

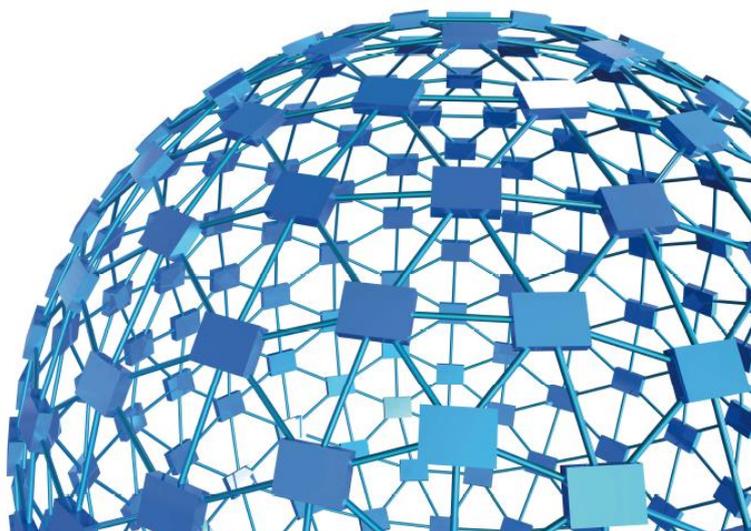


ugo basile®

TRANSFORMING IDEAS
INTO INSTRUMENTS

Instruction Manual

**Fear Conditioning Systems
Series 46000**



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instruction manual

**Fear Conditioning Systems
Series 46000**

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.

New Fear Conditioning System

Series 46100

General

The Ugo Basile Fear Conditioning Systems 46000 includes all the components to run experiments on mice or rats, according to the paradigms:

- Contextual Fear Conditioning
- Cued Fear Conditioning

The detection of **Freezing** is automated and based on video analysis. The **shock**, **light** and **sound** parameters are controlled by software (USB) or manually, via the new Electronic Unit, based on touch-screen technology.

System Configuration

A typical **Basic System** consists of:

- Controller with touch-screen
- Animal box with electrified floor and Context Kit (3 floors, 9 walls)
- Isolation Cubicle, with dual (visible/I.R.) light, speaker and fan

The **complete system** also include:

- Freezing-detection Software
- USB Videocamera

Preinstalled PC can be supplied as optional



Memory

Behaviour

NEW MODEL
all controls managed
by a single
Electronic Unit



tip!

this is part of
the **beehive**
cage-manager system;
buy a single touch-
screen controller, and
manage all UB
conditioning cages.
Ask for details!

Main Features

- AUTOMATIC detection of FREEZING also in Total Darkness
- Specific versions for rats or mice
- Multiple Cage Set-up (up to 16 cages, in groups of 4)

NEW on the 2014 version!

- The new "launcher" application, makes it possible to manage other UB behavioral cages with the same **Touch-Screen Controller 40500-001**; just purchase the hardware and the application software for the additional test!
- **Remote Control feature** will make remote service and software upgrades extremely simple!



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TRANSFORMING IDEAS
INTO INSTRUMENTS

CHECK-LIST

Series 46000 Fear Conditioning Systems

CLIENTE / CUSTOMER _____

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

UB code	CAT.No.	DESCRIPTION	46102	46152	46202	46252	46402	46452	46103	46153	46203	46253	46403	46453
	40500-001	Controller with 12" touch-screen	1	1	1	1	1	1	1	1	1	1	1	1
	46000-110	Fear Conditioning Software NG	1	1	1	1	1	1	1	1	1	1	1	1
	46000-590	Cubicle, with light & speaker	1	1	1	1	1	1	1	1	1	1	1	1
	46000-580	Expansion Cubicle, w/ light & speaker			1	1	3	3			1	1	3	3
	46002	Rat Cage, incl. context kit 46000-320	1	1	2	2	4	4						
	46003	Mouse Cage, incl. context kit 46000-321							1	1	2	2	4	4
	60000-FC	Software ANY-maze for FC		1		1		1		1		1		1
	47400-030	Videocamera Fire-I, with lenses, power supply, cable		1		2		4		1		2		4
	46000-302	Instruction Manual (on USB key)												
E-AU 041		USB Memory Key	1	1	1	1	1	1	1	1	1	1	1	1
	52010-323	USB cable	1	1	1	1	1	1	1	1	1	1	1	1
	HUB-7.0	7-port Hub USB 2.0, with power supply	1	1	1	1	1	1	1	1	1	1	1	1
E-AU 059		Hub Power Supply	1	1	1	1	1	1	1	1	1	1	1	1
E-AU 074		Power Supply	1	1	2	2	4	4	1	1	2	2	4	4
E-WP 042		3m Cable Connecting Expansion Cubicles			1	1	3	3			1	1	3	3
E-WP 008 E-WP 008-1		Mains Cable (EU) Mains Cable (EU)	1	1	2	2	4	4	1	1	2	2	4	4

OPTIONAL

UB code	CAT.No.	✓	DESCRIPTION
E-AU 075			Lux Meter
E-AU 058			Phonometer
	46000-PC		PC with Monitor, keyboard, mouse
	46000-150		I/O Box

DATE ____ / ____ / ____ Serial No. _____ PREPARATO DA / PACKED BY _____

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. _____

NOTE :

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Fear Conditioning Systems

Series **4 6 0 0 0**

1 GENERAL

1.1 Rationale for the technique

Fear Conditioning is a quick and reliable method to assess memory in rodents.

When rodents are exposed to fearful stimuli, they respond, among the others, with immobility behavior, also called “freezing”. All different Fear Conditioning procedures imply the measurement of the freezing response (*i.e.* the fraction of time spent immobile).

A rodent can learn to fear a previous neutral stimulus if that has been associated with an instinctively aversive one (such as an electric shock), or, in other terms, after having been conditioned.

After the conditioning has occurred, and the two stimuli have become associated, the animal is presented the neutral stimulus and, as a consequence, it will **freeze**¹. The time spent freezing is indicative of undergone memory and learning processes, which are at the basis of the association between neutral and aversive stimuli.

Fear Conditioning is a sensitive and quick test, which requires very little training (usually only one trial) to the animals. It is therefore a valuable tool for basic behavior research, as well as for high throughput and drug discovery studies. Moreover, the conditioning established during the Fear Conditioning procedure can be very strong (*i.e.* long-lasting), allowing for long term experiments.

1.2 Principle of Operation of the Fear Conditioning Systems

The Ugo Basile Fear Conditioning systems are designed to run experiments of Pavlovian conditioning on mice or rats.

Single-frequency sounds are delivered as neutral or conditioned, stimulus (CS). Experimental procedures which contemplate the sound as CS are usually referred to as **Cued Fear Conditioning**.

Electric current from the grid floor is delivered as the naturally aversive, or unconditioned stimulus (US).

Tests are run in an animal cage with a grid floor, whose appearance can be easily altered by attaching patterned contexts on the walls and floor. This allows for the

¹ Freezing is commonly defined as complete immobility, apart from respiratory movements

investigation of **Contextual Fear Conditioning**, in which the CS is not the sound but the visual appearance of the cage (*i.e.* the context) itself. In this case the animal associates the electric shock to the environment where it was received.

