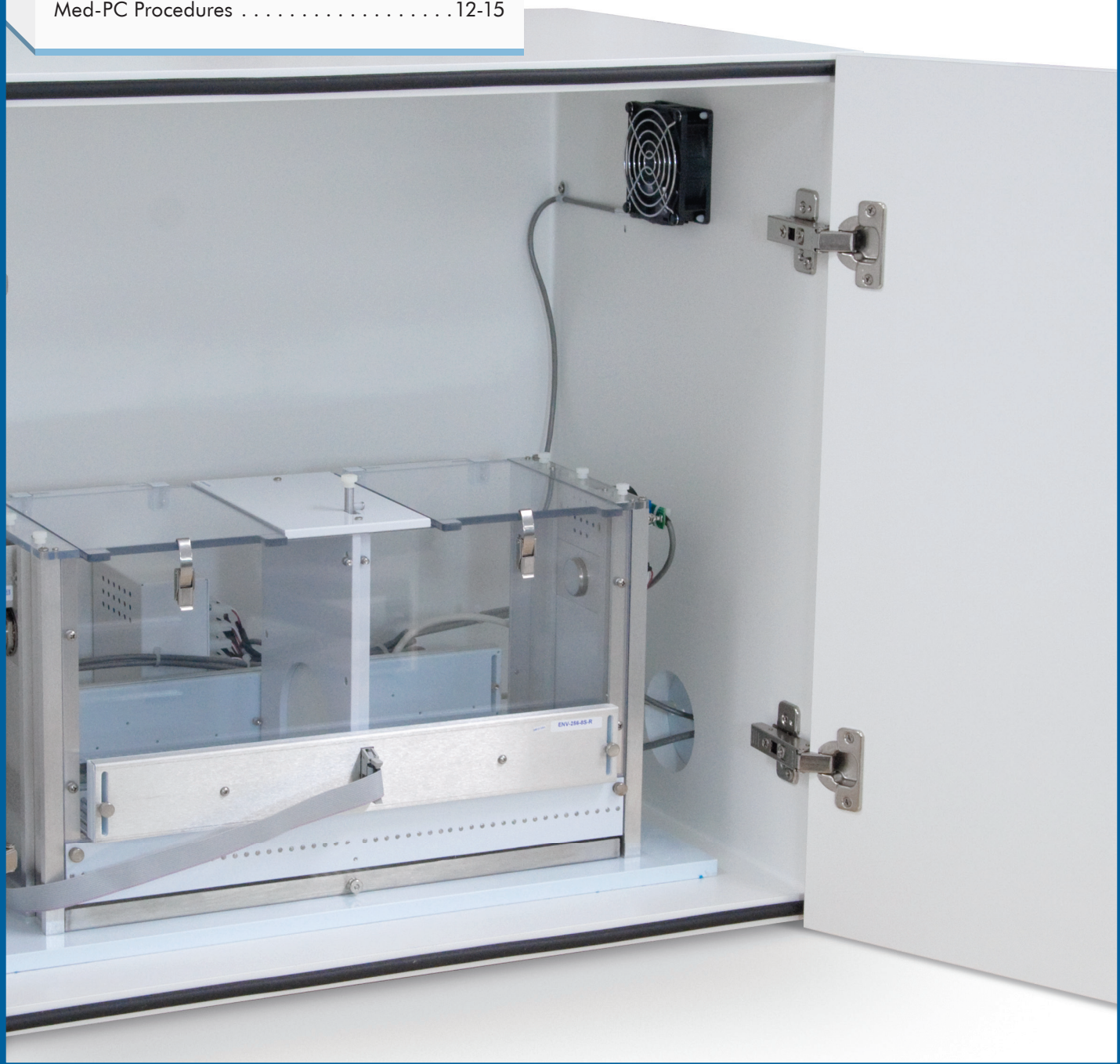


SHUTTLE BOX

Overview	2-3
Standard Packages	4-5
Extra Large Packages	6-7
Components	8-11
Med-PC Procedures	12-15



COMPUTER HARDWARE

- Minimum recommended:
 - Windows 7
 - Intel i3 processor equivalent)
 - 8GB RAM
 - USB, PCI (full height), or PCI-e port depending on interface package
- Or, ask about our Deluxe Computer & Monitor Package (COM-106-NV), which we constantly update for optimal performance with our equipment.

