

RAPC

User's Guide

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Contact

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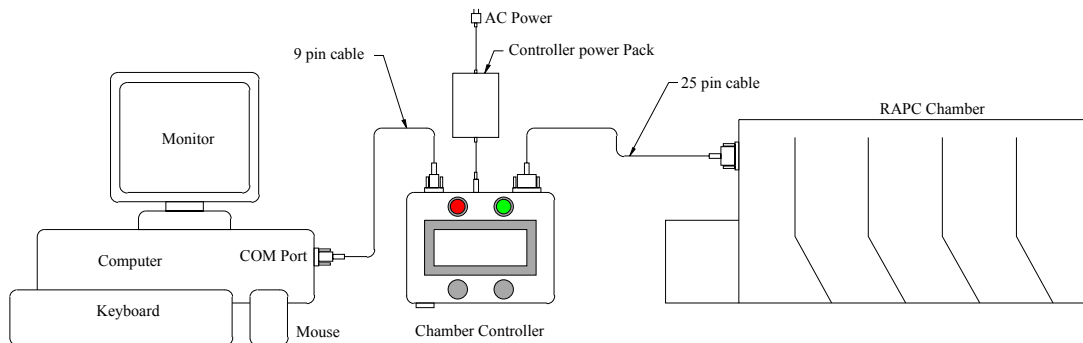
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Introduction

The RAPC System consists of the RAPC Chamber, RAPC Edit software, RAPC Experiment software, and a general purpose Windows based computer. The RAPC Chamber is controlled by an electronic controller. The controller is connected to the PC via standard RS-232C serial communications link. The controller communicates with the PC, receiving display information and sending event information back. The operator receives instructions on the display and responds by pressing the indicated keys after the requested operation is completed.

RAPC Edit program is used to configure the experiments. RAPC Experiment is used to run the experiments and record the experiment data.



Typical System Configuration

Unpacking

1. Open the outer shipping carton on top where shipping labels are attached.
2. Remove some of the peanuts and the upper foam bar.
3. Remove the inner shipping carton.
4. Open the inner shipping carton on top as indicated.

Caution

Cut only packing tape!
The top of the chamber is directly below the box
cardboard.

5. Open the inner box flaps and remove the two cardboard end supports.

Caution

The chamber bottom and top are not attached !
When moving the chamber, lift it by holding it under
the bottom plate.

6. Remove chamber from inner carton.
7. Remove outer plastic cover.
8. Remove the black tape holding the top to the chamber.
9. Remove the top.
10. Older chambers only: Locate four thumb screws (supplied with the
 controller and the cables shipment).
 Install the thumb screws in the lower corners of the
 chamber to secure the bottom.
11. Remove all black tape from the chamber.
12. Replace top.
13. Chamber is ready for use.

Returning The Shipping Boxes

1. Remove more peanuts from the outer box.
2. Place the empty inner carton back in the outer box.
3. Replace top foam support.
4. Replace all peanuts.
5. Seal the outer box and ship back to Bridgekey using the prepaid shipping label.

Cleaning

1. Clean the chamber only with water based cleaners.
2. On older chambers first remove the four base thumb screws to separate the bottom from the chamber.
3. Lift the chamber off its bottom plate and set behind the plate.

Caution

Do not use any solvents to clean the chamber !

The chamber acrylic will crack and fracture if it comes into contact with solvent based cleaners or any solvent based substance, such as alcohol.

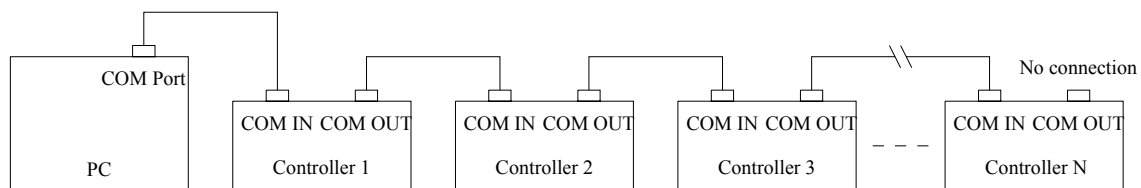
4. Clean the bottom plate.
5. set the chamber on its back wall and clean the dividers, if needed.
6. Replace the chamber back onto its bottom plate.
7. Note that the chamber is located on the bottom plate via the four small corner blocks.
8. On older chambers replace the four base thumb screws.