The detection of Freezing is automated and based on video analysis. The shock, light and sound parameters are controlled by software (USB) or manually, via the new Electronic Unit, based on touchscreen technology.

The context kit provided with each cage alter the animal cage appearance, allowing for both Contextual and Cued procedures to be run with the same system.

2 SYSTEM CONFIGURATIONS

The Ugo Basile Fear Conditioning System is available in three different configurations, ranging from the Basic System, to the Complete and Turn-Key systems.

2.1 Basic System, One Cage - 46102 (Rat) & 46103 (Mouse)

This system is indicated for laboratories that intend to score the freezing behaviour visually, without automatic detection, or that already own a freezing detection system (*e.g.* video-tracking analysis software and camera).

This system contains all the items that are necessary to condition rodents, both in a Cued and a Contextual Fear Conditioning experiment.

The **1-Cage Basic Fear-Conditioning Set-up** includes:

- **46002** Rat cage with electrified floor and contexts 46000-320
or
- **46003** Mouse cage with electrified floor and contexts 46000-321
- **40500-001** Touch-Screen controller for Conditioning Cages (master), with 12" touch screen, controlling light, sound and shock parameters in up to 4 FC cages
- **46000-110** Application Software NG
- **46000-590** Isolation Cubicle for Fear Conditioning Cages, including dual visible/I.R. light, and speaker. Dimensions 50(w)x40(d)x50(h) cm
- All the necessary cables and connectors are provided with the system.

2.2 Intermediate System, One Cage – 46152-S (Rat) & 46153-S (Mouse)

This system provides everything necessary to condition the animals automatically and measure the Freezing behaviour automatically, by a video detection system.

This set-up besides the components included in the Standard System, also contains:

- **47400-030** USB camera with IR lenses (for tests in total darkness)

- All the necessary cables and connectors are provided with the system.

The **Intermediate System** does not include the Freezing detection software, for customer who already own a suitable videotracking system.

2.3 Complete System, One Cage - 46152 (Rat) & 46153 (Mouse)

This system provides everything necessary to condition the animals automatically and measure the Freezing behaviour automatically, by a video detection system.

The **Complete System** besides the components included in the Standard System, also contains:

- **47400-030** USB camera with IR lenses (for tests in total darkness)
- **60000-FC ANY-maze Fear Conditioning Software** for freezing detection and stimulus timing
- All the necessary cables and connectors are provided with the system.

2.4 Turn-Key Systems

We also provide turn-key systems, ready-to-use, including a Windows-based PC, with LCD Monitor. Any-maze Fear Conditioning Software plus all necessary drivers are preinstalled on the PC and the assembled set-up is tested before delivery.

Cat. No. of PC with the described features is **46000-PC**.

2.5 Multiple Systems

The above systems are also available in **Multiple** configuration, to run up to 4 Fear Conditioning experiments simultaneously.

The standard Isolation Cubicle and Touch-Screen Controller, are replaced by the **46000-580** "Expansion" Cubicle which has a **slave-controller on board**.

Part Numbers for **Multiple Systems** are:

- **46202** Basic System, two Rats
- **46203** Basic System, two Mice
- **46402** Basic System, four Rats
- **46403** Basic System, four Mice

- **46252-S** Intermediate System, two Rats
- **46253-S** Intermediate System, two Mice
- **46452** Complete System, four Rats
- **46452-S** Intermediate System, four Rats
- **46453-S** Intermediate System, four Mice

- **46252** Complete System, two Rats
- **46253** Complete System, two Mice
- **46452** Complete System, four Rats
- **46453** Complete System, four Mice

Systems of more than 4 cages can be configured on request. Contact us for details (sales@ugobasile.com).

2.6 Individual Components and Accessories

Individual components and accessories can also be purchased; for a complete list of all available Fear Conditioning components and accessories, see paragraph 8-ORDERING INFORMATION.

2.6.1 FC Cage

Ugo basile Fear Conditioning Cages with Electrified Grid Floor are available in two models, with the following dimension

- **46002** Rat Box: inside dimensions : 26x26x30(h) cm
- **46003** Mouse Box: inside dimensions: 17x17x25(h) cm

The mouse electrified grid is an array of 2mm diam. bars, spaced 8mm apart; in the rat cage bars have a diameter of 3mm and are spaced 12mm apart.



A complete set of removable contexts is provided to alter the colour and texture of the box walls and floor, see also paragraph 1.1-Rationale for the technique.

Each animal box includes a kit with: 3 striped walls, 3 chessboard, 3 grey walls and 3 plastic floors (white, black, grey).

Custom contexts are available on request.

2.6.2 Touch-Screen Controller

The **40500-001 Touch-Screen Controller** is a powerful and versatile tool, which will function as main unit in a number of tests:

- a. Fear Conditioning - available
- b. Passive Avoidance - available

- c. Passive Step Down - available
- d. Active Avoidance - available
- e. Learned Helplessness - available
- f. Startle/Response - available for Mouse

For each test, a specific application software will be available for installation. Each software is sold separately, so it is easy to customize each controller according to the experimental needs. The software managing the FC test is 46000-110.

The application “**Launcher UB**” is installed on the 12” touch-screen (TS12).

When starting the system, the following screen will appear:



Figure 1 “Launcher”

The bottom left section of the screen shows the available applications, which appear as buttons, labelled with the name of the related test.

The color of the button indicates the application status, according as follows:



Light grey: software installed, but not enabled, it is necessary to enter the activation key



Dark Grey: software installed and active: press the button to run the application software.

The **46100-110 Software** comes pre-installed on the controller. In case an application software is not active it is necessary to enter the activation key.

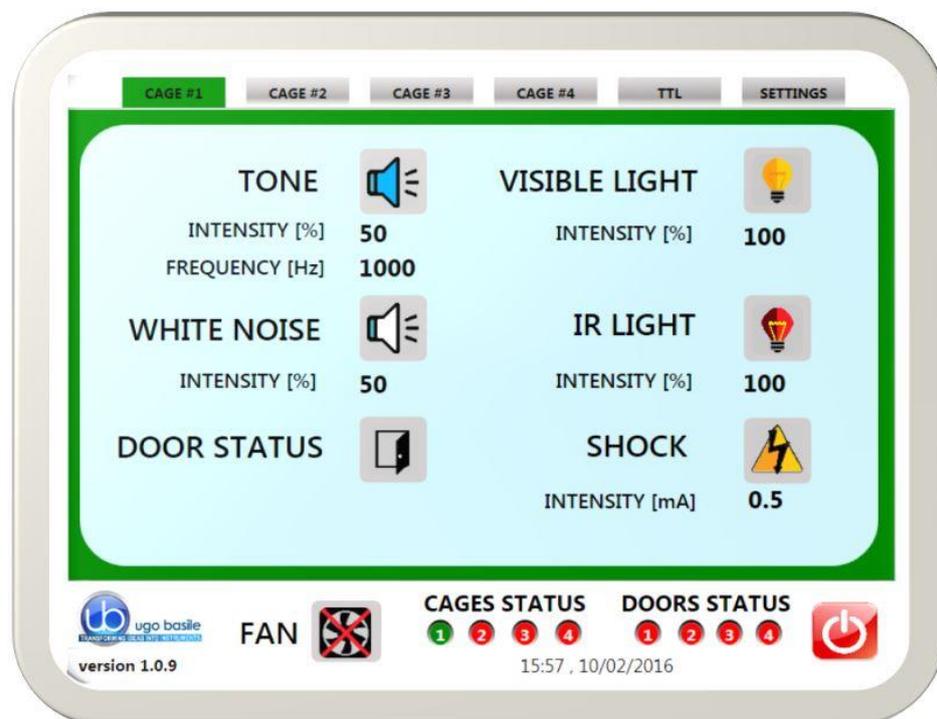


Also refer to the help section on the launcher menu on the Controller



Having run the F.C. application software, the 40500-001 becomes the main Controller Unit to perform FC test, with single or multiple cage setting.

