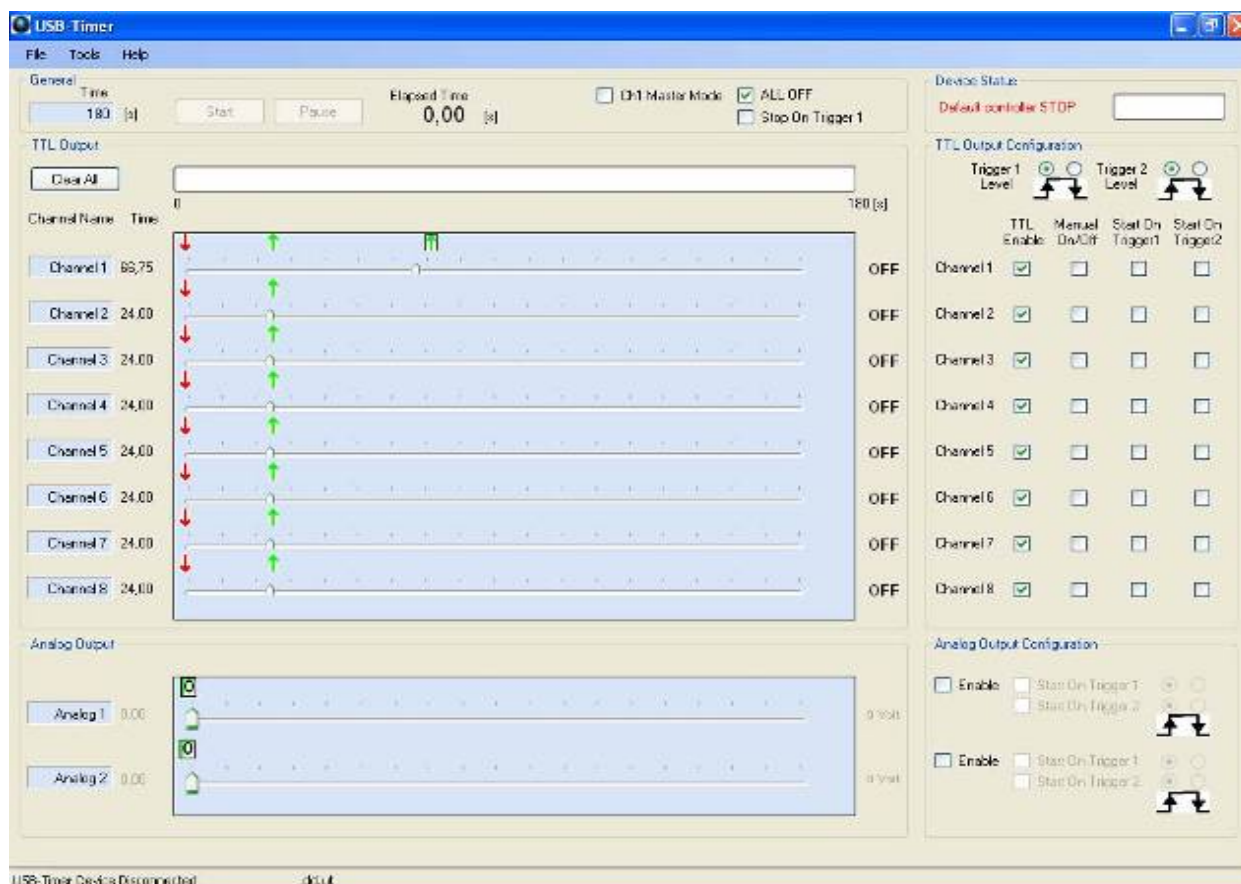
### 6.2 Operation

Once the above described steps have been properly followed, all the necessary software and drivers will be installed and the Multi-Maze is ready to be driven by the Ugo Basile USB-timer software.

First launch the USB-timer software by double-clicking on the USB-timer icon on your desktop or under the “Programs” menu.



A main commands window will appear, similar to the one below:



From this window, the doors can be programmed to open and close at preset times.

Programmable labels, such as CHANNEL NAME and EXPERIMENT TIME are indicated by gray text boxes. Changes to these text boxes can be made by double-clicking on the target site.