COMPUTER SOFTWARE

Med-PC V

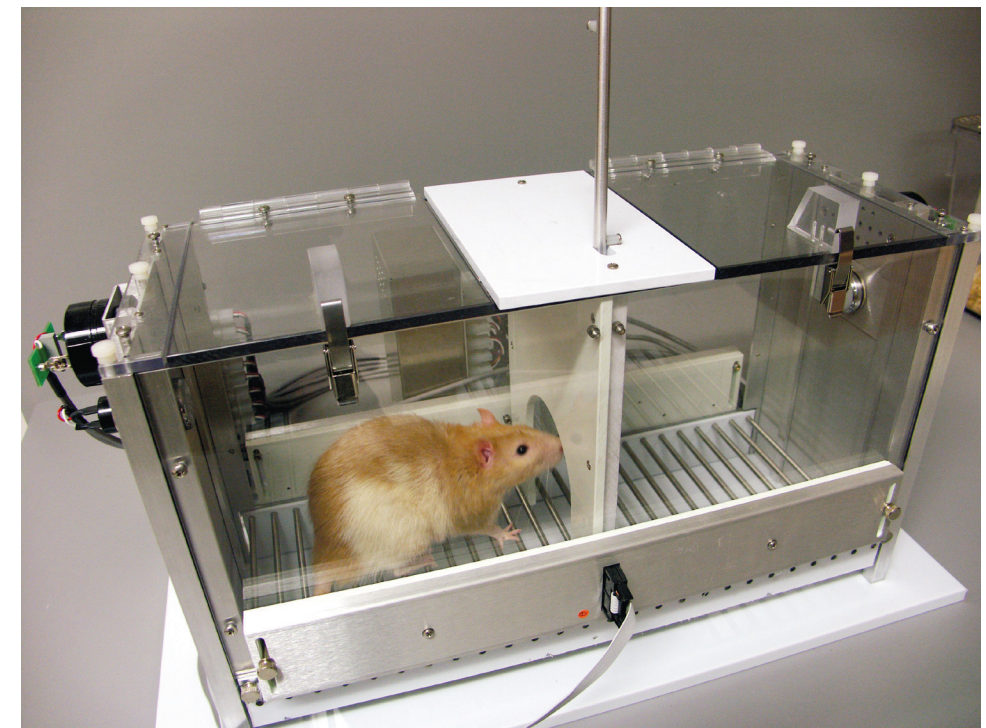
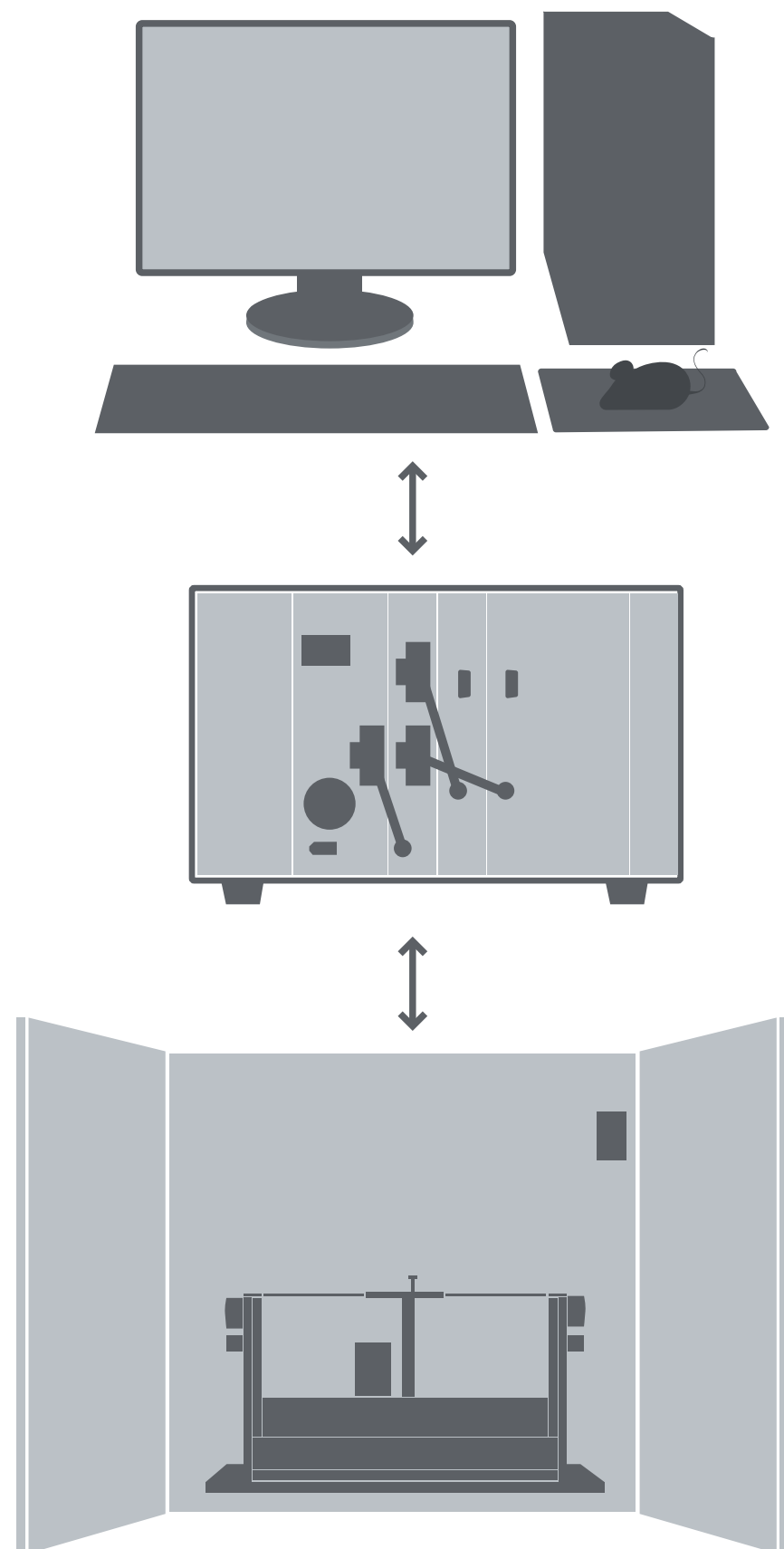
Medstate notation utilities

INTERFACE CABINET

- Small tabletop interface cabinet
- Dual range constant current aversive stimulator module
- Grid floor scrambler module
- Dual shock control module
- SmartCtrl or SuperPort interface modules
(see Power & Control Interface brochure)

CHAMBER & SAC

- Small tabletop interface cabinet
- IR transmitter & receiver strips
- IR controller
- Sonalert module
- Extra tall sound attenuating cubicle
- Modular shuttle box
- Quick disconnect grid floor harness
- Stainless steel grid floor
- Opaque fabric cover (optional)
- Automatic or manual door



PROTOCOL SUMMARIES

ACTIVE AVOIDANCE

Active avoidance is a test in which subjects learn to avoid an aversive stimulus. The animal is placed in a two-compartment shuttle box and have to learn the association between a conditioned stimulus (e.g. light) and an unconditioned stimulus (e.g. foot shock.)

Subjects give a conditioned response when they avoid receiving the shock, by moving to the opposite compartment during the CS presentation (avoidance response).

If animals do not act, foot shock is delivered, but it can be escaped by moving to the opposite compartment (escape response).

This test is also used for assessing depressive-like symptoms in animals involved in a "learned helplessness procedure". In this context, the use of a previous inescapable shock session has profound and long-lasting disruptive effects on the ability of the animals to learn to escape shocks. This escape deficit can be prevented by administering antidepressants.