The FC Controller consolidates all controls in a single, compact electronic unit, of attractive design.



On its **12" touch-screen**, via the user-friendly interface, the researcher sets the following parameters for each connected cage:

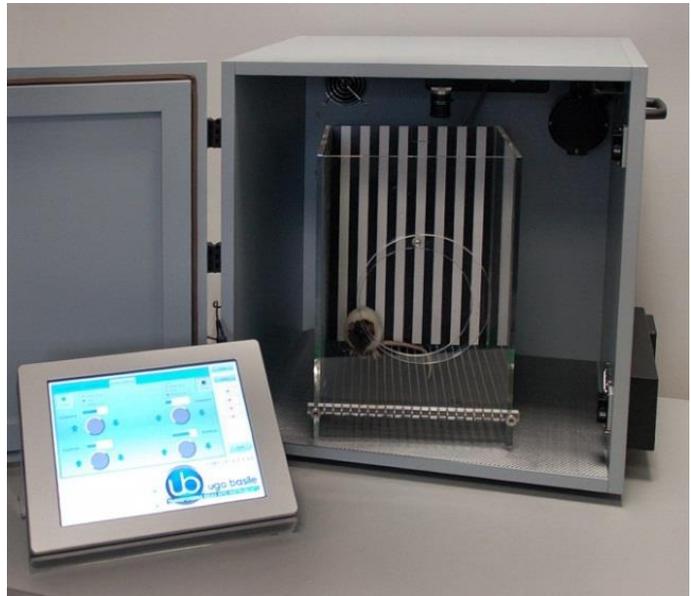
- **Sound and White Noise**, in the range 0-100%, see paragraphs 5.1.1 and 5.1.2. The speaker is positioned inside the Cubicle.
- **Visible Light**: variable from 0 to 100%, see paragraph 5.1.3
- **IR Light**: variable from 0 to 100%, see paragraph 5.1.4
- **Shock**: constant current (0 to 3mA in 0.1mA steps), see paragraph 5.1.5.

2.6.3 Isolation Cubicle

The new-design Isolation Cubicle **46000-590** includes:

- a **dual** (visible and I.R.) **LED light**
- a noiseless **fan**
- a **loudspeaker**
- a **fixture to hold the video-camera** (included in the Complete systems)

all conveniently positioned inside the cubicle.



Multiple-cage set-ups include expansion-cubicle/s **46000-580**, complete with the above and provided with their own controller (slave).

3 SYSTEM SPECS.

Warranty	
Warranty	Ugo Basile Fear Conditioning Systems are covered by a 24-month warranty.
Digital inputs	
Inputs	4
Input voltage	TTL input 0-5Vdc opto-isolated
Touch Screen Controller	
LCD	12" with resistive touch screen
CPU Module Port	2 USB Port 2.0; 1 Ethernet port 10/100Mb;1 DVI port for external monitor
Peripheral Port	4 output for Sound, Shock and light; 1 Power supply 12V-2A
Expansion Bus Connection	2 RJ11 connectors
ANY-maze Port	1 USB port type B (only for software connection)
Setting	
Shock	Constant current

Shock Intensity	from 0.1 to 2.9 mA, in 0.1 mA steps
Shock Duration	Duration: from 0 to 99 seconds
Visible Light	Variable from 0 to 100%
I.R. Light	variable from 0 to 100%
Sound	100Hz-18KHz, 0-100% (100%=100dB ±2dB) and white noise 0-100% (100%=72dB ±3dB)
Physical	
Power	80V/240Vac, 50/60 Hz
Dimensions	Cubicle 55(d) x 60(w) x 57(h) cm Controller 25(d) x 33(w) x 5.5(h) cm Mouse Cage 21(d) x 24(w) x 30(h) cm Rat Cage 30(d) x 34(w) x 41.5(h) cm
Shipping Dimensions	79x61x75 cm for each cage
Weight	35Kg, for each cage set
Shipping Weight	42Kg, approx. for each cage set

3.1 PC Requirements

For a correct operation, it is advisable to work with the following minimum features:

PC	MAC
HW Features <ul style="list-style-type: none"> • Intel3 (or higher) • RAM system 1Gbyte (or higher) • RAM video 128Mbyte (or higher) 	HW Features <ul style="list-style-type: none"> • Processor: Intel • RAM: 1G or more
Recommended Operating System <ul style="list-style-type: none"> • Windows XP, Vista, 7 or later • Space on Hard Disk 1Gbyte 	Recommended Operating System <ul style="list-style-type: none"> • OSX 10.5 and up

3.2 Intended Use

The 46000-Series fear Conditioning Systems are intended for investigation use on laboratory animals only.

3.3 Intended Environment

Storage Conditions:

- Temperature : 0°C to 40°C
- Humidity: 0 to 70%

Operating Conditions:

- Temperature : 10°C to 30°C
- Humidity: 0 to 60%

4 INSTALLATION

4.1 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 **Check List** supplied.

If the instrument is damaged or, after having tested it, fails to meet rated performances, notify the carrier and our company immediately.



Protect the environment!

Dispose of packaging properly, according to existing and applicable waste management rules and regulations.

4.2 Notes on the Instruction Manual

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

We recommend keeping the manual ready to be consulted by the qualified personnel who use the instrument.

Free of charge copies of the instruction manual are available upon request: please contact our service department (see paragraph 7.4-Customer Support) specifying the series number of your instrument.

4.3 ANY-maze Software



If you purchased a complete system, including ANY-maze FC or full license, make sure you install ANY-maze on your PC **first** and then connect FC system.

<http://ub.anymaze.com/downloads.htm>

4.4 Before Applying Power

The instrument is powered by a single external power supply, no manual voltage selection is required because instrument automatically adapts to line voltage.

4.4.1 Mains Cord

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

4.5 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



4.5.1 Additional Safety Consideration

- a. Place your system on a steady flat surface.
- b. Do not obstruct a comfortable access to the power module.
- c. Use original accessories and spare parts only, see paragraph 8.
- d. Immediately disconnect and replace damaged mains cord.
- e. Do not operate in hazardous environments or outside prescribed environmental limitations (i.e. +10C° / +40C°, 95% max. relative humidity, non-condensing)
- f. 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

see also paragraph 7-MAINTENANCE.

