

Operant Systems

- *ABET*
- *Operant Chambers*
- *Learning System*
- *Chamber Accessories*
- *Sound Attenuation Cubicles*
- *9-Hole Boxes for Rat & Mouse*



Animal Behavior Environment Test System

The Animal Behavior Environment Test System (ABET) is a fully integrated, Microsoft Windows™ - based program that allows for flexible computerized control and monitoring of up to 16 environments. Compatible with virtually any animal behavior equipment, the ABET software program provides a user-friendly, point-and-click programming method to create an unlimited number of schedules. ABET eliminates your need to learn computer programming to operate the system. All of the system options are chosen through a series of pull-down windows, buttons, and check boxes.

Hardware assignment has also been made quick and simple. All the user needs to know is the interface number and the line the device is wired into on the input/output module. Input and output devices are referred to by their actual name, such as "press bar" and "pellet dispenser". Testing input and output devices for proper functionality, prior to running schedules, is easy with the use of an on-screen diagnostic program.

Through the use of Boolean algebraic equations, schedules become logical representations of the experiment protocol. This makes the system flexible enough for even the most complex schedules, but easy enough to learn in a matter of minutes.

ABET Features:

With ABET, hardware address assignment is quick and easy.

Preprogrammed schedules can be used for immediate testing and can also be modified to meet your specific requirements.

Creating your own schedules from scratch is made easy with the use of Boolean algebraic equations.

The user can take advantage of simultaneous schedule flow, sequential schedule flow, or a combination of both.

Identical and/or different schedules can be run on up to 16 environments simultaneously.

Visual indicators are used to easily monitor each environment's schedule status.

Universal terminal block connections allow ABET to be used with animal hardware from most manufacturers.

Text-based, comma-delimited data makes importing results into any analysis software quick and easy.





ABET HARDWARE

ABET Starter Kit Model 88500

- ABET Starter Interface
 - ABET Interface Cable & Converter Box
 - ABET Computer Interface Card
 - Set of 6' 36-pin Centronic Cables (2)
 - Mini I/O Module
 - DB-25 Cable, 10'
 - Power Supply, 28V DC
 - Animal Behavior Environment Test System Software
- Model 81401
 - Model 81403
 - Model 81404
 - Model 81405-6
 - Model 81409
 - Model 81406-10
 - Model 83619
 - Model 89500



Optional Cables:

Set of 25' 36-pin Centronic Cables Model 81405-25

These cables may be used in place of the Model 81405-6 set of cables above to connect the starter interface to the converter box.

- 10' DB-25 Cable Model 81406-10
- 25' DB-25 Cable Model 81406-25
- 50' DB-25 Cable Model 81406-50

These cables connect interface to test chamber and may be used in addition to or as replacements for the Model 81406-10 cable above, and with the ABET Expander Components below. Connect multiple cables together as needed up to 100' maximum.



ABET Expander Equipment

ABET Expander Interface Model 81402

The interface hardware allows the ABET software program to control the animal behavior equipment as desired. The Expander Interfaces connect to the Base Interface through a direct connection in a vertically stacked configuration. Up to 15 Expander Interfaces may be stacked, to create a complete system of 16 environments. Each interface provides up to 16 digital input lines and 32 digital output lines per environment.

- Full I/O Module Model 81408
- Mini I/O Module Model 81409

The Full Module provides 16 input and 32 output lines through multilevel, screw clamp terminal blocks for easy connection of animal hardware. This module also includes 10 modular connections for control of up to 10 intensity modules. The Mini Module provides 8 input and 15 output lines. This module also includes 5 modular connections for control of up to 5 intensity modules. The modules can be mounted directly to the base of your animal equipment. Each modular connection uses 3 output lines.

Technical Specifications

- Maximum Number of Interfaces: 16
- Maximum Number of Outputs per Interface: 32
- Maximum Number of Inputs per Interface: 16
- Maximum Number of Intensity Modules per Interface: 10
- Maximum Supply Voltage: 35VDC
- Minimum Supply Voltage: 22VDC
- Quiescent Current per Interface: 40mA
- Maximum Output Current per Interface: 2A
- Maximum Current per Output: 0.5A
- Maximum Output Line Voltage: 50VDC
- Maximum Input Line Voltage: 50VDC
- Maximum Length Between Computer and Interface Stack: 25'
- Maximum Length Between Interface Stack and Environments: 100'
- Power Connector: 2.1mm Center-Positive DC Jack
- Operating System: Windows® 95/98/2000/XP
- Timing Resolution: 1mS
- Computer Requirements: Pentium Class
- 32MB RAM
- 20MB of Available Hard Disk Space
- CD-ROM Drive
- PCI Slot (ISA can be ordered if necessary)

ABET HARDWARE (CONTINUED)

Light Intensity Module Model 81407LM

This module provides control of the intensity of the Stimulus Lights Model 80221 in 7 discrete steps. It connects directly to the I/O Modules using a modular plug.