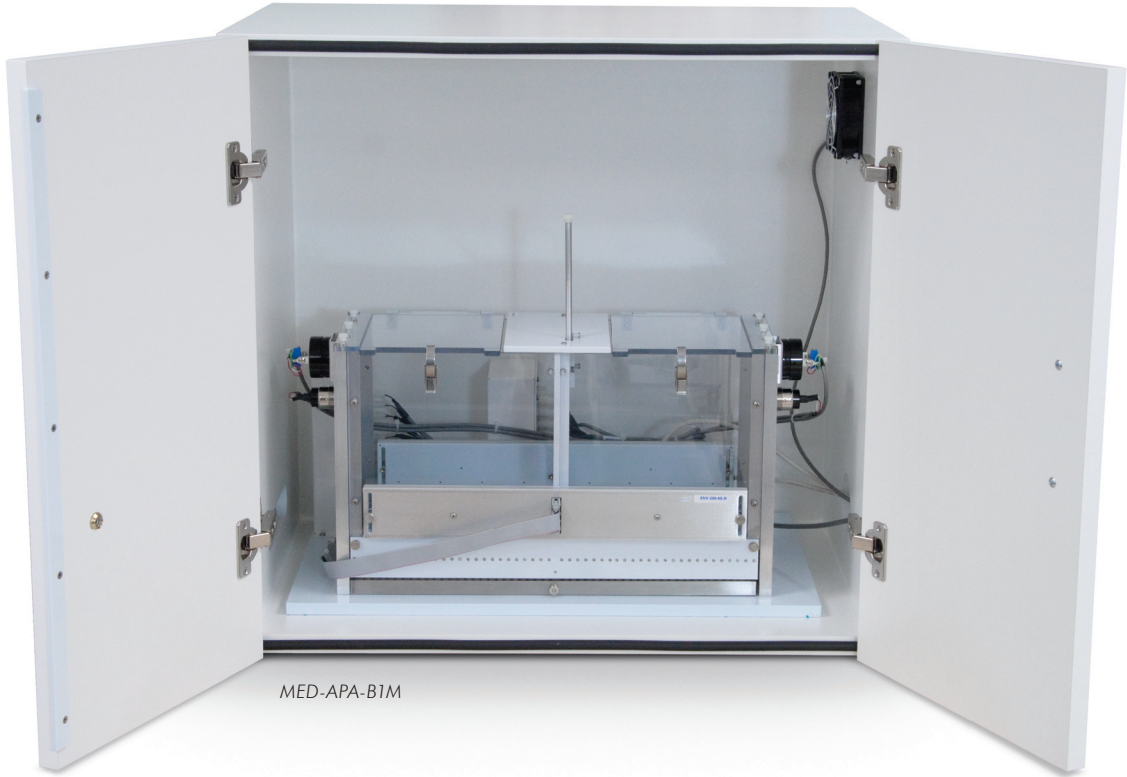
PASSIVE AVOIDANCE

Passive avoidance is a fear-motivated test typically used to assess short or long-term memory on small laboratory animals. It requires the subjects to behave contrary to their innate tendency to prefer dark areas and avoid bright ones.

During the acquisition/conditioning phase the animal is placed in a white compartment. When the animal crosses to the other half, into the black compartment, it receives a mild foot shock. Because of this, the animal learns that moving to the dark compartment has negative consequences.

During the test phase the animal is again placed in the white compartment and the passive avoidance response is evaluated. As opposed to an avoidance that entails active movement to avoid an aversive stimulus, the avoidance of the dark compartment requires the animal to remain in the white compartment and, therefore, the absence of movement; namely passive avoidance response.

Memory performance is positively correlated with the latency to escape from the white compartment; the better the recollection, the greater the latency.



SHUTTLE BOX TEST PACKAGE
BASIC

MED-APA-B1M **MOUSE** | **STANDARD** | **MANUAL DOOR**
MED-APA-B1R **RAT** | **STANDARD** | **MANUAL DOOR**

- Designed for an active avoidance paradigm
- Chamber divided in two by either a manual door or hurdle

SHUTTLE BOX TEST PACKAGE
DELUXE

MED-APA-D1M **MOUSE** | **STANDARD** | **AUTO DOOR**
MED-APA-D1R **RAT** | **STANDARD** | **AUTO DOOR**

- Designed for active/passive avoidance, and many learned helplessness paradigms
- Chamber divided in two by an automatic door

- Shuttle box chamber is the same for both rats and mice.
 - Conversion requires simply changing out the grid floor and adjusting the height of photobeam sensors.
- Four independent infrared photobeams on each side of the chamber for accurate measurement of activity.
 - More reliable and higher resolution than a tilting floor, pressure plate, or single photobeam solution.
- MDF sound attenuating cubicle limits distractions during testing.
- Stimulus light and Sonalert tone generator on each side.
- Grid floor is equipped with our patented quick disconnect harness for aversive stimulation delivery to either side of the chamber floor and makes for easier clean-up.
- Up to sixteen (16) chambers can be controlled with one computer, either a desktop or laptop.*

NOTE: Computer, power + control interface, and software are not included. Order the MED-SYST-8-USB package to run up to eight chambers, or the MED-SYST-16-USB for up to sixteen.