4.6 Setting Up a Basic System

The setup of the Standard Systems (46102/3, 46202/3, 46402/3) consists in the installation of:

- Isolation Cubicle
- Animal Cage
- Touch-Screen Controller

ANY-maze users will connect via USB the PC to the Touch-Screen Controller, via the HUB provided, see paragraph 4.3-ANY-maze Software.

Here is a view of the cubicle inside, where you can see, from left to right:

- the visible/I.R. light
- the fan

- the videocamera, and its ceiling fixture
- the speaker

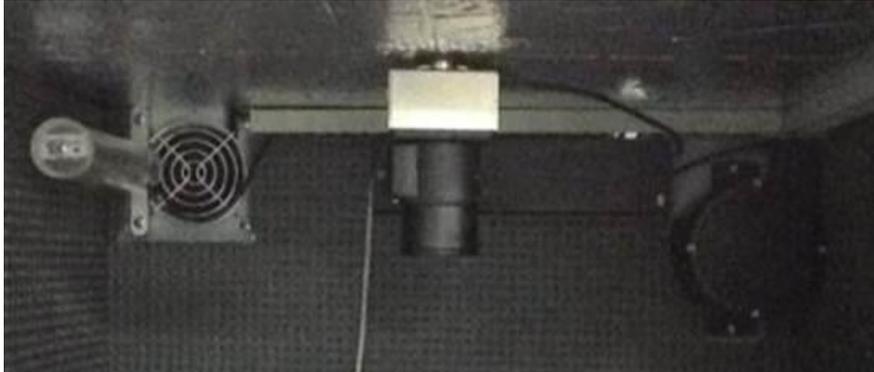


Figure 2 “View of the Cubicle Inside”

The videocamera is to be assembled on its mounting block, gliding on the clamp fixed on the cubicle ceiling.

4.7 Cage

Position the cage inside the cubicle.

Connect the D-SUB cable you find inside the cubicle, to the matching connector located on the back wall of the cage.

See picture

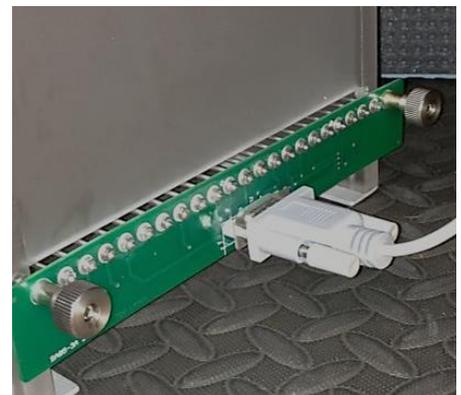


Figure 3 “Cage Connection”

4.8 Connections

4.8.1 Back Panel

Observe the back panel of the Touch-Screen Controller



Figure 4 “Controller, Back Panel”

And the back panel, with all connections:

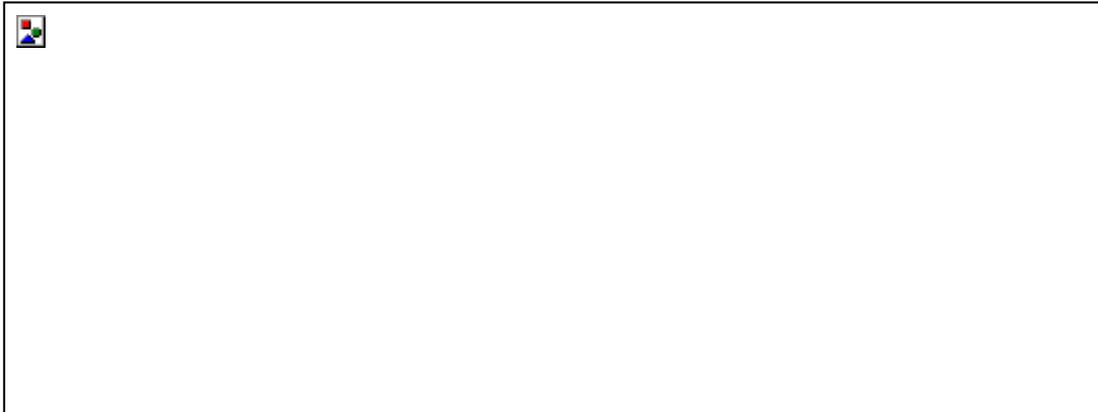


Figure 5 “Controller, Back-Panel Connections”

- **Connectors 1 to 4** go to cage 1 via the connectors provided on the back panel of cubicle 1. Possible mismatching is prevented by color coding:
 - **Connector 1** (grey color): shock
 - **Connector 2** (red color): light
 - **Connector 3** (black color): sound
 - **Connector 4** (blue color): fan and door-switch
- **I/C** for connection of I/O box 46000-150, when available (see paragraph 4.9-Setting up a Complete System)
- **BUS A-B** is the communication cable, which goes to the second cubicle (first expansion-cubicle), and from there to third and fourth cubicle in a daisy-chain (see paragraph 4.8.3, and related figure)
- **USB**: for connection to HUB
- **12V** for the power supply

4.8.2 Side Panel



Figure 6 “Controller, Side-Panel Connections”

On the side panel, please consider only the two USB ports, as other connectors are for factory use only.

- **USB**: This port is used for application software updates, see paragraph 5.3.1

4.8.3 Connecting the Main Cubicle and Expansion-Cubicles

Connections are arranged as follows on the back panel of the main cubicle:



Figure 7 “Main Cubicle, Back-Panel Connections”

You will notice the same color code as described in previous paragraph. Connectors are attached to the cage inside the cubicle, providing control for shock, light, sound, fan and door-switch.

On the back panel of cubicle 2 (expansion 1) and cubicle 3 (expansion 2), connections are arranged as follows, from left to right:

- Power supply
- Communication cable coming from the previous cubicle
- Communication cable going to the following cubicle
- 4 connectors to cage, with the color code described in previous paragraph



Figure 8 “Cubicle 2 & 3, Back-Panel Connections”

Finally, the following picture shows the last cubicle in the chain, cubicle 4 (expansion 3). Connections are identical to the previous picture, except there is no communication going out:

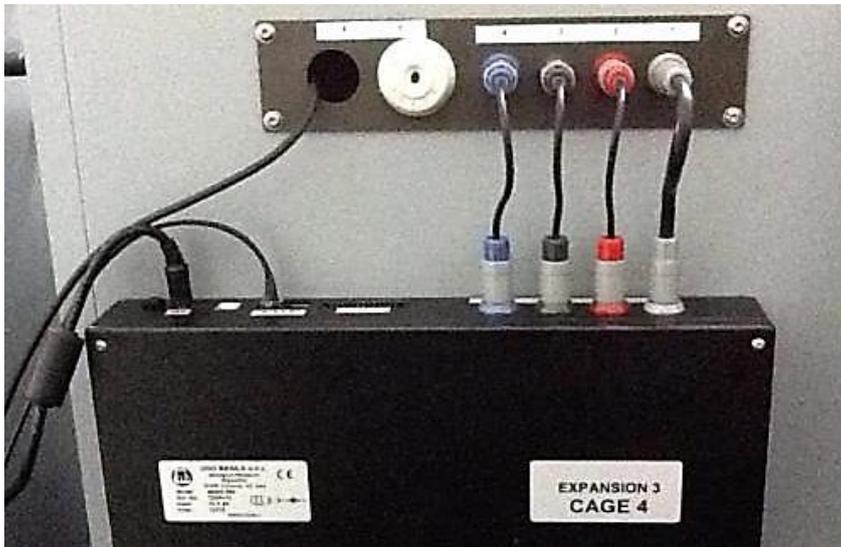


Figure 9 “Cubicle 4, Back-Panel Connections”

4.8.4 Hub/Videocamera Connections

A Hub is provided, for connection of USB videocameras, when the FC system is controlled by ANY-maze, see paragraph 6. The Hub connects to the touch-screen controller USB port positioned on the back panel, see paragraph 4.8.1.

Make sure the connection scheme follows the labels on the hub, see picture:



Figure 10 “Hub Labelling”

4.9 Setting up a Complete System



When installing a complete system, including ANY-maze full or FC license, make sure you install ANY-maze on your PC **first** and then connect FC system

Complete Systems (46152, 46153, 46252, 46253, 46452 & 46453) also incorporate:

- USB cameras
- ANY-maze Fear Conditioning (“Freezing” detection) Software

The ANY-maze Fear Conditioning Software operates both freezing detection and the stimulus (*i.e.* light, sound and shock) timing.

When controlled by the ANY-maze Software, the Fear Conditioning Controller can manage every event inside the cubicle.

The Help section within the ANY-maze Fear Conditioning Software describes in detail the installation of USB cameras, the use of the Ugo Basile Touch Screen and the configuration and functioning of the freezing detection tool.

A fully functioning ANY-maze demo version can be downloaded from the web site: <http://ub.anymaze.com/downloads.htm>

Important Note:

Any Basic System can be upgraded to a Complete System, by ordering the USB camera kit **47400-030** and the ANY-maze Fear Conditioning Software **60000-FC**.

See paragraph 8-ORDERING INFORMATION for details.

5 CONTROLS

From the touch-screen, the user can manually set the parameters for shock, light and sound events, which will be triggered by the TTL inputs from the I/O Box **46000-150**.



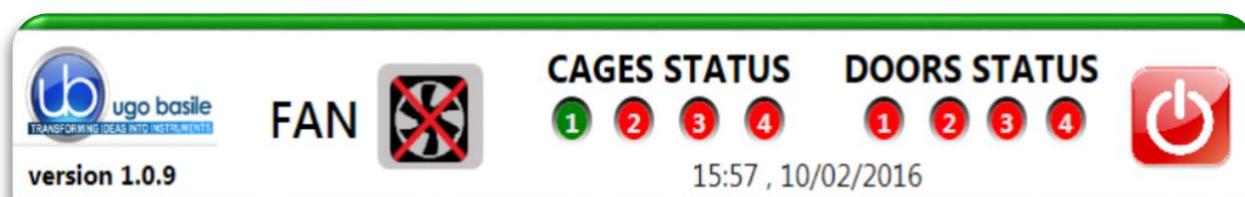
If your system is managed by ANY-maze, skip this section (paragraph 5) and refer to paragraph 6.

ANY-maze users can control the FC functions and setting directly via its USB-port, please refer to the ANY-maze HELP section.

In this case, all manually controlled functions are disabled.

The 12" touch-screen of the 40500-001 Controller is divided into 3 sections:

- the **upper** section encompasses a page for each cages connected to the set-up (up to 4), and the other available menus (TTL and SETTINGS)
- the **central** section is where settings are managed, see paragraph 5.1.
- the **bottom** provides information about the system: firmware version, status of cages 1-4 (**connected/non connected**), door status (**open/closed**)



The fan switch (ON/OFF) is available in the bottom section as well:



When this icon is pressed, the fan is activated on all the connected cages.



Select this command to switch off the fan on all the connected cages.

Finally, the ON/OFF button is also located in the bottom section.

5.1 Setting Cage Parameters

The parameters of light, sound and shock can be customized for **each cage** as described in the following paragraphs, please refer to *Figure 10 “Cage #1 General Controls”*.

The configuration can then be saved in the “SETTING” menu.

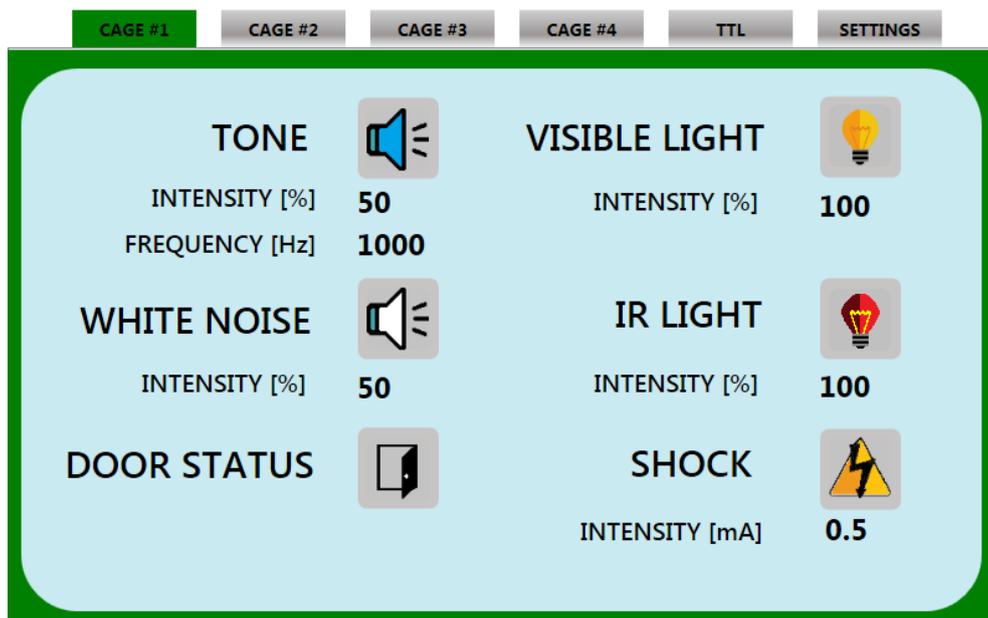


Figure 11 “Cage #1 General Controls”

5.1.1 Tone Setting



By selecting the Tone icon, the speaker positioned inside the cubicle is activated

The intensity and frequency values can be set by clicking on the figures nearby: a **virtual keyboard** will pop-up, enabling the values to be entered



INTENSITY [%]	50
FREQUENCY [Hz]	1000

INTENSITY: 0÷100% in steps of 1%, default value 50%

FREQUENCY: 100÷18.000Hz in steps of 100Hz, default value 1.000Hz

Factory Settings: Intensity 50% = 80dB ±1dB
Intensity 100% = 100dB ±2dB

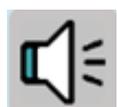


For intermediary settings we recommend using a **phonometer**.