By default, CHANNEL NAME is set to Channel 1, Channel 2, etc. and EXPERIMENT TIME is set to 180 seconds.

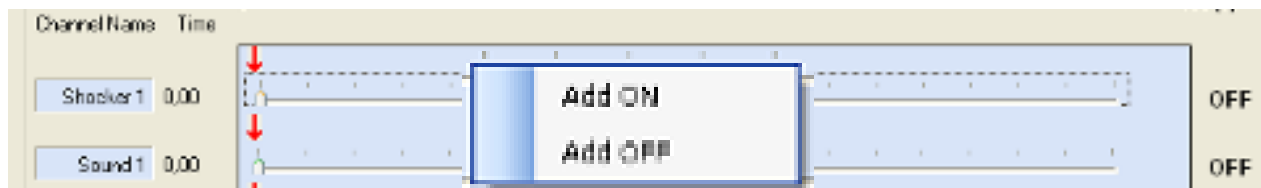
**NOTE :** once a parameter has been changed, make sure to press the “**Enter**” key to update the entry.

On first program start-up, all channels are set to the off state and at time zero (indicated by the red arrows at the beginning of each trace).

Subsequent program launches will re-install the settings from the previous run. However, the software will always present a defined setting, either on (green arrow) or off (red arrow), at time zero for each channel.

## 6.3 Programming Opening/Closure of the Doors

Programming opening/closure of the doors is achieved by right-clicking at the desired time point within each channel and selecting the desired transition (ON or OFF) from the pop-up menu.



Any number of transition events, in as many different channels as needed, can be programmed. In addition, the time position of any transition can be adjusted by clicking on the arrow and dragging the associated slider to a new position.



**Transitions can also be repositioned by use of the keyboard left and right arrow keys.** The minimum time resolution for positioning is 250 ms.

Any previously programmed transition can be removed by right-clicking on the arrow and selecting **DELETE** from the dropdown menu.

The ability to communicate transitions from the software to the hardware is set by selecting the TTL ENABLE checkbox to the right of each channel. Note that when TTL ENABLE is unselected, the associated MANUAL ON/OFF checkbox becomes active and selectable.

To the immediate right of each channel trace is a CHANNEL STATUS INDICATOR.

This indicator switches between OFF and ON and displays the current status of the corresponding channel as the time sweep moves through the transitions.

An “emergency” button is provided to turn all channels OFF at once. This is simply achieved by selecting the **ALL OFF** checkbox in the General sub-section of the main window. Alternatively, the Stop on Trigger 1 input may be used to turn all channels off via an external mechanism.

## 6.4 Configuration Data and Log Files

All parameters can be saved and recalled for later use as a configuration data file; to create a **configuration data file**, select File/Save File from the menu and give the file a unique name. Saved configuration data files have an .ut extension.

A **log file** containing a description of the system state (transition settings, total duration of experiment, etc.) may be saved at any time. LOG FILES are useful for recreating a lost configuration data file or as an output for your data logbook.

To create a log file, select Tools/Make Log from the menu. A LOG FILE with the name of the currently loaded protocol will be created, saved to disk, and displayed on screen.



## 6.5 Set-Up and Run an Experiment

A **typical procedure** to set up and run an experiment will consist of the following basic steps:

- Set the duration of the experiment
- Name each channel (e.g. Door 1, Door 2, etc.)
- Set the ON/OFF transition sequences for each channel.
- Enable all needed channels by checking the appropriate boxes. (TTL ENABLE)
- Save a configuration data file (optional).
- Run the experiment.

The experimental run can be executed by pressing the **START** button.

If triggering is enabled, sweeps will not actually start moving until the trigger condition is met.

Sweeps can be paused at any time during a run by pressing the **PAUSE** button. Once a run has been stopped, cursors can be quickly returned to the starting position by pressing the **RESET TIMERS** button.

## 7 MAINTENANCE

Ugo Basile Multi-Maze is covered by a 24-month warranty. Service, if necessary, has to be done by authorized UB personnel only; servicing by anyone other than an authorized service facility will void the warranty.

If a problem occurs, contact your representative, see paragraph 7.5-Customer Support.



**UNPLUG THE MAINS CORD BEFORE CARRYING OUT ANY MAINTENANCE JOB!**

### 7.1 Cleaning and Sterilization

Judicious cleaning aside, the maintenance does not require specific actions.

