TSE
Technical & Scientific
Equipment GmbH

# TSE Place Preference System

## Multi-purpose testing system for mice & rats

# TSE Place Preference System

**Conditioned place preference** is a widely used technique to assess the rewarding properties of a psychotropic drug.

Treatment with a specific preparation is repeatedly paired with a distinct environment while a control treatment is paired with a different environment.

When the animal has access to both environments during post-conditioning tests, preference for the drug-paired cues will indicate the rewarding effects of the test drug. Aversion is indicated by avoidance of the drug-paired compartment.

## Components

The system is available for rats and mice and consists of the following components:

- place preference boxes with species-specific size,
- optional shockable floor grid, manual or automatic doors, rearing indicators,
- optional drinking/feeding modules for conditioned place preference experiments,
- housings,
- a control unit with optional shocker,
- a special control interface, and
- the TSE Place Preference software package.

In the standard configuration up to 8 boxes can be operated simultaneously with one computer but the total number of boxes may be increased if desired.

Our place preference boxes feature 3 distinct compartments: two equally sized large outer compartments (“choice chambers”) separated by a small central area (“neutral chamber”).

| **Box Dimensions “Rat”** | |
|---|---|
| Overall size: | 720 x 250 x 320 mm (LxWxH) |
| Outer compartments: | 305 x 250 x 320 mm (LxWxH) |
| Center: | 110 x 250 x 320 mm (LxWxH) |
| *(Inner sizes)* | |

| **Box Dimensions “Mouse”** | |
|---|---|
| Overall size: | 400 x 150 x 200 mm (LxWxH) |
| Outer compartments: | 170 x 150 x 200 mm (LxWxH) |
| Center: | 60 x 150 x 200 mm (LxWxH) |
| *(Inner sizes)* | |

The standard dimensions may be modified according to your specific needs!

In the standard configuration the **walls** are made of opaque PVC. One compartment is colored gray throughout, the other is covered with black & white striped material (20mm strips). The central compartment is white. All wall elements can be easily exchanged for other types if required by individually inserting them in guide rails.

Please tell us your choice of colors when ordering the system!