Tone Intensity Module Model 81407TM

This module provides control of the intensity of the Sonalert Tone Model 80223 in 7 discrete steps. It connects directly to the I/O Modules using a modular plug.

I/O Module Baseboard Model 81412

This 9"x9" plastic baseboard can be used to mount the I/O Modules when a chamber baseboard is not available.

DB-25 to Cinch Jones Model 81411

This custom cable is designed for users who are interested in replacing their Operant Conditioning Console Model 81335A with an ABET system. It provides a direct connection from the interface to the standard Cinch Jones connector used with the cabling from the Operant Chamber.

28 Volt Power Supply Model 83619

This 2A power supply will operate 2 or more operant cages. Multiple power supplies can be connected to the interface stack as needed. Short circuit protection is provided by internal current foldback circuitry.

Dimensions: 12.75"x9.75"x5.5"

ABET SOFTWARE

Model 89500 Animal Behavior Environment Test System Software

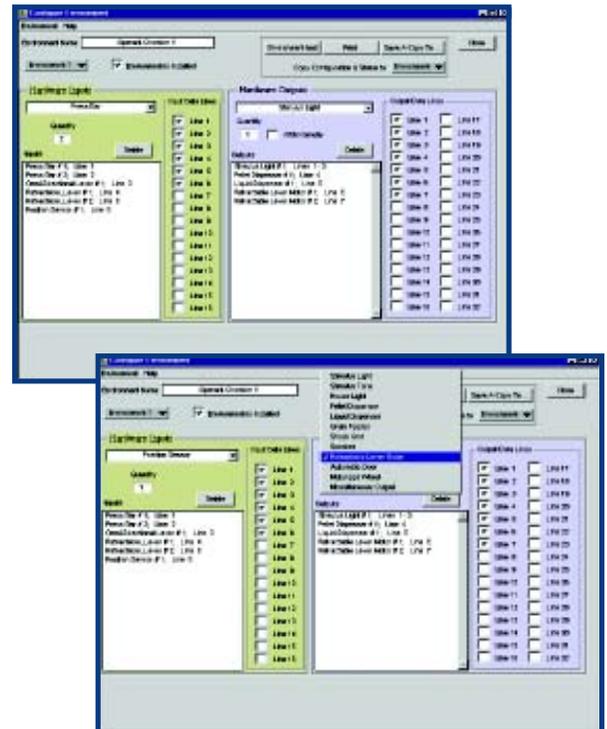
The ABET software uses four basic windows - Environment Configuration, Schedule Configuration, Monitoring Configuration, and Run Schedule. This easy-to-use, no-programming-necessary, software system was designed with pull-down menus to make schedule configuration and hardware address setup a breeze.

Environment Addressing

The environment configuration window provides the ability to assign specific hardware addresses to each individual hardware device. As the hardware devices and data lines are selected, the program automatically assigns a label to represent the specific device. The environment number that is selected is controlled by a pull-down list located within that window. A specific environment name may be assigned to any given environment. If a name is assigned, the environment will be referred to by that name in other program windows. If a name is not entered, the environment will be referred to by a number. To assign an input or output device address, a pull-down list is used to select the desired device label. Once the label is selected, simply click the check box next to the desired data line. A list of the address assignments is automatically created.

Schedule Configuration

The schedule configuration window provides the ability to configure schedules through the use of Boolean algebraic created conditions. After each of the conditions is defined, the conditions are added to the schedule and a group number and sequence number are assigned to each condition. The group and sequence numbers define the order of evaluation for the conditions and provide the ability to determine the flow of the schedule. When the condition is considered true, the actions that are selected are then executed and the schedule continues on to the next condition as defined by the sequence number and group number.