The actuators which operate the sliding doors located below the Central Platform do not require any adjusting or attention, but, as any precision mechanism, their operation could be impaired by fragments of food pellets, faeces or urine spills from the animal.

This should be rare as the gap between the sliding doors and the arm central platform is minimal. However, any particle or wet spot should be removed promptly.

The Multi-Maze may be wiped down with a dry, lint-free cloth. Clean only the case of the Controller using a damp, soft cloth; do not use chemicals or abrasive elements. The arm elements can be disassembled for thorough cleaning.

Under no circumstances allow moisture to penetrate the instrument. Unplug power cord from AC outlet before cleaning.

## 7.2 Disposal of Old Electrical & Electronic equipment

Applicable in the European Union and other European countries with separate collection systems



This product shall not be treated as household waste.

To reduce the environmental impact of WEEE (Waste Electrical and Electronic Equipment) and minimize the volume of WEEE entering landfills, please reuse and recycle.

Send to a recycling center equipped to handle electronics.

## 7.3 Abnormal conditions

Operate the instrument only as intended by the manufacturer. If you suspect the instrument protection has been impaired, disconnect the power cord and secure the instrument against any unintended operation.

The protection is likely to be impaired if, for example, the instrument shows visible damage or has been subjected to severe transport stress. Proper use of instrument depends on careful reading of all instruction and labels.

## 7.4 Long Inactivity

The instrument does not require any particular maintenance after long inactivity, except cleaning; please protect the instrument from dust while not in use.

## 7.5 Customer Support

For any further information you may desire concerning the use and/or maintenance of the Multi-Maze, 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 request via our web site <http://www.ugobasile.com/support/request-an-rma.html> 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.

## 8 ORDERING INFORMATION

### 8.1 Mouse Configurations

- 41503 **3-Arm configuration**, for **Y-maze test**, standard profile walls, automated doors, including Y and T arenas
- 41504 **3-Arm configuration**, and “Start” Compartment, for Y-maze and T-maze test, standard profile walls, automated doors, including Y and T arenas
- 41508 **8-arm Radial Maze configuration**, for Radial and Y-maze test, standard profile walls, automated doors, including 8-arm, Y and T arenas

\* The 41504 and 41508 configurations also enable the Y-maze test to be carried out, with no additional accessories

### 8.2 Rat Configurations

- 41513 **3-Arm configuration**, for **Y-maze test**, standard profile walls, automated doors, including Y and T arenas
- 41514 **3-Arm configuration**, and “Start” Compartment, for Y-maze and T-maze test, standard profile walls, automated doors, including Y and T arenas
- 41518 **8-arm Radial Maze configuration**, for Radial and Y-maze test, standard profile walls, automated doors, including 8-arm, Y and T arenas

\* The 41514 and 41518 configurations also enable the Y-maze test to be carried out, with no additional accessories

### 8.3 Components

- 41500-001 Multi-Maze Main Unit for Mouse, incorporating support base, motor controls and interface to external unit
- 41510-001 Multi-Maze Main Unit for Rat, incorporating support base, motor controls and interface to external unit
- 41153-010 Controller

- 41500-002 Standard Arm for Mouse, with automated door, and high profile (12cm h)
- 41500-012 Standard Arm for Rat, provided with automated door, and high profile (30cm h)
- 41500-003 “Start” Compartment for T-maze (Mouse), with automated door
- 41500-013 “Start” Compartment for T-maze (Rat), with automated door

## 8.4 Accessories

- M-LM 948-F Y-Maze Central Arena for Mouse
- M-LM 949-F T-Maze Central Arena for Mouse
- M-LM 961-F 8-Arm Radial Maze Central Arena for Mouse
  - Y-Maze Central Arena for Rat
  - T-Maze Central Arena for Rat
  - 8-Arm Radial Maze Central Arena for Rat
- 41504-320 Blank Wall for T-Maze - Mouse
- 41504-320 Blank Wall for T-Maze - Rat
- E-AU 041 USB pen-drive, including
  - 41500-302 Instruction Manual
  - 46000-011 USB-Timer Software
  - 41153-050 Multi-Maze Communication Software
- 41153-011 Control Unit Flat Cable
- 52010-326 USB Cable (5 metres)
- E-WP 008 Mains Cable
- E-FT 012 1.6A fuses (2)