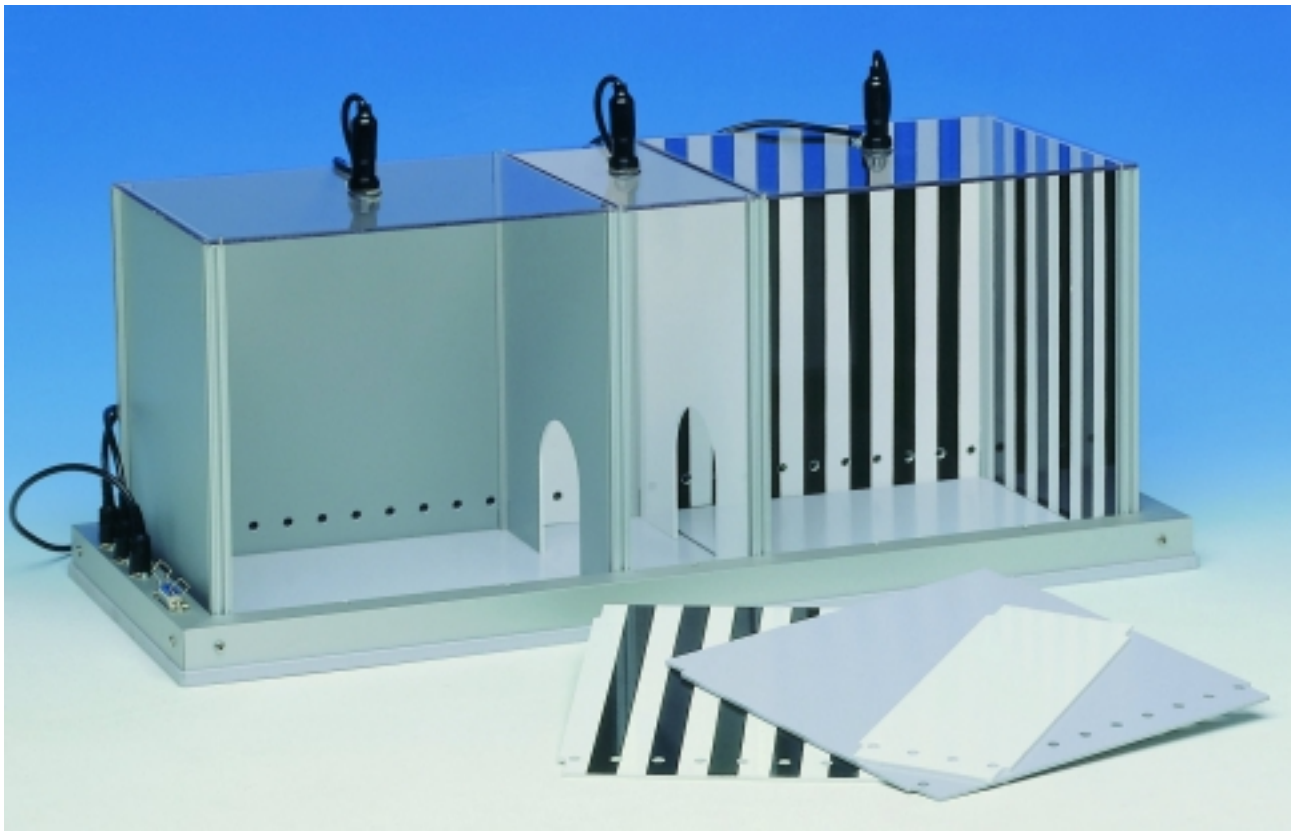
Dividers are used to separate the compartments from each other. They are colored differently on both sides to match the wall color of the corresponding compartment.

**Closed** dividers are used to restrict the animal's movement to one compartment during conditioning. These closed dividers are exchanged for walls containing an arched **gateway** on pre-exposure and test days (rat gateway size: 90 x 115 mm (WxH)).

Transparent removable lids are used to close the box in order to prevent the animal from escaping. Lights mounted in the lids may be used as a house light or to increase the difference between compartments.

| | |
|---|---|
| Lamps: | 2.2W |

PVC floor inserts with varying surface structures (smooth or roughened) may also be used to increase the difference between choice chambers.



We can also supply stainless steel grid rod floor or mesh floor inserts.

**Typical stainless steel floor inserts**

**Grid rod floor**

| | |
|---|---|
| Mouse: | rod ∅ 4mm, distance* 5mm |
| Rat: | rod ∅ 6mm, distance* 13.5mm |

** distance rod to rod*

**Mesh floor**

| | |
|---|---|
| Mouse: | ∅ 1mm wire mesh, 6mm square |
| Rat: | custom made (animal weight required) |

All floor inserts can be manufactured according to your specific needs.

If you use a grid or mesh floor the box compartments are equipped with waste pans underneath that can be easily removed for cleaning purposes.

Entries into the choice chambers and the center are monitored with **infra-red location sensors** (arrow). It is always possible to recognize whether the animal is located in the right or left outer compartment or in the center during test trials.

Since the sensors are mounted along the entire length of the box walls - the side-walls are pierced at these points - they also allow the monitoring of locomotor activity during conditioning, testing and during drug challenges resulting in the output of the "distance traveled" in each of the 3 compartments.

The photobeam detectors are scanned with a frequency of 15Hz ensuring that even the fastest movements are detected.

**Example: "Rat" sensors**

| | |
|---|---|
| Outer compartments: | 11 sensor pairs each |
| Center: | 4 sensor pairs |
| Distance between sensors: | 28mm |

The animal is placed in the selected compartment or the center from above.

Alternatively an **entry tube** is available that connects to the central compartment. A manually operated door ensures standardized access to the middle compartment, i.e. any bias introduced by the experimenter's handling of the animal is prevented.