By selecting this icon, the speaker is deactivated.

5.1.2 White Noise



By selecting the White Noise icon, the speaker positioned inside the cubicle is activated

Intensity values can be set by clicking on the figures nearby: a virtual keyboard will pop-up, enabling the values to be entered

INTENSITY [%]	50
---------------	----

INTENSITY: 0÷100% in steps of 1%, default value 50%

Factory Settings: Intensity 50% = 65dB ±3dB
Intensity 100% = 72dB ±3dB



For intermediary settings we recommend using a **phonometer**.



By selecting this icon, the speaker is deactivated.

5.1.3 Visible Light Setting



By selecting the Light icon, the light positioned inside the cubicle is switched on

The intensity and frequency values can be set by clicking on the figures nearby: a virtual keyboard will pop-up, enabling the values to be entered

INTENSITY [%]	50
---------------	----

INTENSITY: 0÷100% in steps of 1%, default value 50%



The light fixture can be rotated to obtain the best lighting conditions: it is advisable to direct the light towards the reflecting ceiling of the isolation cubicle. In this way the light will be uniformly diffused rather than direct.



By selecting this icon, the visible light is switched off.

5.1.4 I.R. Light Setting



By selecting the I.R. Light icon, the infrared light positioned inside the cubicle is switched on

The intensity and frequency values can be set by clicking on the figures nearby: a virtual keyboard will pop-up, enabling the values to be entered

INTENSITY [%] **50** **INTENSITY:** 0÷100% in steps of 1%, default value 50%



The light fixture can be rotated to obtain the best lighting conditions: it is advisable to direct the light towards the reflecting ceiling of the isolation cubicle. In this way the light will be uniformly diffused rather than direct.



By selecting this icon, the I.R. Light is switched off

5.1.5 Shock Setting



By selecting the shock icon, the shock is enabled

The intensity and frequency values can be set by clicking on the figures nearby: a virtual keyboard will pop-up, enabling the values to be entered

INTENSITY [mA] **0.5** **INTENSITY:** 0÷3mA in steps of 0.1mA, default value 0.5mA



By selecting this icon, the shock is disabled

5.1.6 Door Status



This icon indicates the door status: open or closed

The above described parameters are to be repeated for **all the cages** connected to the TS-controller.

When leaving a CAGE page, the active settings will be interrupted, and will be afterwards activated by TTL. All, except the I.R. light which, if switched on, remains active.

When a TTL input is given by the software managing the test, light, sound and shock will be activated with the values defined with the above described procedure.

When the setting for all the cages is complete, the configuration can be saved in the “SETTING” menu, see paragraph 5.3.

5.2 TTL Menu

In this menu, one of the available TTL inputs (from 1 to 4) is matched to one of four available outputs:

- light
- tone
- white noise
- shock

See Figure 11 “Cage #1 General Controls”.

The IR Light is not controlled by TTL: if it was switched on when defining the cage parameters, it will remain active.

During the experiment, the section **INPUT STATUS** indicates for each cage which TTL input is **active (green)** or non-active (**red**)    

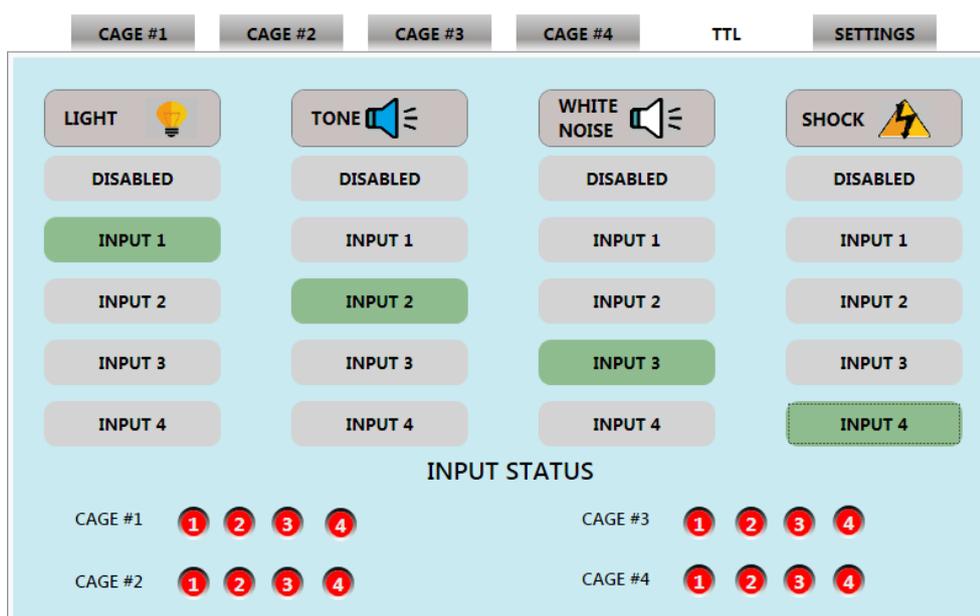


Figure 12 “TTL Menu”

5.2.1 Experiment with TTL Controls

When controlling an experiment via TTL, each cage is connected via an I/O box (Cat. 46000-150, which in turn is connected to the controller (Cage 1) or to the related expansion box (Cage 2 to 4). One I/O box for each connected cage.

In order to perform a TTL-controlled experiment, it is necessary to be on the **TTL** page. Moving to another page during the experiment will deactivate all the active outputs.

5.3 SETTING Menu

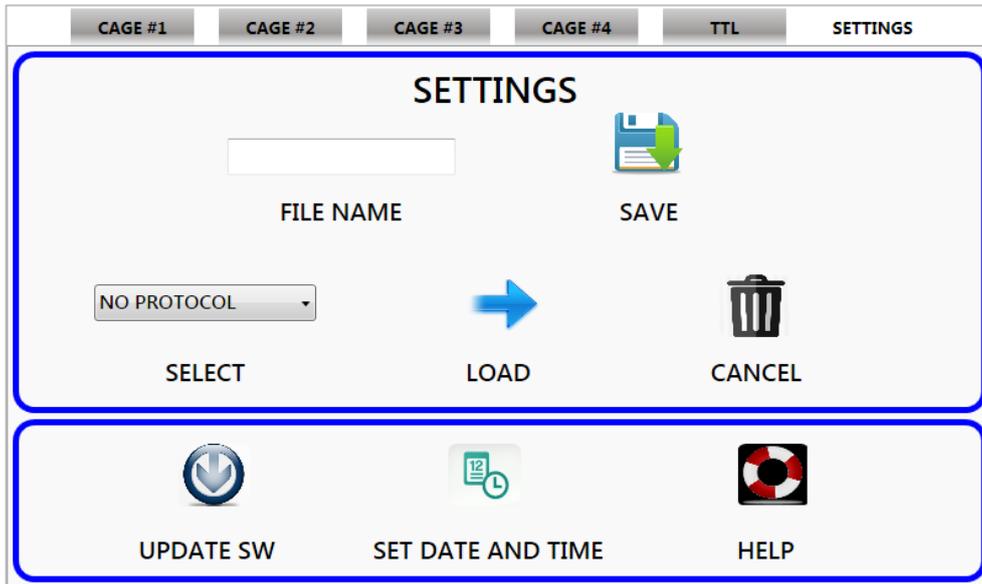


Figure 13 “SETTING Menu”

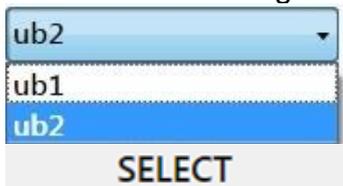
The upper section of this page is the SETTINGS window, managing cage configurations:



The command **SAVE** saves in the internal hard disk the configuration of inputs/outputs defined in pages CAGE #1, CAGE #2, CAGE #3, CAGE #4 & TTL, with the name indicated in the **FILE NAME** box




To recall an existing configuration, open the drop-down list



and select among the available configurations.