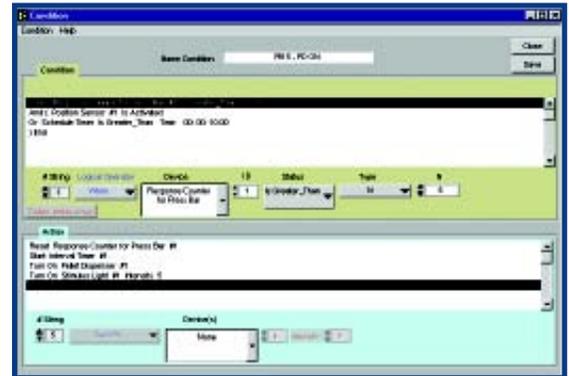




ABET SOFTWARE

Condition Control

The condition control window provides the ability to configure schedules with unlimited conditional statements and unlimited actions. These conditional statements create a Boolean algebraic equation. The conditions are created using the hardware labels that represent the particular hardware device. Group and sequence numbers are used to define the order of evaluation for the conditions and provide the ability to have simultaneous schedule flow, sequential schedule flow, or a combination of both. When the condition is considered true, the actions that are selected are then executed, and the schedule continues on to the next condition in sequence. The conditions follow the Boolean algebraic rules for evaluation. Each conditional statement is evaluated as either true or false. The logical operators that connect the statements then determine whether the entire condition is true or false. If a condition is evaluated as true, the actions for that condition will be executed. Each of these action statements consist of a control for the device, a selection of the device, and an ID number. An intensity adjustment is entered if intensity modules are used. You may save any created condition. When the condition is saved, the condition name is added to the list of conditions in the schedule window and may be used for future schedules.



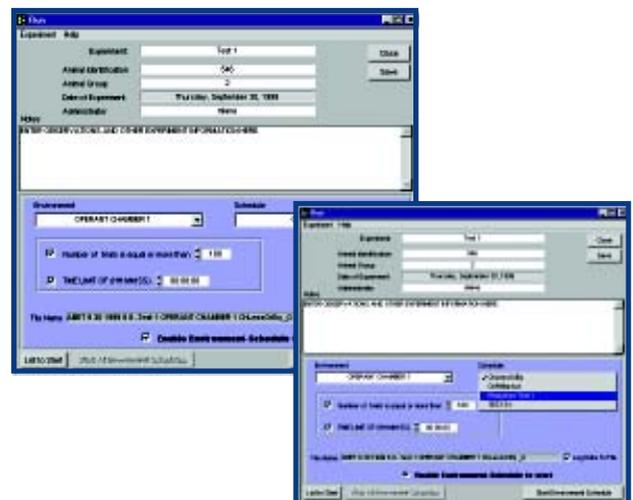
Monitoring Configuration

The monitoring configuration window provides the ability to select the hardware devices, counters and timers to display during the execution of the schedule. The values that are displayed are for user feedback during the experiment to ensure that the schedule is proceeding as expected. When the schedule is running, monitoring windows will be opened to display the items selected from the monitoring configuration window. Changes to the selection of the devices to monitor can be updated on schedules that are running.



Run Schedule Configuration

The run schedule window provides the ability to start a schedule in a selected environment. Schedules can be run for a specific length of time or number of trials before completion, or the schedule can run until it is manually stopped. While the schedule is running, a text-based time-stamped file is created to store the results of the schedule. Schedules can be started individually or stored as experiments for simultaneous starting on multiple environments. When the schedule is running, monitoring windows will be opened to display the items selected from the monitoring configuration window. The values that are displayed are for user feedback during the experiment to ensure that the schedule is proceeding as expected.



Data Acquisition

The data file is a comma-delimited text file that can be imported into virtually any spreadsheet application for analysis. The data file first stores the header information entered in the run schedule window. This information includes the experiment name, animal identification, animal group, date of experiment, administrator, and notes about the experiment. It is then formatted into a table that separates all of the hardware devices of the environment and the internal counters and timers used in the schedule into columns. Each time a condition is evaluated as true, and the actions occur, the software records the time when they were executed, as well as the current state of the devices.

OPERANT CHAMBERS

Basic Operant Chamber (Rat)

Basic Operant Chamber (Mouse) (not shown)

Operant Chamber with Non-shock Floor, Rat or Mouse (not shown)

Model 80003

Model 80003M

Model 80003NS

Built for long-lasting durability and easy cleaning, our front/top-loading operant chamber is constructed of .032" stainless steel and .25" polycarbonate. The base is made of high density polyethylene that is stain- and scent-resistant. This cage is prepunched to handle 4 press bars, 4 stimulus lights, a pellet dispenser and a liquid dispenser. The top will accommodate an omnidirectional lever, and the removable floor is made of shockable grid rods. The non-shock floor for Model 80003NS is made of stainless steel wire mesh. Side and top panels can be customized to satisfy your needs. Dimensions: 8.5"x8.5"x11"



**Model 80003
w/ accessories**

Pigeon Operant Chamber (not shown)

Pecking Key with 3-Color Display (not shown)

Standard Pecking Key (not shown)

Grainfeeder (not shown)