SG-6080C shown with ENV-410C, ENV-412C, and ENV-415C



PACKAGE CONTENTS

A = MED-APA-B1M C = MED-APA-D1M
B = MED-APA-B1R D = MED-APA-D1R

#	SKU	DESCRIPTION	A	B	C	D
1	ENV-018MD	Extra Tall MDF Sound Attenuating Cubicle	A	B	C	D
1	ENV-010MC	Center Channel Modular Shuttle Box	A	B	C	D
1	ENV-010MA-GF	Stainless Steel Grid Floor for Mouse	A		C	
1	ENV-010MB-GF	Stainless Steel Grid Floor for Rat		B		D
2	ENV-221M-LED	Stimulus Light, LED, White	A	B	C	D
1	ENV-010A	Manual Door	A	B		
1	ENV-010B2	Auto Door			C	D
1	ENV-010C	Opaque Fabric Cover	A	B	C	D
2	ENV-223AM	Sonalert Module w/Volume Control	A	B	C	D
1	ENV-010MA-QD	Quick Disconnect Grid Floor	A		C	
1	ENV-010MB-QD	Quick Disconnect Grid Floor		B		D
1	ENV-410C	Dual Range Constant Current Aversive Stimulator	A	B	C	D
2	ENV-412C	Grid Floor Scrambler Module, Solid State	A	B	C	D
1	ENV-415C	Dual Shock Control Module	A	B	C	D
1	DIG-716P2	SmartCtrl Package, 8 In/16 Out	A	B	C	D
1	SG-6080C	Small Tabletop Interface Cabinet	A	B	C	D
1	ENV-253C	IR Controller, 8 Channel	A	B	C	D
1	ENV-256-8S	Photo Beam Shuttle Box Sensor Strips	A	B	C	D
8	SG-216A-2	Mini-Molex Extension, 3-Pin, 2' (61 cm)	A	B	C	D
2	SG-219G-10	Shock Output Cable, DB-9, ^M / _F , 10' (3.04 m)	A	B	C	D
1	SG-219SA	Shock Control Cable, 15' (4.57 m)	A	B	C	D

NOTE: See "Power + Control Interface" brochure for descriptions and specs for SmartCtrl and Superport interface components and cables, and "Operant Conditioning & General Behavior" brochure for aversive stimulation equipment



EXTRA LARGE SHUTTLE BOX
TEST PACKAGE BASIC

MED-APA-B1XL RAT | X-LARGE | MANUAL DOOR

- Designed for active avoidance paradigm
- Chamber is divided into two sections by either a manual door or plastic hurdle

EXTRA LARGE SHUTTLE BOX
TEST PACKAGE DELUXE

MED-APA-D1XL RAT | X-LARGE | AUTO DOOR

- Designed for use in active/passive avoidance, and many learned helplessness paradigms
- Chamber is divided into two sections by an auto-matic door

- Extra large shuttle box chamber is available for rats only.
- Four independent infrared photobeams on each side of the chamber for accurate measurement of activity.
 - More reliable and higher resolution than a tilting floor, pressure plate, or single photobeam solution.
- MDF sound attenuating cubicle limits distractions during testing.
- Stimulus light and Sonalert tone generator on each side.
- Grid floor is equipped with our patented quick disconnect harness for aversive stimulation delivery to either side of the chamber floor and makes for easier clean-up.
- Up to sixteen (16) chambers can be controlled with one computer, either a desktop or laptop.

NOTE: Computer, power/control interface, and software are not included. Order the MED-SYST-8-USB package to run up to eight chambers, or the MED-SYST-16-USB for up to sixteen.

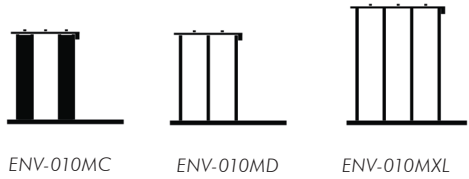
SG-6080C shown with ENV-410C, ENV-412C, and ENV-415C