Press the **LOAD** icon to load the parameters for CAGE #1, CAGE #2, CAGE #3, CAGE #4 e TTL saved in the selected configuration.



This command permanently cancels from the hard disk the configuration selected in the drop-down list (ub2, in the example below)




5.3.1 Update SW

Upload the software update you received from Ugo Basile on a USB flash drive. Insert the flash drive on one of the two USB ports available on the side panel of the TS-controller, see paragraph and figure 4.8.2.



Wait at least 15 seconds, then press the UPDATE SW icon. Press OK to continue with the update.

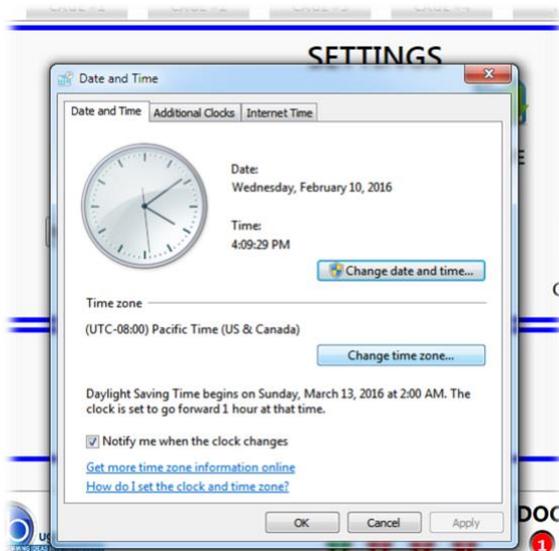


An error message will appear if the file is not available on the USB key or if the name is not correct.

5.3.2 Set Date and Time



This command sets time and date, opening the Windows date and time page:



To accept the setting, press OK.

5.3.3 Help



The HELP command opens the FC instruction manual in .pdf format



6 MANAGING THE TEST VIA ANY-MAZE

Connect the TS-Controller to a PC with an active ANY-maze licence (full or FC) on board, via the hub, see paragraph 4.8.4.

The screen will display the status of inputs and outputs for each individual cage connected to the set-up.

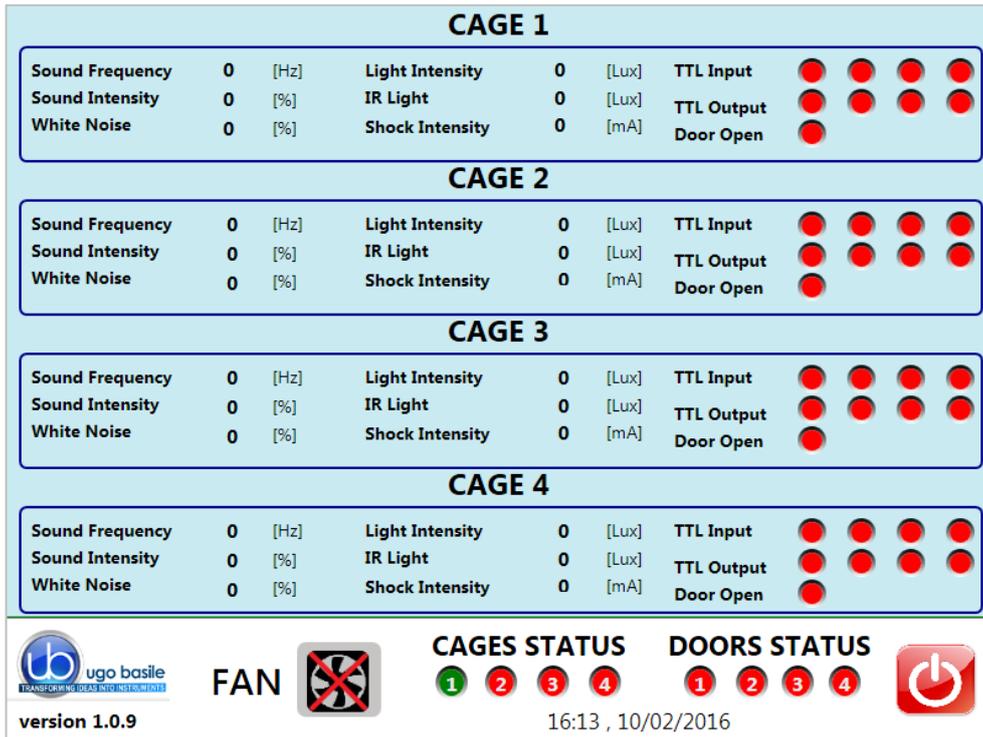


Figure 14 “ANY-maze status display”



When FC is managed by ANY-maze, the software controls all the FC functions and setting directly via the USB-port. **In this case, all manually controlled functions are disabled.**

Please also make reference to the ANY-maze HELP section.

7 MAINTENANCE

Ugo Basile Fear Conditioning Systems are 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 7.4-Customer Support.



7.1 Cleaning and Sterilization

The Fear Conditioning hardware 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.

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

7.2 Disposal

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 FC 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 depend on careful reading of all instruction and labels.

7.4 Customer Support

For any further information you may desire concerning the use and/or maintenance of the Fear Conditioning Systems series 46000, 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>

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

FC systems are delivered in a pliable wooden crate, to be stocked for future use: in case it is necessary to return the system for repair/control, whenever possible, make sure to use the original packing. We may not be held responsible for damages during transport due to poor packing:



UGO BASILE s.r.l.