Model 80005

Model 80123

Model 80125

Model 80205

Built to the same rugged standard as our Basic Operant Cage, the Pigeon Operant Chamber, is constructed of .032" stainless steel, and .25" clear polycarbonate. There are 23 stainless steel grid rods .1875" in diameter and are spaced .50" apart. The base is made of high density polyethylene that is stain- and scent-resistant. This cage can be equipped with 3 pecking keys and a grainfeeder. The optional 3-color pecking key can display red, green and white. Dimensions: 12"x12"x12.5"

LEARNING SYSTEM

Complete Learning System Model 84025

The Lafayette Learning System is your complete system for teaching operant conditioning. This system includes a four-lever cage with shockable grid floor, two press bars, an omnidirectional lever, two stimulus lights, a pellet dispenser, and a liquid dispenser. Also included is the easy-to-use conditioning console complete with 13 preprogrammed schedules. Dimensions: Cage- 12"x12"x12.5" Conditioning Control - 12"x8"x7"



Model 84025

Operant Conditioning Console Model 81335B

The Operant Conditioning Console Model 81335B is a fully integrated animal learning control instrument used for laboratory studies. All schedules can be easily programmed and implemented in a variety of environments. Manual shaping activation and student participation is also provided.

The Operant Conditioning Console Model 81335B has the capability to be used with the following devices:

- Pellet Dispenser Model 80208
- Liquid Dispenser Model 80201
- Air Stimulus Model 80108
- 4 Press Bars Model 80110
- 4 Stimulus Lights Model 80221
- 4 Stimulus Tones Model 80223
- 4 Auxiliary Outputs



Model 81335B



OPERANT CHAMBER ACCESSORIES

Sure Drop Pellet Dispenser Model 80208

This new style of pellet dispenser no longer relies on meshing disks which were prone to jamming. By using a solenoid, the dispenser can deliver up to six, 45mg pellets a second. This pellet dispenser also features an optional tone, when dispensing, to aid in shaping. There is an external switch for testing its operation, and a 3,000-pellet storage capacity. The dispenser uses a standard 28V DC power source, comes complete with receptacle, and can be custom mounted to most manufacturers' cages. Dimensions: 6"x3.25"x12.75"



Model 80208

Press Bar Model 80110

Stainless steel construction (.032" thick) ensures long-lasting reliable operation. A micro switch is used to sense a lever press. The force required to move the bar is factory calibrated to be less than 10gm and is field adjustable via counterbalance washers located on the back. Movement required to activate the lever switch is 3mm.



Model 80110

Liquid Dispenser Model 80201

This drop-type liquid dispenser holds up to 65cc of liquid in a graduated, calibrated closed reservoir. The amount of liquid dispensed can be easily adjusted via the control box, and works off of a standard 28V DC power source. Receptacle included. Dimensions: 4"x2"x1.5"



Model 80201

Retractable Lever Model 80113

The retractable lever features a smooth running motor to ensure quiet, reliable extension and retraction of the lever. Control of the lever extension and retraction is now accomplished with one output line. The lever activation is monitored with one input line. This simplifies the wiring by reducing the number of external connections.



Model 80113

Omnidirectional Lever Model 80111

Mounted to the top of the cage, this lever records responses via rod deflection in any direction. The stainless steel rod is 4.75" in length and is .25" in diameter.



Model 80111

OPERANT CHAMBER ACCESSORIES

White Noise Package Model 15800

This package includes the control, a 7-watt amplifier, and 4 speakers. It features a 31-stage pseudorandom noise generator at 20 to 20,000Hz, filtered to remove square wave spikes.



White Noise Control Model 15800C

The White Noise control has a 7-watt amplifier and features a 31-stage pseudorandom noise generator at 20 to 20,000Hz filtered to remove square wave spikes.

Sonalert Model 80223

The Sonalert provides a 2,800Hz tone at 80dB for use as an auditory stimulus. Amplitude can be adjusted by varying the voltage supplied. See Tone Intensity Module Model 81407TM on page 6.



Stimulus Light Model 80221

This light features a large, 1" white frosted lens for distinct CS presentations, and works off of a standard 28VDC power source. To control light intensity in 7 discrete steps, use Light Intensity Module Model 81407LM on page 6.



28 Volt Power Supply Model 83619

This 2A power supply will operate 2 or more operant cages. Multiple power supplies can be combined as needed. Short circuit protection is provided by internal current foldback circuitry.
Dimensions: 12.75"x9.75"x5.5"

Basic Photocell Kit Model 81413

This infrared photo beam system is designed to be easily interfaced with the ABET Behavioral Control System or any control system that operates on and provides from 10 - 30 V DC. It uses a separate source and receiver that can be placed up to 12' apart. The output from the device is a normally open switch consisting of an open collector transistor that can switch up to 30 V DC at 100 mA max. Power Source not included.