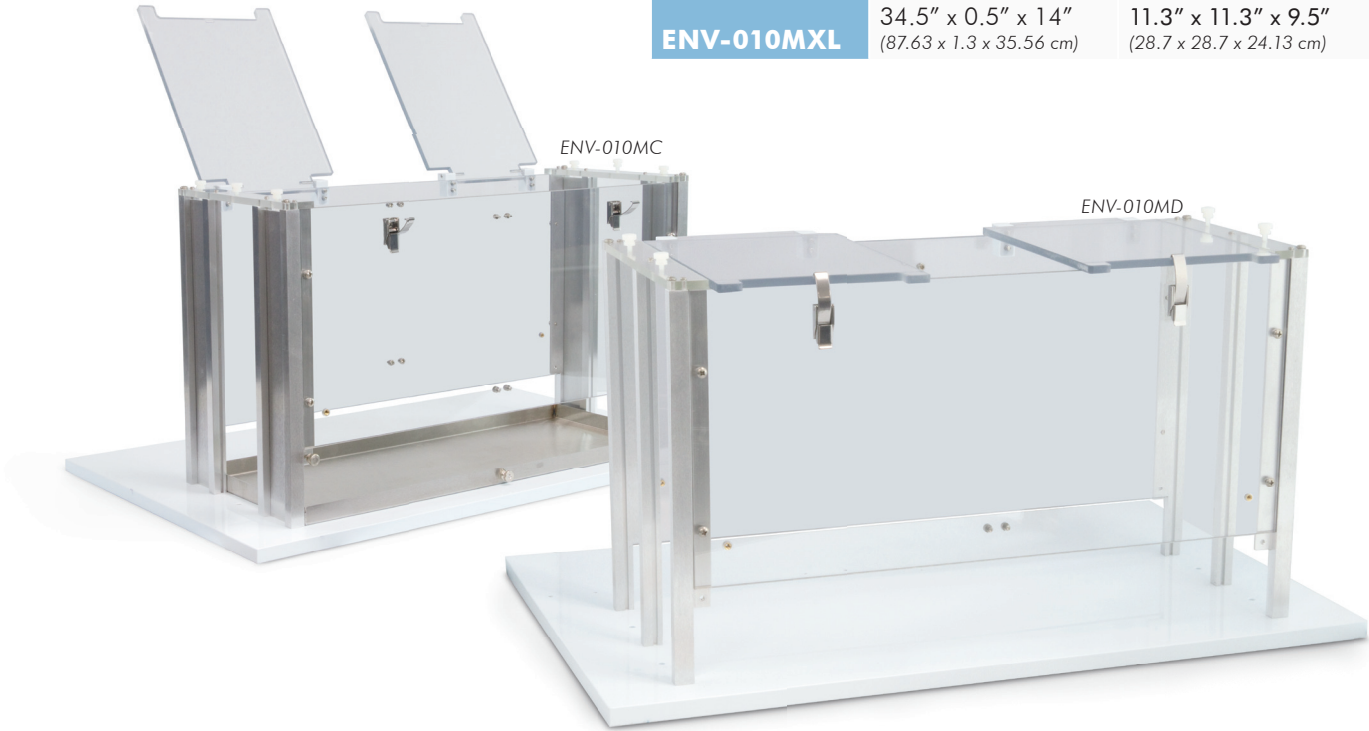
PACKAGE CONTENTS

A = MED-APA-B1XL			B = MED-APA-D1XL	
#	SKU	DESCRIPTION	A	B
1	ENV-020M	MDF Sound Attenuating Cubicle	A	B
1	ENV-010MXL	Shuttle Box, Extra Large <i>for Rat</i>	A	B
2	ENV-005FPU-R	Quick Change Floor/Pan Unit <i>for Rat</i>	A	B
1	ENV-010AXL	Manual Door, Extra Large	A	
1	ENV-010BXL	Auto Door, Extra Large		B
1	ENV-013IR-2	IR Detector Package	A	B
2	ENV-221M-LED	Stimulus Light, LED, White	A	B
2	ENV-223AM	Sonalert Module w/Volume Control	A	B
1	ENV-410C	Dual Range Constant Current Aversive Stimulator	A	B
2	ENV-412C	Grid Floor Scrambler Module, Solid State	A	B
1	ENV-415C	Dual A/B Shock Control Module	A	B
1	DIG-709A	Power Distribution Panel, 28V DC	A	B
1	DIG-713A	SuperPort 16 Input Module, TTL	A	B
1	DIG-721	Standard 8 Output Module	A	B
1	SG-215D3	Passive Connection Panel	A	B
1	ENV-256C	IR Controller, 16 Channel	A	B
1	SG-6080C	Small Tabletop Interface Cabinet	A	B
1	SG-210A	Universal Cable, 12 Conductor, 25' (7.62 m)	A	B
1	SG-210CP-2	Power Cable, 2' (61 cm)	A	B
1	SG-210TTL-20	Cable w/Shielded Power Leads, DB-25, 20' (6.1 m)	A	B
1	SG-211P	Interface Cable, 12 Conductor, 3' (0.9 m)	A	B
2	SG-219G-10	Shock Output Cable, DB-9, ^M / _F , 10' (3.04 m)	A	B
1	SG-219SA	Shock Control Cable, 15' (4.57 m)	A	B

NOTE: See "Power + Control Interface" brochure for more information on SmartCtrl and Superport interface components and cables, and "Operant Conditioning & General Behavior" brochure for aversive stimulation equipment.



	BASE (W×H×D)	COMPARTMENT (W×H×D)
ENV-010MC ENV-010MD	21" x 0.5" x 13.5" (53.3 x 1.3 x 34.3 cm)	8" x 8" x 6.29" (20.32 x 20.32 x 15.98 cm)
ENV-010MXL	34.5" x 0.5" x 14" (87.63 x 1.3 x 35.56 cm)	11.3" x 11.3" x 9.5" (28.7 x 28.7 x 24.13 cm)



EXTRA LARGE SHUTTLE BOX
THREE MODULAR CHANNELS

ENV-010MXL **RAT** | **3 CHANNEL**

- Ideal for special applications with multiple response levers and/or dispensers
- White polypropylene base, clear polycarbonate door and rear panel
- Three sturdy aluminum channels securely hold any modular component
- Includes a stainless steel waste pan and quick disconnect harness (ENV-010MXL-QD)

SHUTTLE BOX
CENTER MODULAR CHANNEL

ENV-010MC **MOUSE+RAT** | **1 CHANNEL**

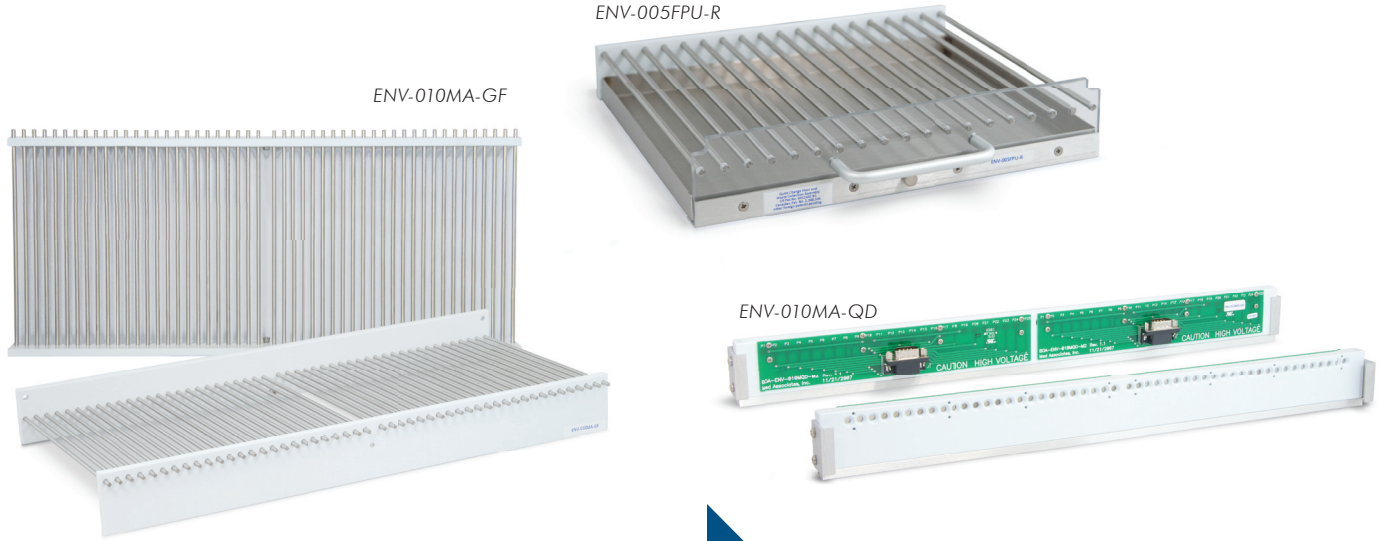
SHUTTLE BOX
DUAL MODULAR CHANNELS

ENV-010MD **MOUSE+RAT** | **2 CHANNEL**

- White polypropylene base, clear polycarbonate door and rear panel
- Sturdy aluminum channels securely hold any modular component
- Includes a stainless steel waste pan