The whole setup is operated in sound-attenuating **housings** equipped with a ventilation fan.

**Example: "Rat" housing**

Dimensions: 1000 x 410 x 660 mm (LxWxH)

The housing features an observation window in the front door to allow monitoring during the experiment. A manually operated house-light is also included.

The **control unit** provides the connection between the boxes and the computer. It contains all the electronics for controlling the box components and transfers the measuring data to the control **interface** built into the system computer. An IBM-compatible computer (Pentium) is required.

## Box Options

Please order the boxes with your choice of optional components. Most options can also be retrofitted to existing boxes.

- The boxes can be manufactured with a **reduced** number of light-beam sensors located only on both sides of the archways. In this configuration only location is detected – this means that no information on locomotion is available.
- The box can also be extended with unidimensional **rearing indicators** if vertical movement is to be detected in addition to locomotion.
- The dividers can be exchanged for **manual doors** or software-controlled **automatic doors**.
- **Loudspeakers** can be integrated into the box if auditory stimuli (sound and noise) are to be applied. The control unit is then equipped with an audio/noise generator. The noise generator may also be used to produce continuous white noise throughout the whole experiment.
- An **electrical stimulus** can be applied through the metal floor grid (shockable type) if conditioned fear stress and its influence on place preference is to be analyzed (exposure to a compartment paired previously with mild electric foot shock). The control unit is then equipped with a microprocessor-controlled shocker module to produce these foot shocks. The module ensures a constant current with a high degree of accuracy. A pulsating stimulus current can also be applied if required by the experimenter.

**Programmable Shock Generator**

Constant or pulsating current
Current strength 0.1...3.1mA (in steps of 0.1mA)
(up to 4.5mA on request)

***Note:*** The place preference box can also be manufactured **without** any light-beam sensors if it is intended to be used in conjunction with a video tracking system, e.g. TSE VideoMot2.

## Further Extensions

If continuous **drug administration** is required during conditioning a counterbalance arm can be fixed to the box side.

The TSE counterbalance arm is made of lightweight aluminium and is suitable for connecting a variety of swivels.

***Left:*** 1-channel fluid swivel with button tether
***Right:*** 3-channel fluid swivel with collecting attachment

If microdialysis is to be performed during conditioning, swivels with a collecting attachment are available.

A detailed brochure on infusion and microdialysis equipment will be sent to you on request.

If fluid administration or microdialysis are to be performed during the **test trials** then the box has to be operated without lids and without dividing walls!

The system can also be upgraded to perform **operant place conditioning experiments**.

The operant place conditioning paradigm does not use passive administration of a drug but instead the **active** intake of a reinforcing agent by the animal, e.g. a rewarding solution such as sucrose.

The OPPC extension module features special wall inserts for the outer compartments each equipped with a mounting device that will hold a fluid bottle or a food crib.

Removal events are registered by an additional light-beam sensor mounted in the vicinity of the reinforcer container. If the animal drinks or feeds this sensor is interrupted and gives information on frequency and duration.

In training trials the animal learns to associate one compartment with the reinforcer (e.g. ethanol), the other one with the non-reinforcer (e.g. water). In a series of subsequent tests in the absence of the reinforcer and non-reinforcer the preference of the animal for the compartments and the effects of drug treatment on this preference can be established.

- If you are interested in high-resolution intake data over the course of the experiment the contents of the drinking dispensers or food baskets can be continuously monitored. Information on this “Drinking & Feeding Monitor” option will be sent to you on request.