OPERANT CHAMBER ACCESSORIES

Master Shocker Supply Model 82400SS

This constant current shocker features a large display meter and two output levels 0 to 1mA on the front and 0 to 5mA on the back panel. Line voltage required is 105/125V AC and current regulation is 3 percent for a 50KOhm change in subject resistance. Grid Harness Model 80001GH is used to connect the shocker directly to the operant cage or use the Neon Grid Scrambler Model 58020 and Grid Harness Model 80240A. Dimensions: 10"x7"x5.5"



Master Shocker with Scrambler Model 82404SS

This model features either a direct 0 to 5mA output, or a silent neon scrambled constant 0 to 1mA with zero crossover. A built in interrupter pulses the shock output within a 1-second interval, (5-100% of 0.05-1 second adjustments). Line voltage required is 105/125VAC and current regulation is 3 percent for a 50KOhm change in subject resistance. The voltage regulator limiter prevents outputs from rising above 1600V at no load. Direct output from the 5-way binding post is a bipolar 60Hz sine wave. Grid Harness Model 80240A is used to connect the shocker to the operant cage. Dimensions: 19"x7"x6"



Constant Current Shocker Model 58006

This simple unit delivers up to 1mA of current to any subject 100,000 Ohms or less. Line voltage required is 105/125V AC. Current regulation is 2.5% for a 50KOhm change in subject resistance. Use as is for direct shock or with Neon Grid Scrambler Model 58020. Dimensions: 6"x5.75"x4.75"



Neon Grid Scrambler Model 58020

This device can be used with any of our shocker units. Noiseless scrambled shock is provided for up to 2mA. Use Grid Harness Model 80240A to attach to the operant cage. Dimensions: 6"x6"x4.5"



Basic AirPuff Unit Model 80108

AirPuff Air Delivery Tubes Model 80109

The AirPuff system provides air puff stimulation as an alternative to electrical shock. Each unit features two gas solenoids, timing controls, switch for optional manual operation, indicator lights and adjustable air delivery tubes. The air stream may be remotely started and stopped by almost any conventional control signal. Stimulation may be delivered as a series of air puffs by adjusting the timing controls to set the duration of each puff and the interpuff interval. A user supplied air source is required.



SOUND ATTENUATION CUBICLE

Standard Chamber Cubicle - Model 83015A

Large Chamber Cubicle - Model 83017

Multiple Chamber Cubicle - Model 83016

These sound attenuating cubicles feature moderately expanded PVC foam panels that resist moisture and many chemicals. All outside walls are 0.75" (19 mm) thick. Several features improve access to the animal while at the same time reducing incursion of light and sound. The fully removable door features an air and light tight seal around the entire frame and a red tinted window (standard feature) that allows the investigator to look in without allowing the animal to look out. Metal offset baffles are provided for the exhaust fan, air inlet, and cable porthole. The slide out tray makes this cubicle usable with both front and top loading chambers. A 24V DC house light is included with each cubicle.

Features:

- Moderately Expanded PVC Foam Panels
- **Fan:** 24V DC rated at 34 CFM
- **House Light:** 24V DC @ 100 ma
- Easy-Glide metal tray catches spilled waste and improves animal access
- Removable doors with red tinted, double pane window
- Optional non-windowed doors, door peepholes, tether access hole, and video access hole with metal covers are available on request. (Minimum quantity or additional charge may apply)



Model 83015A

Technical Specifications:

Model 83015A:

Overall Outside Dimensions (including fans and baffles):

Width: 33" (83.8 cm)

Depth: 20" (50.8 cm)

Height: 20" (50.8 cm)

Working Space with tray:

Width: 25" (63.5 cm)

Depth: 17" (43.2 cm)

Height: 17" (43.2 cm)

Ideal for standard operant chambers

Model 83016:

Overall Outside Dimensions (including fans and baffles):

Width: 72.75" (184.8 cm)

Depth: 26.50" (67.3 cm)

Height: 24.60" (62.5 cm)

Working Space with tray:

Width: 68" (172.7 cm)

Depth: 22" (55.9 cm)

Height: 22.5" (57.2 cm)

Use with Multiple test chambers



SOUND ATTENUATION CUBICLE (CONTINUED)

Technical Specifications (continued):

Model 83017:

Overall Outside Dimensions (including fans and baffles):

Width: 34.75" (88.3 cm)
Depth: 29.25" (74.3 cm)
Height: 25.60" (65.0 cm)

Working Space with tray:

Width: 28.50" (72.4 cm)
Depth: 22.75" (57.8 cm)
Height: 22.75" (57.8 cm)

Use with large operant chambers, rat wheels, open field test stations, etc.