Single Chamber Controller Setup

1. Unpack the controller, the power pack, and the two cables.
2. Plug the power pack output cord into the Power connector on the back of the controller.
3. Plug the AC power cord into a standard 120VAC outlet.
4. Plug the other end of the power cord into the power pack.
5. Plug one end of the supplied 9 pin cable into COM IN connector on the back of the controller.
6. Plug the other end of the 9 pin cable into a COM port on the back of the PC.
7. Note the PC's COM port number.
8. Plug one end of the supplied 25 pin cable into the CHAMBER connector on the back of the controller.
9. Plug the other end of the 25 pin cable into the connector on the chamber, located near the Start House.

Multiple Chamber Communications Cable setup

1. Plug one end of the first 9 pin cable into a COM port on the back of the PC.
2. Plug the other end of the 9 pin cable into COM IN connector on the back of the first controller.
3. Plug the second 9 pin cable into the COM OUT connector of the first controller.
4. Plug the other end of the second 9 pin cable into the COM IN connector of the second controller.
5. Repeat steps 4 and 5 until all controllers are connected.
6. The last controller in the chain will have a cable connected to its COM IN connector. The COM OUT connector will be unused.



Software Installation

1. Insert the RAPC CD ROM disc into the CD ROM drive. The Setup procedure will start automatically (if the computer system is configured so).
2. If the Setup procedure does not start automatically, locate the program SETUP.EXE on the CD ROM and start it (double click it).
3. Follow instructions in the setup procedure.
4. The fully automatic installation will install both RAPC Edit and RAPC Experiment programs on your computer.
5. The manual installation option will install only the selected program on the computer. It may be desirable to install only the RAPC Edit program on one computer where the experiments are designed and to install RAPC Experiment on a different computer where the experiments are performed.
6. Icons for the installed programs are placed on the desktop.

Software Removal

1. Use Windows Add/Remove Programs utility found in the Windows Control Panel to remove RAPC software.
2. Select RAPC program and click Remove.
3. Both RAPC Edit and RAPC Experiment will be removed.
4. Configuration files and experiment result data files will be retained in their specified folders

Starting the System

1. Turn on the power to the controller by pressing the front On/Off switch to I position.
2. The LCD backlight comes on and there will be text on the screen.
3. Start the RAPC Experiment software on the PC by double clicking the desktop icon.
4. On the PC, using the Port pull down menu, select the COM port used for connection to the controller.
5. Load the experiment file using the File pull down menu and select Open item.
6. The software is supplied with one sample configuration file.
7. Select the file and click OK.
8. The configuration is loaded into the PC and into the controller and the experiment is ready to run.
9. Follow the instructions on the LCD in the controller or the LCD image presented on the PC's screen.
10. Refer to the RAPC Edit and RAPC Experiment sections of this guide.

RAPC Edit™ Program

The RAPC Edit is used to prepare the experiment specifications, such as experiment name, desired sequences of performance and learning, white noise volume, door lock patterns, and inactivity time outs. The experiment specifications are stored in RAPC Experiment Specification files with the extension .RAP. The specification files are used by the RAPC Experiment program to control the different experiments.

Start the RAPC Edit program by double clicking the program icon on the desktop. Certain experiment parameters are automatically preset based on the values set in the default template experiment file called DEFAULT.RAPT. Fill in the remaining configuration parameters. When the configuration is complete, store the new configuration file using the Save option under the File pull down menu. The RAPC Edit program can now be closed.

RAPC Edit File pull down list

Open	Opens a dialog box to allow selection of an existing experiment configuration file. An existing file may be selected and modified.
Open Template	Opens a dialog box to allow selection of an existing template experiment configuration file. To create a new template file, a configuration file is first created and saved under any desired name. Later, the file name extension of this configuration file must be manually changed from .RAP to .RAPT.
Save	Saves the current experiment configuration in the file under the current file name. If the template configuration file has been used, the user must specify a new file name.
Save As	Opens a dialog box to allow the configuration file to be saved under a new name.
Exit	Closes the RAPC Edit program. Any unsaved changes to the configuration file are lost.