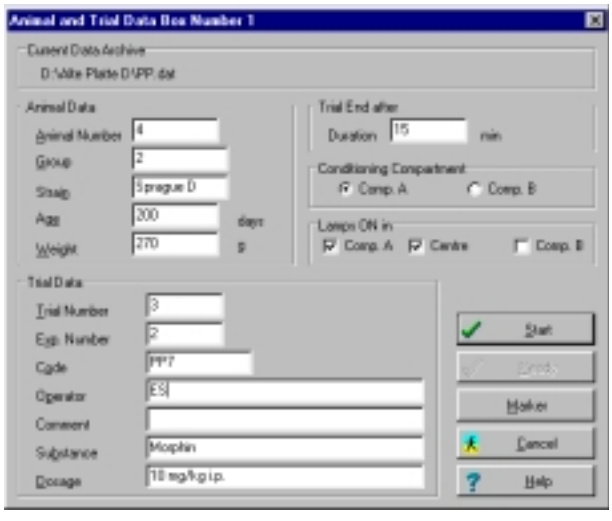
## Software Control

The comfortable “Place Preference” Windows software (Win 9x/NT) that controls the experimental procedure and collects the measuring data is very easy to learn and use. On-line help is provided describing all program functions in detail. The software languages currently available are English and German. It currently runs under the operating systems Windows 95, 98 and NT.

Working with the system is performed according to the following pattern:

- preparing the setup for an experiment,
- running the experiment, and
- analyzing the collected data.

### *Preparing an Experiment*




For conditioning the animal is either injected with a drug immediately before it is placed into the box or it is continuously infused via a swivel/tether combination. The test trial is either performed with undrugged animals, with animals in the drugged state under which they had been conditioned or after administration of a challenge treatment.

In order to characterize the experiment various entry fields are available that are filled in before the experiment is started. These identifiers later allow easy searching through the data base and are also outputted in the protocols.

In the “Animal and Trial Data” window the total trial duration is set and the decision is made whether any of the lamps are to be switched on during the experiment.

### *Experiment Start*

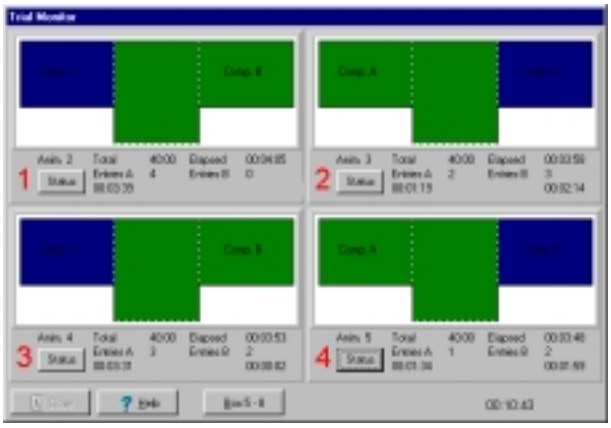
After all data have been entered, the animal is placed into the selected conditioning compartment (conditioning trial) or in the center (test trial). If a start tube is available the animal is placed in the tube and the door to the center compartment is opened manually.

Data acquisition is started by pressing a single key.

All boxes that are connected up can be started and stopped independently in this way.

### *The Running Experiment*

The so-called “trial monitor” allows a rapid overview throughout the course of the experiment, allowing the status of all connected boxes to be seen at a glance.



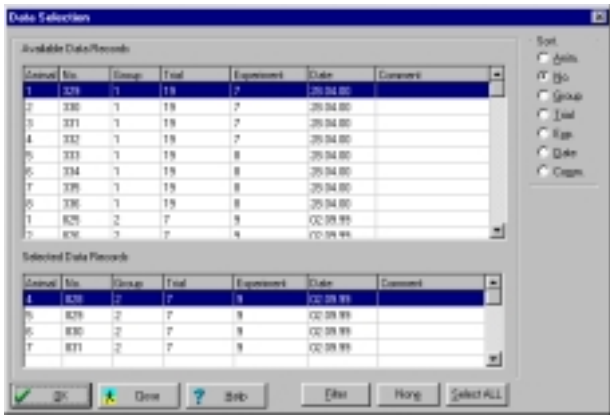

In the **conditioning phase** – which is usually performed repeatedly over a couple of days – the trial is automatically stopped when the preset time has elapsed.