Model 83015A
 (Test Chamber Model 80003
 w/ accessories sold
 separately)

Space Saver Cubicle – Model 83018

Material and construction of this cubicle are identical to the previous three models. This unit does not have the external offset baffles. Instead the fan is mounted on the inside and the air baffle and cable holes are straight through with flush mounted panels. The single removable door is replaced with double doors that are supported by full-length hinges. Each door has its own covered peephole. The top is provided with covered tether and video access ports. This cubicle was designed to take up a minimum amount of space and still be used with a standard test chamber.

Model 83018:

Outside Dimensions:

Width: 25" (63.5 cm)
Depth: 16" (40.6 cm)
Height: 17" (43.2 cm)

Working Space with tray:

Width: 22.25" (56.5 cm)
Depth: 13.25" (33.7 cm)
Height: 15" (37.8 cm)



RAT AND MOUSE 9-HOLE BOXES

9-Hole Box – Rat Model 80600

9-Hole Box – Mouse Model 80610

General Features:

- Sound/light attenuating casing
- Ventilation fan
- Stainless steel and perspex operant chamber
- Grid floor and removable tray on baseboard
- Pellet or liquid dispenser
- Reinforcement tray
- Nine holes with lamps or LEDs
- IR-beam detection of nose poke
- Electronic brightness control
- Houselight and loudspeaker in roof
- 10m cable
- IR activity monitoring (mouse box only)



The Lafayette Instrument Co. 9-hole box-rat is the same box cited in over 60 published papers by T.W. Robbins and others. The 9-hole box-mouse retains all the features of the rat box refined and developed specifically for mouse operant studies. Both boxes include improvements to be more easily maintained and cleaned.

This novel variation on the conventional operant chamber is used primarily for the serial 5-choice reaction time task. The nose-poke response is rapidly trained and is easier than a lever-press for the animal to execute. Nine responses can be used, rather than the usual two, allowing for the study of response sequencing. Reaction times can be separated from movement times by requiring the animal to hold its nose in one hole until signalled to move to another. Lateralisation can be studied by presenting brief stimuli to the periphery while the animal is required to hold its nose in the central hole. Discrimination can be studied parametrically by varying brightness and position of stimulus, and attention can be tested with the use of distracting lights or noises. These are just a few of the tasks to which the apparatus has been successfully applied. For a review of the 5-choice serial reaction time task see T.W Robbins, *Psychopharmacology*, (2002) 163, 362-380.

9-Hole Box for the Mouse Model 80610

The mouse 9-hole box is the only mouse operant chamber with associated published data for an attentional task for mice (Humby, Laird, Davies and Wilkinson, *European Journal of Neuroscience*, Vol. 11, pp. 2813-2823, 1999).

The task – the serial 5-choice reaction time task (also available in human and monkey CANTAB) - is a test of sustained and selective attention, which has been well characterized in the rat and has shown clinical validity in a variety of settings, including attentional deficits in Alzheimer's disease patients. It is the first in what is expected to be a growing set of operant based tests in mice, allowing the exploitation of molecular genetics methods in unraveling the genetic contribution to complex psychological and behavioral processes.





RAT AND MOUSE 9-HOLE BOX

Sound Attenuating Cubicle

The 9-hole box sits on an aluminum pull-out tray, which slides easily in and out of a sturdy light/sound attenuating cubical made of moderately expanded PVC panels. This permits easy cleaning and maintenance. The cubical is equipped with a ventilating fan, external connectors for power and electronics interfacing, and an observation peephole.

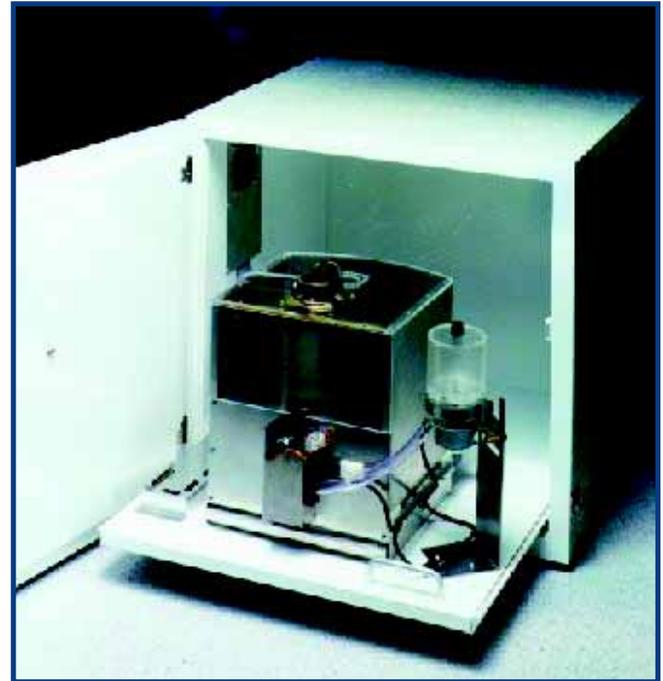
Behavior Network Control System

The Behavior Network Control (BNC) hardware and software system permits the independent control of a number of operant chambers. The hardware includes a 14A power supply to power the operant chambers.