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Phone : +39 0332 744574



service@ugobasile.com
logistics@ugobasile.com

sales@ugobasile.com

8 ORDERING INFORMATION

8.1 Basic Systems

46102	Basic Rat Single-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible and I.R. light and speaker, cage. "Freezing" detection software and videocamera not included
46103	Basic Mouse Single-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible and I.R. light and speaker, cage. "Freezing" detection software and videocamera not included
46202	Basic Rat Two-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible and I.R. light and speaker, complete expansion-cubicle, two cages. "Freezing" detection software and videocameras not included
46203	Basic Mouse Two-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible and I.R. light and speaker, complete expansion-cubicle, two cages. "Freezing" detection software and videocameras not included
46402	Basic Rat 4-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible and I.R. light and speaker, 3 complete expansion-cubicles, 4 cages. "Freezing" detection software and videocameras not included
46403	Basic Mouse 4-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible and I.R. light and speaker, 3 complete expansion-cubicles, 4 cages. "Freezing" detection software and videocameras not included

8.2 Intermediate Systems

46152-S	Rat Single-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, cage. Including videocamera without analysis software
46153-S	Complete Mouse Single-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, cage. Including videocamera without analysis software
46252-S	Complete Rat Two-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, complete expansion-cubicle, 2 cages. Including videocamera without analysis software
46253-S	Complete Mouse Two-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, complete expansion-cubicle, 2 cages. Including videocamera without analysis software
46452-S	Complete Rat 4-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, 3 complete expansion-cubicles, 4 cages. Including videocamera without analysis software

46453-S	Complete Mouse 4-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, 3 complete expansion-cubicles, 4 cages. Including videocamera without analysis software
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8.3 Complete Systems

46152	Complete Rat Single-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, cage. Including videocamera and software 60000-FC
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46153	Complete Mouse Single-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, cage. Including videocamera and software 60000-FC
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46252	Complete Rat Two-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, complete expansion-cubicle, 2 cages. Including videocamera and software
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46253	Complete Mouse Two-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, complete expansion-cubicle, 2 cages. Including videocamera and software
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46452	Complete Rat 4-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, 3 complete expansion-cubicles, 4 cages. Including videocamera and software
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46453	Complete Mouse 4-Cage Set-up, including controller with touch screen, application software, isolation cubicle with visible/I.R. light and speaker, 3 complete expansion-cubicles, 4 cages. Including videocamera and software
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8.4 Components

40500-001	Controller with 12" touch screen, controlling light, sound and shock parameters in up to 4 FC cages, including application software 46100-010
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46000-110	FC application software NG
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46002	Rat Cage for Fear Conditioning, with electrified grid floor, dimensions 25x25x35(h) cm
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46003	Mouse Cage for Fear Conditioning, with electrified grid floor, dimensions 17x17x25(h) cm
--------------	--

46000-590	Isolation Cubicle for Fear Conditioning Cages, including dual visible/I.R. light, and speaker. Dimensions 50(w)x(40)d)x50(h) cm
------------------	---

46000-580	Additional Isolation Cubicle for Fear Conditioning Cages, including dual visible/I.R. light, and speaker. Dimensions 50(w)x40(d)x50(h) cm. Slave-controller on board
------------------	--

60000-FC	Software ANY-maze for fear conditioning (freezing detection)
-----------------	--

47400-030	Complete BW Videocamera Fire-i, including standard and wide-angle lenses (without IR filter), power supply, FireWire 4.5m cable and 6to4 pin adaptor
------------------	--

46102-002	Additional Rat Cage for Fear Conditioning System, including cage and expansion-cubicle with controller on-board, visible/I.R. light and speaker. Videocamera not included.
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46103-003	Additional Mouse Cage for Fear Conditioning System, including cage and expansion-cubicle with controller on-board, visible/I.R. light and speaker. Videocamera not included.
------------------	--

HUB-7.0 7-port Hub USB 2.0, with power supply

9 BIBLIOGRAPHY

- P.L. Roubertoux et alia: “**Differential Brain, Cognitive and Motor Profiles Associated with Partial Trisomy. Modeling Down Syndrome in Mice**” Behavior Genetics 10.1007/s10519-017-9835-5: 1-18, **2017**
- Contestabile et alia: “**Zinc Supplementation in Rats Impairs Hippocampal-Dependent Memory Consolidation and Dampens Post-Traumatic Recollection of Stressful Event**” Eur. Neuropsychopharmacology 26(6): 1070-1082, **2016**
- D.W. Anderson et alia: “**Effects of Low Level Lead Exposure on Associative Learning and Memory in the Rat: Influences of Sex and Developmental Timing of Exposure**” Toxicology Letters 246: 57-64, **2016**
- Kubik-Zahorodna et alia: “**Neurological Deficits of an Rps19(Arg67del) Model of Diamond-Blackfan Anaemia**” Folia Biologica, 62: 139-147, **2016**
- D. Sierra-Mercado et alia: “**Controlled Cortical Impact Before or After Fear Conditioning does not Affect Fear Extinction in Mice**” Brain Research 1606: 133-141, **2015**
- S. Yusufshaq et alia: "Post-Weaning Social Isolation impairs observational fear conditioning" Behav. Brain Res. 242 (1): 142-149, **2013**
- Sirri et alia: “**Temporal Gene Expression Profile of the Hippocampus Following Trace Fear Conditioning**” Brain Research 1308 , 14-23, **2010**



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!

10 CERTIFICATIONS

CE Compliant, UL and cUL Listed

10.1 CE Declarations of conformity

The system meets requirements of EMC Directive 2004/108/EEC for Electromagnetic Compatibility and Low Voltage Directive 2006/95/EEC for product safety and 2011/65/UE on the restriction of use of hazardous substances in electrical and electronic equipment.

10.2 EMC Directive

- EN61326-1:2006

- EMC requirement for electrical equipment for measurement, control and laboratory use.

10.3 Electromagnetic emission

- EN 55011/A2:2002, Radiated and conducted emission (Class A)
- EN 61000-3-2/A2:2005 Harmonic Current Emission
- EN 61000-3-3/A2:2005 Voltage fluctuation and flickers

10.4 Electromagnetic Immunity

- EN 61000-4-2:2001 Electrostatic Discharge (2kV contact, 2kV air, 2kV Vert/Hor coupling planes)
- EN 61000-4-3:2006 RF Radiated electromagnetic field (3V/m, 80-1000MHz,;3V/m, 14000MHz – 2GHz)
- EN 61000-4-4:2004 Electrical fast transient (1kV on PSU Line, 0,5kV on IO Signal data and control lines)
- EN 61000-4-5:2006 Surges (1kV Main Lines, L-N,L-PE,N-PE)
- EN 61000-4-6:2007 RF Conducted Electromagnetic field (3Vrms, 0.15MHz – 80MHz)
- EN 61000-4-11:2004 Mains Dips and interruptions.

10.5 Low Voltage directive

- EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use.

10.6 UL and cUL certifications

- UL Standard UL 61010-1 2nd edition
- Canadian Standard: CSA-C22.2 No. 60101-1-04

Notes

A series of horizontal dashed lines for writing notes.





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. FEAR CONDITIONING SYSTEM - SERIES 46000
Catalog number Rat series: 46102, 46152, 46202, 46252, 46402, 46452
Mice series: 46103, 46153, 46203, 46253, 46403, 46453

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

- *2006/95/CE relating to electrical equipment designed for use within certain voltage limits*
- *2004/108/CE relating to electromagnetic compatibility*
- *2011/65/UE on the restriction of the use of certain hazardous substances in electrical and electronic equipment*

Account Manager

Adriano Basile

Nome / Name

April 2014

Date

Firma / Signature