In the subsequent **test trial** the animal is free to explore both chambers. The number of entries and the time spent in each compartment is continuously updated. The location of the animal is indicated by a color change of the respective compartment.

Markers can be set in order to document any events that are of importance for the experiment.


## Analysis of Measured Data

Search functions allow the easy selection of data records to be analyzed from the data base. A filter function is provided to facilitate data management.




Two tables are available: the run table and the results table.

### *The Run Table*

The run table provides a chronological overview over the course of the experiment. It lists

- the position of the animal in the box, i.e. in compartment A, B or in the center,
- the time of transfer between compartments (relative from start),
- the time spent in the compartment during each visit, and
- the distance traveled during each visit (in mm).

**Run Table**

| | | |
|---|---|---|
| Animal No. | : | 4 |
| Group | : | 2 |
| Trial | : | 3 |
| Experiment | : | 2 |
| Date | : | 17.08.00 17:40 |
| Comment | : | |
| Age | : | 200 days |
| Weight | : | 270 g |
| Code | : | PP7 |
| Total Time | : | 00:15:00 |
| Elapsed Time | : | 00:15:00 |
| Operator | : | ES |
| Substance | : | Morphin |
| Dosage | : | 10 mg/kg i.p. |
| Cond. Comp. | : | A |
| Lamps ON | : | Comp. A/ Centre/ |

| Time | A* | Centre | B | Duration | Dist mm |
|---|---|---|---|---|---|
| 00:00:00 | | X | | 00:00:02 | 196 |
| 00:00:02 | X | | | 00:00:04 | 564 |
| 00:00:05 | | X | | 00:00:03 | 216 |
| 00:00:09 | X | | | 00:00:34 | 1783 |
| 00:00:43 | | X | | 00:00:01 | 168 |
| 00:00:44 | | | X | 00:00:04 | 476 |
| 00:00:48 | | X | | 00:00:05 | 273 |
| 00:00:53 | X | | | 00:00:46 | 1457 |
| 00:01:39 | | X | | 00:00:02 | 182 |
| 00:01:42 | | | X | 00:00:02 | 98 |
| 00:01:44 | | X | | 00:00:01 | 210 |
| 00:01:45 | X | | | 00:00:00 | 14 |
| 00:01:45 | | X | | 00:00:00 | 42 |
| 00:01:45 | X | | | 00:04:42 | 6845 |

Test trial of a morphine conditioned animal
Only the beginning of the table is shown

The conditioning compartment is marked with an asterisk. Locomotion monitored with the infra-red location sensors is converted into a distance in mm.

If markers have been set they appear in a separate column.

### *The Results Table*

The results table is divided into 2 parts. The first part gives information on:

- the total time spent in each of the 3 compartments,
- the percentage of time spent in each of the 3 compartments compared to the total time in the box (%T), and
- the percentage of time spent in each choice chamber compared to the total time spent in the choice chambers (%C).

In the second part the locomotory data are summarized:

- the distance traveled in the 3 compartments,
- the percentage of distance traveled in each of the 3 compartments compared to the total distance traveled in the box (%T), and
- the percentage of distance traveled in each choice chamber compared to the total distance traveled in the choice chambers (%C).

## Results Table

| | | |
|---|---|---|
| Animal No. | : | 4 |
| Group | : | 2 |
| Trial | : | 3 |
| Experiment | : | 2 |
| Date | : | 17.08.00 17:40 |
| Comment | : | |
| Age | : | 200 days |
| Weight | : | 270 g |
| Code | : | PP7 |
| Total Time | : | 00:15:00 |
| Elapsed Time | : | 00:15:00 |
| Operator | : | ES |
| Substance | : | Morphin |
| Dosage | : | 10 mg/kg i.p. |
| Cond. Comp. | : | A |
| Lamps ON | : | Comp. A/ Centre/ |