The intuitive graphical programming language allows for fast, easy and flexible programming. Pre-written standard schedules are also available.

Behavior Network Control (BNC)

A compact single unit, which is connected to the operant chambers via patch panels. There are 144 I/O lines available, configurable as I or O in blocks of 8 at the time of manufacture. The patch panelling makes it easy for the user to configure and change the system to make effective use of the I/O lines available.



BNC Professional

A robust system made from industrial grade components. Operant chambers are plugged directly into the system (no patch panelling required).

Standard Schedule for the 9-Hole Box

Serial 5-Choice Reaction Time task

This Behavior Network Control schedule gives the user the flexibility needed to set up and run the serial 5-choice reaction time task for either rat or mouse. The tasks are: variable ITI, variable stimulus brightness, variable stimulus duration and variable temporal position of a distracter. All parameters are independently selectable for each subject and the details are kept in a file for each subject.

BEHAVIOURNET CONTROL (BNC) SYSTEM

BehaviourNet Control has been designed to overcome the challenges not met by other operant control systems:

Challenges not met with existing operant control systems:

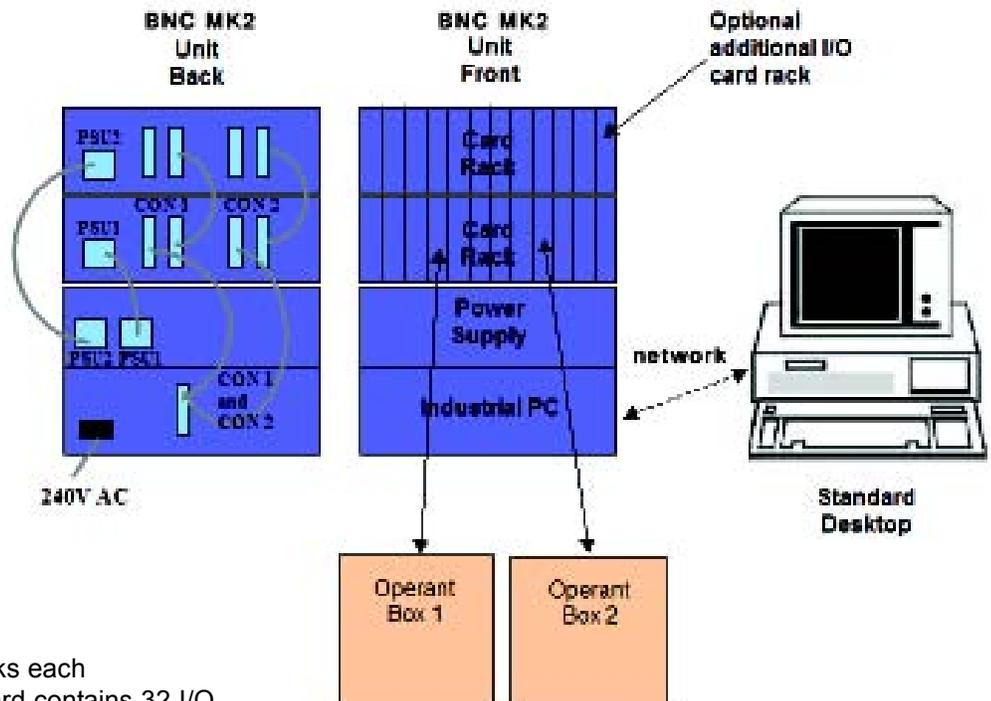
- Reliance on programming knowledge
- Long debugging process
- Compliance with GLP regulations - security of data, lack of a clear auditing trail
- Having to anticipate the right data questions at the start
- Complex task set up
- Speed constraints - missing data

The Solutions:

- An easy to use **graphical scheduling** language that does not constrain programming
- **Simulation** program, which allows schedules to be thoroughly tested away from the lab
- **Data security** - all data encrypted, schedules and data can be locked
- **Automatic storage** of all input data
- **Drop down lists** of approved tasks and settings; enforced default data entry at start of experiment
- A dedicated PC with real-time embedded software to ensure **fast and secure data collection**

The BNC Mk1

The 9-hole chambers are attached to the BNC via optional 2mm plugs attached to the PC via a Local Area Network and several Control Units may be operated from one PC.