	ROD DIAMETER	ROD LENGTH	ROD SPACING*	ROD TOTAL	QUANTITY PER CHAMBER
ENV-010MA-GF	0.125" (0.32 cm)	6.29" (16 cm)	0.319" (0.81 cm)	50	1
ENV-010MB-GF	0.187" (0.47 cm)	6.29" (16 cm)	0.625" (1.6 cm)	26	1
ENV-005FPU-R	0.19" (0.47 cm)	9.53" (24.2 cm)	0.625" (1.59 cm)	19	2

*center to center



STAINLESS STEEL GRID FLOOR

ENV-010MA-GF **MOUSE** | **STANDARD**
ENV-010MB-GF **RAT** | **STANDARD**

- Have extra floors on hand for maximum throughput by minimizing cleaning time between animals
- Stainless steel grid rods mounted in white polypropylene supports
- Floor is easily removed via two thumbscrews for cleaning
- Add the quick disconnect harness for aversive stimulation and/or contact lickometer applications

QUICK CHANGE FLOOR
w/WASTE PAN

ENV-005FPU-R **RAT** | **X-LARGE**

- Combines a removable stainless steel waste pan and floor into one unit
- Floor can be changed easily between subjects for improved throughput

QUICK DISCONNECT
GRID FLOOR HARNESS

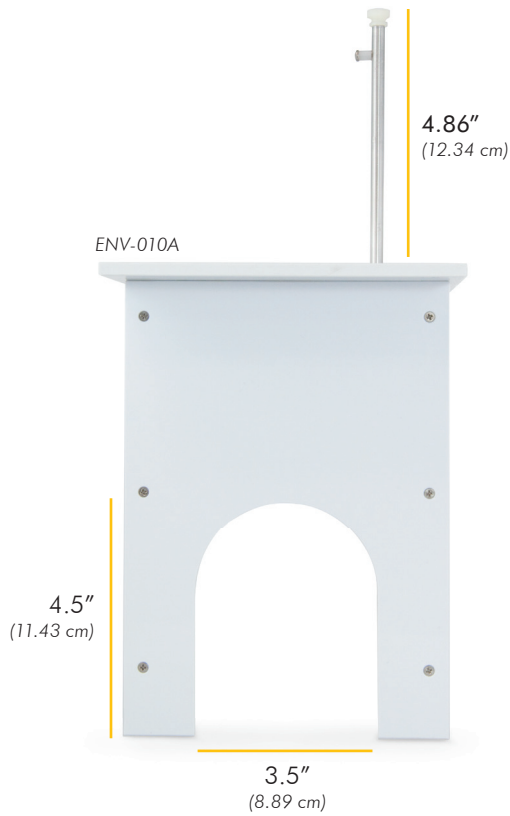
ENV-010MA-QD **MOUSE** | **STANDARD**
ENV-010MB-QD **RAT** | **STANDARD**
ENV-010MXL-QD **RAT** | **X-LARGE**

- Floor can be changed easily between subjects for improved throughput
- Spring-loaded contacts mounted in a polypropylene strip and wired in sequence to a DB9 connector
 - When installed, each rod presses firmly against a contact for reliable shock delivery
- Attaches to the rear of the chamber, and remains in place when the floor is removed for easy cleaning without wires, circuit boards, or other connections
- The harness for the XL shuttle box (ENV-010MXL-QD) is included in the XL chamber (ENV-010MXL)
- Use the SG-219G-10 ^M/_F DB-9 Shock Output Cable to connect to an aversive stimulator

◦ NOTE: This harness will not work with older floors that have been drilled and tapped

US Pat. No. 6412441 B1, Canadian Pat. No. 2,368,344, UK Pat. No. 1226750, Australian Patent 772111, France 1,226,750, Germany 602 05 143.6, Italy 1,226,750, The Netherlands 1,226,750, European Pat. No. 1226750, other foreign patents pending.

	ARCHWAY (W×H)	OPEN HEIGHT
ENV-010A	3.5" x 4.5" (8.89 x 11.43 cm)	4.86" (12.34 cm)
ENV-010AXL	4.5" x 4.2" (11.43 x 10.67 cm)	6.65" (16.9 cm)
ENV-010B2	3.5" x 4.5" (8.89 x 11.43 cm)	5.7" (14.48 cm)
ENV-010BXL2	4.5" x 4.2" (11.43 x 10.67 cm)	5.7" (14.48 cm)



MANUAL DOOR

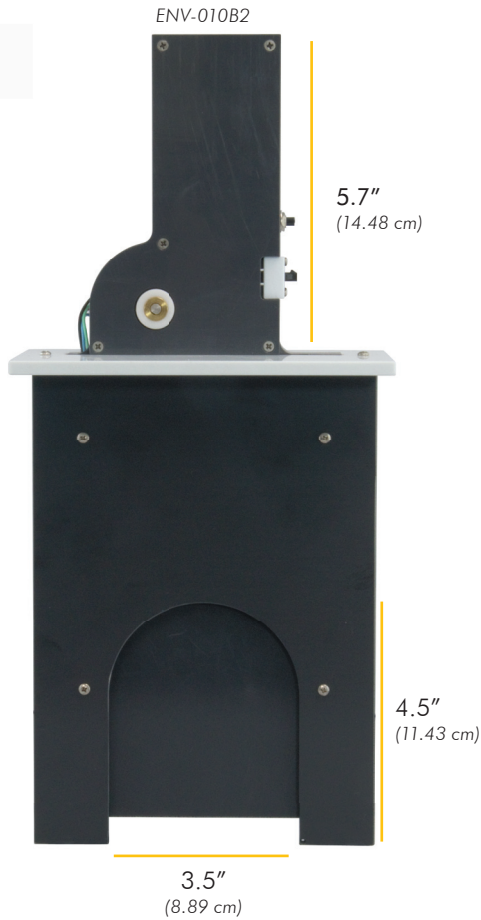
ENV-010A **MOUSE+RAT** | **STANDARD**
ENV-010AXL **RAT** | **X-LARGE**