**Analysis Length of Stay**

| | Time | %T | %C |
|---|---|---|---|
| Comp. A* | 00:14:10 | 94,4 | 98,4 |
| Comp. B | 00:00:14 | 1,6 | 1,6 |
| Centre | 00:00:36 | 4,0 | |

**Analysis Distance**

| | Dist in mm | %T | %C |
|---|---|---|---|
| Comp. A* | 15918 | 81,3 | 92,7 |
| Comp. B | 1257 | 6,4 | 7,3 |
| Centre | 2399 | 12,3 | |

Test trial of a morphine conditioned animal. The morphine induced place preference is evident

In the test trials the percentage of time spent in a specific compartment provides a reliable measure of preference.

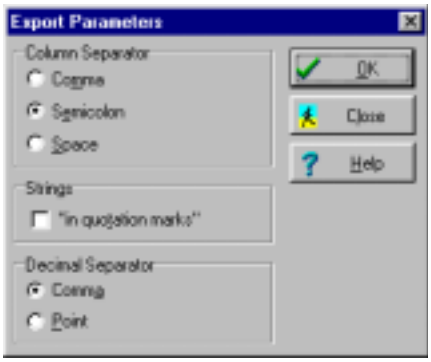
The table can be upgraded to display the number of times during the test session that the animal crossed into the different compartments (=entries).

The system outputs distance traveled as a measure of activity. Locomotor stimulating effects of drugs or any drug-induced sedative effects can easily be seen when data is compared with control animals.

If rearing indicators are present in the system the table also lists the number of rearing events in each of the 3 compartments.

In **conditioned place preference configurations** the list also outputs the time and overall frequency of removal events at the liquid/food containers.

### *Data Export*




All measuring data can be converted into ASCII files for further-reaching complex statistics with statistical, database or spreadsheet programs. Adjustable export parameters allow the adaptation of the file structure to the individual requirements of the user.

An example of an export file is shown below (results table with 4 trials).

| Anim | Trial | Exp | Date | Start | Elapsed | Cond.Comp. | TimeA | TimeC | TimeB | DistA | DistC | DistB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 7 | 9 | 02.09.99 | 09:23:05 | 900 | A | 849814 | 36174 | 14012 | 15918 | 2399 | 1257 |
| 5 | 7 | 9 | 02.09.99 | 09:23:19 | 900 | B | 43470 | 190892 | 665638 | 3256 | 3671 | 6371 |
| 6 | 7 | 9 | 02.09.99 | 09:23:29 | 900 | B | 16134 | 11712 | 872154 | 2206 | 1204 | 12390 |
| 7 | 7 | 9 | 02.09.99 | 09:23:37 | 900 | B | 51560 | 98362 | 750078 | 4784 | 6674 | 17967 |