The BNC Mk2

A system can have one or two I/O racks each containing up to 12 I/O cards. Each card contains 32 I/O lines, user configurable as I or O in blocks of eight.

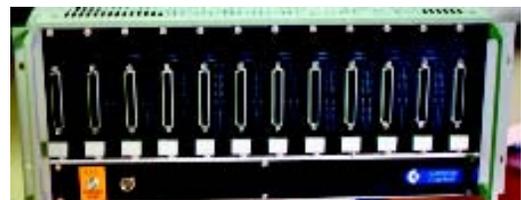
The industrial PC contains embedded real time software.

The power supply is a high-grade industrial power supply – input voltage 110V/240V, supply voltage 24V DC / 24A. A double unit containing two 24V supplies is also available, to drive a two card rack system.

The data handling software is installed on a standard PC (or PCs) and communicates with the BNC Mk2 control unit via a network cable or hub.

The I/O rack

Each card has 4 banks of 8 inputs or outputs. These can be configured by the user as I or O via a dip switch.





BEHAVIOURNET CONTROL (BNC) SYSTEM SOFTWARE

The data handling software is Windows 2000 and XP compatible and runs on most modern PC's. It communicates through a network to the controller PC, which has real-time embedded software to run the experiments. There are five independent elements to the data handling software:

BNC Designer - a graphical programming environment

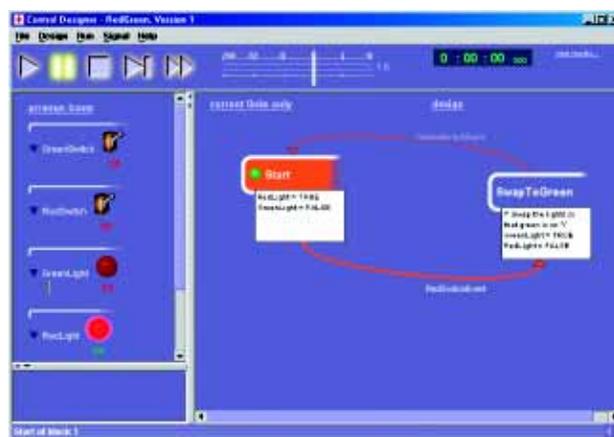
The user interface allows easy construction and understanding of tests. Easily learned - no prior programming knowledge needed. A selection of library calls, including randomisation and pseudo-randomisation functions, makes it possible to create even very complex programs.

The BNC Simulator - for fast testing and debugging of programs

A program can be simulated from within the BNC Designer. A graphical representation of the program shows exactly which parts of the program are in progress. This means that if the program is failing at any point, the fault in the program can be quickly identified and altered.

The BNC Settings Editor - allows you to easily change variables

The programming element of the system allows for certain things to be set from outside the program. This includes not only simple variables such as values set for timers, but also more complicated elements such as which elements are included in a set, whether a certain path in a program is followed, how many trials are followed. The variables can also be set individually for each trial. It is even possible to jump to different trials according to a response. For example, a training program can be set up so that when a certain task has been mastered the program can jump to a more complex task. The Settings Editor is designed from the BNC Settings Designer wizard. The Settings Designer allows the researcher to set up which variables can be changed and also allows for limits on these changes. Consequently an assistant can easily set variables within a test, but only according to rules set up by the researcher.



The BNC Network Manager - from which the tests are run and monitored

The BNC Network Manager helps with the initial set-up of the hardware. Each of the connected test chambers can be controlled **completely independently**. Additional monitoring columns can be created to add other information relevant to the experiment being run. Constraints can be made on how this is filled in (e.g. numerical values only) and filling in the data can be made compulsory before the test will run.

The BNC Results Manger – for managing and analysing your data

All data is automatically collected and saved as raw data. All raw data is encrypted to prevent accidental or deliberate changes to the data - very valuable if working to GLP requirements. The data is saved to archives. Which archive data is saved to can be automatically calculated according to user set rules.

The BNC Results Manager enables the easy extraction of relevant data from this mass of raw data by means of filters. Filters extract latencies from the raw data. Filters are easily set-up from the graphical interface and can be created or changed after the experimental data has been collected. Both raw and filtered data can be saved as a spreadsheet ready to transport to such packages as Excel and SPSS. Filtered data can also be exported to a database (e.g. Access or Oracle). The BNC Results Manager also has it's own report generator. Results can be selected, for comparison, from an archive according to user set criteria. The report designer allows spreadsheet report to be created.