- Our most cost-effective door
- Easily removed for cleaning
- Door can be locked in the raised position
- A small arm extends from the top that allows the door to be lifted and locked in the open position

AUTO DOOR

ENV-010B2 **MOUSE+RAT** | **STANDARD**
ENV-010BXL2 **RAT** | **X-LARGE**

- Turn the door control line ON (ground) to open the door, turn the control line OFF to allow the door to free fall to the “closed” position
- Smooth, quiet motor raises and lowers door
- Easily removed for cleaning
- Controlled by a 28 V DC signal, designed for use with Med-PC



ENV-010M-17



HURDLE

ENV-010M-17 **MOUSE+RAT** | **STANDARD**

- A 1.5” high polycarbonate obstacle used to divide the two sides of the grid floor when doors are not being used

ENV-010MSD
shown with ENV-010MC + ENV-010MB-GF

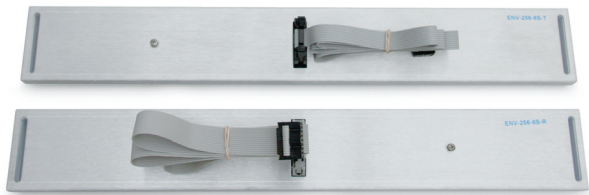


STEP DOWN INSERT

ENV-010MSD **MOUSE+RAT** | **STANDARD**
ENV-010MSD-XL **RAT** | **X-LARGE**

- Used for passive avoidance studies
- Easily inserted and removed from the chamber
- Cut-out area for unimpeded photobeam transmission

ENV-256-8S-T and -R



PHOTOBREAM SENSORS

ENV-013IR-2 **RAT** | **X-LARGE**
ENV-256-8S **MOUSE+RAT** | **STANDARD**

- Pair of infrared (IR) array strips with individual IR photobeam sources and detectors
- Easy to install and to adjust height for accommodating both rats and mice

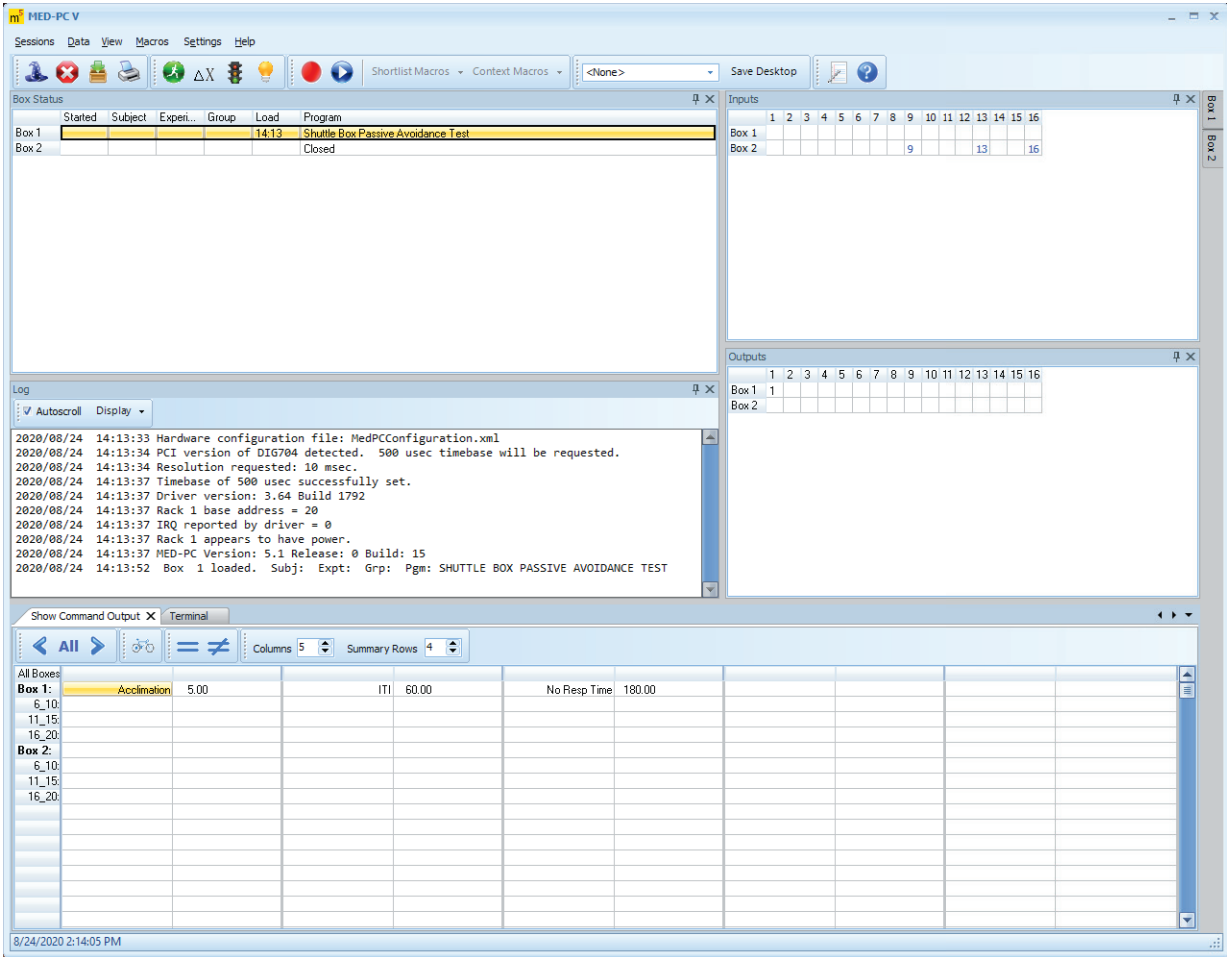
ENV-010C
shown on shuttle box



OPAQUE COVER

ENV-010C **MOUSE+RAT** | **STANDARD**

- Covers half of the shuttle box for passive avoidance testing
- Machine washable cotton “duck” fabric
- Velcro straps secure cover in place
- Does not interfere with IR photobeams



SOF-700RA-7 shown in Med-PC V

SHUTTLE BOX ACTIVE/PASSIVE AVOIDANCE PROTOCOL

SOF-700RA-7 **MOUSE+RAT** | **STANDARD**
SOF-700RA-30 **RAT** | **X-LARGE**

The shuttle box task has been used to study conditioning in non-human animals for over seventy years. Shuttle box tests of avoidance and escape from aversive stimulus are used in contemporary research because these behavioral assays are efficient and standardized methods for testing learning and memory processes. Two types of procedures are generally used:

ACTIVE AVOIDANCE

A stimulus signals that an aversive stimulus is imminent, and the subject learns to avoid the aversive stimulus by moving to the other side of the two-compartment chamber after the presentation of the stimulus.