Export file example

# Ordering Information

| Cat.No. | Description |
|---|---|
| | |
| **257000** | **Place Preference Test System** |
| | |
| ***1. Boxes*** | |
| 257000-MAU | **Place Preference Box "Mouse"**<br>3-chamber box equipped with infra-red sensors for exact determination of locomotion.<br>Overall inner size: 400 x 150 x 200 mm (LxWxH); size outer compartments: 170 x 150 x 200 mm (LxWxH); size center compartment: 60 x 150 x 200 mm (LxWxH).<br>*Other dimensions are available on request.* |
| 257000-RAT | **Place Preference Box "Rat"**<br>3-chamber box equipped with infra-red sensors for exact determination of locomotion.<br>Overall inner size: 720 x 250 x 320 mm (LxWxH); size outer compartments: 305 x 250 x 320 mm (LxWxH); size center compartment: 110 x 250 x 320 mm (LxWxH).<br>*Other dimensions are available on request.* |
| | |
| ***2. Control Unit*** | *For control and data acquisition of place preference boxes. The control unit package also includes a special interface to be built into the computer (Pentium required).* |
| 257000-C | **Place Preference Box Control Unit** for connection of up to 8 Place Preference Boxes, expandable. |
| 257000-C/E | **Place Preference Box Control Unit Extension Set "Anxiety Test"** for up to 8 extension modules "anxiety test" 257000-VT. For connection to control unit 257000-C. |
| 257000-AG | **Audio Generator** - *to be built into the control unit 257000-C.* Used in connection with loudspeaker 257000-LP. |
| 257000-NG | **Noise Generator** - *to be built into the control unit 257000-C.* Used in connection with loudspeaker 257000-LP. |
| | |
| ***3. Options*** | *If doors are ordered the manually operated closed/open dividers are not used.* |
| 257000-DM | **Manual door for Place Preference Box**. Please specify door position when ordering since these doors are differently colored on both sides in order to match compartment color. |
| 257000-DE | **Automatic (software-controlled) door for Place Preference Box**. Please specify door position when ordering since these doors are differently colored on both sides in order to match compartment color. |
| 257000-ST | **Start tube** for the center compartment with manually operated inlet. To be exchanged for the front wall insert. |
| | |
| 257000-FG-M | **Non-shockable stainless steel floor set for Place Preference Box "Mouse"** complete with droppings collector set. |
| 257000-FG-R | **Non-shockable stainless steel floor set for Place Preference Box "Rat"** complete with droppings collector set. |
| | |
| 257000-FGS-M | **Shockable stainless steel floor grid set for Place Preference Box "Mouse"** complete with droppings collector set. For delivery of shocks optional shocker modules 257000-SHOCK are required. |
| 257000-FGS-R | **Shockable stainless steel floor grid set for Place Preference Box "Rat"** complete with droppings collector set. For delivery of shocks optional shocker modules 257000-SHOCK are required. |
| 257000-SHOCK | **Shocker** for shockable floor grid (3 pcs. per box required) or shockable drinking bottle/food basket (1 pc. per bottle/basket required) - *to be built into the control unit 257000-C.* Standard output: 0.1 ... 3.1 mA, constant or pulsating; up to 4.5 mA on request. |
| | |
| 257000-OPPC | **Operant Place Preference Conditioning Extension Module for Place Preference Box.**<br>Consists of 2 special side wall inserts for the outer compartments each equipped with a drinking bottle or a food container (please specify type, size and box type (mouse or rat) when ordering) and an additional infra-red sensor that is mounted on the long side wall to monitor removal events. |
| 257000-VT | **Extension Module "Anxiety Test" for Place Preference Box** for electrical stimulation of a drinking bottle or a food basket. Includes a drinking bottle or a food basket (please specify when ordering). Requires: 257000-C/E control unit extension set, 257000-FGS shockable floor grid set and 1 pc. 257000-SHOCK shocker per module. |
| 257000-LP | **Loudspeaker for Place Preference Box.** Requires 257000-AG audio generator or 257000-NG noise generator . |
| | |

| | |
|---|---|
| ***4. Software*** | |
| 257000-S | **Software Package "Place Preference"** for Windows (95/98 and NT). For control of up to 8 Place Preference Boxes, expandable. |
| | |
| ***5. Housing*** | |
| 257000-MAU-HOUS | **Sound Attenuating Housing for Mouse Place Preference Box**. With observation window, ventilator and house light. |
| 257000-RAT-HOUS | **Sound Attenuating Housing for Rat Place Preference Box**. With observation window, ventilator and house light. |

***Accessories****: A detailed brochure on infusion & microdialysis equipment will be sent to you on request.*

A complete system consists of:

1. **N** x boxes, mouse or rat
2. 1 control unit
3. Your choice of options, extensions and accessories
4. 1 software package
5. **N** x housing, mouse or rat

**N= Number of measuring places**

The TSE Place Preference System is undergoing continuous development in cooperation with our users and new functions are being added at frequent intervals. If you are interested in hardware modifications or in a new type of analysis please contact us and we will discuss your specific needs!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