## 8.5 Optional

- 60000 ANY-maze Software, see also [www.ub.anymaze.com](http://www.ub.anymaze.com)
- 41700-040 B/W USB Camera, including day&night 2.7-13.5mm varifocal lens, 5m USB cable and ceiling support

# 9 INSTRUMENT SPECIFICATIONS

## General

Computer compatibility	Direct connection to PC
Power Requirement	Universal input 85-264 VAC, 50-60Hz, 40 W max.
TTL Inputs	8
Door control	Manual, TTL, or by PC
Operating Temperature	10° to 40°C

Sound Level	Negligible
Pollution Degree	≤ 2

### Physical

Net weight	41503	19Kg	41513	Kg
	41504	22Kg	41514	Kg
	41508	32Kg	41518	Kg
Shipping Weight	41503	33Kg	41503	Kg
	41504	38Kg	41504	Kg
	41508	55Kg	41508	Kg
Packing Dimensions (full configuration)	No. 3 boxes 60x50x63cm		No. 3 boxes 60x50x63cm	
	Total weight 58Kg		Total weight Kg	
Arm Dimension	Length	35cm	Length	60cm
	Width	5cm	Width	10cm
	Height	12cm	Height	30cm
	(from walking floor)		(from walking floor)	
Dimension of the assembled system	41508	96x96x42(h)cm	41508	(h)cm

### Main Features

New proprietary modular system

Doors slide underneath the floor

Smooth and silent operation

Easily cleanable

Manual or PC-driven operation modes (via TTL or USB connection)

Interchangeable walls for egocentric or allocentric spatial memory tests, different colors or textures available on request

### Warranty

41500 is covered by a 24-month warranty

## 10 BIBLIOGRAPHY

### 10.1 Method Papers and Book Chapters

- Olton, D.S.; Samuelson, R.J.: **"Remembrance of places passed: Spatial memory in rats"** Journal of Experimental Psychology: Animal Behavior Processes, 2 (2): 97–116, **1976**
- Cunha et al. **"Brain-Derived Neurotrophic Factor (BDNF) Overexpression in the Forebrain Results in Learning and Memory Impairments"** Neurobiology of Disease: 358-368, **2009**

- Gitler et al. **“Different Presynaptic Roles of Synapsis at Excitatory and Inhibitory Synapses”** The Journal of Neuroscience, 24(50): 11368-11380, **2004**
- Tracey J. Shors **“Learning during stressful times”** Learning and Memory 11: 137-144, **2004**
- Edward D. Lewin **“Use of the Radial-Arm Maze to Assess LEARNING and Memory in Rodents”** Methods of Behavior Analysis in Neuroscience, ed. Jerry J. Buccafusco, CRC Press LLC, Boca Raton, Florida USA, **2001**
- Jacqueline N. Crawley **“What’s Wrong with my Mouse”**: Chapter 6 “Learning and Memory”, Wiley Inc., New York, USA, **2000**
- 



**We do the search for you: we weekly browse bibliography and link new papers to the bibliography section of each UB device.**

**Don't forget to check our web page periodically for updated bibliography!**

## This image shows a full page of handwriting practice paper. It features multiple sets of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is white, and the lines are a light blue or grey color. There is no text or other markings on the page.





# Notes

Handwriting practice lines consisting of 25 horizontal dashed lines.



## This image shows a full page of handwriting practice paper. It features multiple sets of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is white, and the lines are a light blue or grey color. There is no text or other markings on the page.





ugo basile®

TRANSFORMING IDEAS  
INTO INSTRUMENTS

## 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

PRODUCT: **MULTIMAZE**

CATALOG NUMBER **41500 (series)**

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

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

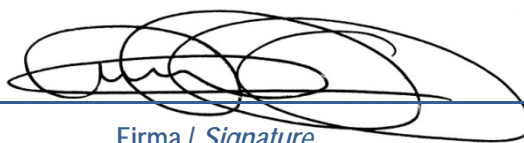
Account Manager

Mauro Uboldi

Nome / Name

October 2018

Date



Firma / Signature