The primary dependent measures include whether the subject escapes the aversive stimulus or avoids the presentation of the aversive stimulus entirely by using the stimulus to predict its occurrence.

- User-defined parameters include:
 - Number of trials to run
 - Available stimuli
 - Avoid/escape intervals
 - CS/UCS overlap to punish ITI crossings flags
 - Maximum session time
- Data are created with variables including:

- Trial number
- Avoids/escapes
- Avoid/escape latency
- Left/right chamber activity
- Crossings and/or punished crossings
- Total inter-Trial interval shocks

PASSIVE AVOIDANCE

The subject is motivated (trained) to move to the preferred side of the two-compartment chamber. The subject is then confined to the dark portion of the chamber, and experiences inescapable aversive stimulus. The subject is removed, and placed back into the light portion of the chamber for testing.

Then, for the test, the subject is allowed free access to the dark side of the chamber. If the inescapable aversive stimulus during the training phase was sufficient to produce conditioning, then this should be evidenced by increased latencies to enter the dark side of the chamber during the test.

NOTES

- To run these protocols in our extra-large shuttle box (ENV-010MXL), a modified version is available (SOF-700RA-30).

SHUTTLE BOX ACTIVE AVOIDANCE FR-2 PROTOCOL

SOF-700RA-23 **MOUSE+RAT** **STANDARD**

SUMMARY

- Animal has to cross from one side, to the other, then back again
 - After activating the conditioned stimulus, aversive stimulation is activated on both sides of the chamber
 - Animal has to cross two times to deactivate it
 - Each session is automatically divided into five blocks:
 - Acclimation period
 - FR-1 trials
 - Observation period
 - FR-1 trials
 - FR-2 trials
 - NOTE: Durations are user defined and can be eliminated as needed
 - Stimuli presentation (5 sec) followed by an aversive stimulus escape interval (25 sec max)
 - Mean Inter-Trial Interval (ITI) = 15 sec
 - Maximum session time = 60 minutes
- User defined:
 - Stimuli
 - Avoid times
 - Escape times
 - CS/UCS overlap
 - Session time
 - ITI crossings punishment
 - Data collected from each trial includes:
 - Trial count
 - FR value
 - Avoid counts & latency
 - Escape counts & latency
 - Left & right movements
 - Crossings
 - ITI aversive stimulations

SHUTTLE BOX STEP DOWN PROTOCOL

SOF-700RA-11 **MOUSE+RAT** **STANDARD**

The platform should be placed so the subject steps down into the right side of the chamber.

TRAINING PHASE (either level or toggle)

- Delay to aversive stimulation onset = 0.001 sec
- Aversive stimulation duration = 2 sec
- No-response time = 180 sec
- Inter-trial interval = 120 sec

TESTING PHASE (either level or toggle)

- Delay to aversive stimulation onset = N/A
- Aversive stimulation duration = N/A
- No-response time = 180 sec
- Inter-trial interval = 120 sec
- Data collected:
 - Trial numbers
 - Response latencies

SHUTTLE BOX LEARNED HELPLESSNESS PROTOCOL

SOF-700RA-28 **MOUSE+RAT** **STANDARD**

SUMMARY

- Training delivers many trials of aversive stimulation using one compartment of the shuttle box
- Testing determines if repetitive aversive stimulation is associated with deficits in escape responding
- User-defined independent variables include: (default values)
 - Tone Duration = 5 sec
 - CS/UCS Overlap = 1
 - Escape Interval = 10 sec
 - Aversive Stimulus Duration = 1-10 sec (random)
 - ITI period = 2–15 sec (random)
 - Total Training Trials Run = 180
 - Total Testing Trials Run = 30
 - Acclimation Period = 120 sec
 - Avoid Interval = 5 sec
- Data collected includes:
 - Avoids
 - Escapes
 - Crossings

TRAINING PHASE

- Subject is loaded into either side of the chamber.
- On START command, the program detects if the subject has been loaded into the chamber.
- If so, the experiment begins with both lights turning on, and the door opens.
- The ITI period begins, then a tone signals the end of ITI as an aversive stimulus is delivered. The program alternates between these two phases until the specified number of trials to run has completed.

TESTING PHASE

- Subject is loaded into either side of the chamber.
- On START command, program detects if the subject has been loaded into the chamber.
- If so, the experiment begins. Both lights turn on, the door opens, and the acclimation period begins.
- After acclimation, the door closes for an ITI period. Once that ends, the door opens, a tone is presented in the same side as the subject, and the trial begins.
- Trial begins with the avoid interval. If the subject crosses over to the other side of the chamber during this time, an avoid is recorded and the trial ends.
- If the subject does not cross over to the other side of the chamber before the end of the avoid interval, the escape interval begins, the aversive stimulus turns on.
- If the CS/UCS overlap, the tone will stay on until the aversive stimulus turns off.
- If the subject crosses over to the other side of the chamber during the escape interval, an escape is recorded, the aversive stimulus turns off, and the trial ends.
- At the end of the escape interval, if the subject has not crossed over to the other side of the chamber, the aversive stimulus is turned off, a failure to escape is recorded, and the trial ends.
- At end of each trial, the door closes and the tone turns off.
- Then, another ITI period, followed by another trial until the number of trials to run has been reached.
- At the end of experiment, the lights turn off and the door closes.



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