RAPC Edit Help pull down list

Help	Presents Windows Help for the RAPC Edit program.
About	Presents information about the RAPC Edit program. The window is closed by clicking the OK button.

RAPC Edit main window controls

Title	Enter the title of the experiment.
Date	The system automatically enters the time and date when the specification file was created. The time and date used are those of the PC clock.
Author	Enter the name of the author of the experiment.
Note	Enter any general note associated with this experiment.
Total number of Components (Performance and Learn)	Select the total number of components from a pull down list. The maximum number of components is 10.
Total number of Trials per Component	Select the total number of trials per each component of the experiment. The maximum number of trials is 10.
Component Sequence	Select the desired sequence of components from a pull down list.
Visualize	Click this button to open an information window which will present the actual sequence of events. The window is closed by clicking the OK button.
Inactivity Timeout	Select the timeout time, in minutes, from a pull down list. During the experiment, if there is no animal activity (no door sensors are activated) for the duration of the timeout, the experiment is terminated and the attention is called to the chamber by lighting the red LED. The inactivity timer can be set to a value between 3 and 10 minutes. The 20 minute selection is used for animal habituation prior to running experiments.

Speaker Volume	Select the desired white noise volume by selecting a value from the pull down list. Value of 0 represents minimum volume (sound off) and value of 31 represents the maximum volume.
Learning Chamber Configuration	Click the door symbols to achieve the desired door lock pattern for the Learning trials. Only one door per divider may be 'unlocked'.
Performance Chamber Configuration	Click the door symbols to achieve the desired door lock pattern for the Performance trials. A Confirmation window is presented with every change of the Performance Chamber Door Lock Configuration to prevent accidental change in these settings. Click OK to confirm the new setting or click Cancel if change is not desired. Only one door per divider may be 'unlocked'.

RAPC Edit Screen Example

The screenshot displays the RAPC Edit software interface. At the top, the window title is "RAPC Edit - default.rapt". Below the title bar, there are menu options for "File" and "Help".

The main interface is divided into several sections:

- Metadata Section:** Contains fields for "Title" (Memory Experiment - Series BX3), "Date" (08/17/2004 09:54:39), "Author" (John Rivers), and "Note" (Testing to confirm Bill's theory using the latest batch of animals from Judy's lab).
- Configuration Section:** Includes dropdown menus for "Total # of Components (Performance and Learn)" (set to 3), "Total # of Trials per Component" (set to 3), and "Component Sequence" (set to "Learn / Performance Alternating"). There is also a "Visualize" button.
- Timeout and Volume Section:** Features dropdown menus for "InactivityTimeout" (set to 5 min.) and "Speaker Volume" (set to 8).
- Chamber Configurations:** Two diagrams are shown:
 - Learning Chamber Configuration:** A 3x4 grid of doors labeled A, B, C, and D across three rows (1, 2, 3). Row 1: A (locked), B (unlocked), C (locked), D (locked). Row 2: A (unlocked), B (locked), C (unlocked), D (locked). Row 3: A (locked), B (locked), C (locked), D (unlocked).
 - Performance Chamber Configuration:** A 3x4 grid of doors labeled A, B, C, and D across three rows (1, 2, 3). Row 1: A (locked), B (locked), C (locked), D (unlocked). Row 2: A (locked), B (unlocked), C (unlocked), D (locked). Row 3: A (unlocked), B (locked), C (locked), D (locked).

RAPC Experiment™ Program

The RAPC Experiment program is used to control the experiment based on the specification stored in the experiment specification file created using the RAPC Edit program.

Start the RAPC Experiment program by double clicking the icon on the desktop. RAPC Experiment communicates with all the chambers connected to the computer. All detected chambers are indicated in the Chamber Status area. The first chamber is automatically selected. Other chambers may be selected by clicking on the radio button next to any active chamber. Chambers that are not detected as active cannot be selected.

Each experiment is controlled by the RAPC Experiment Specification file. This file defines the flow of the experiment, the door lock configurations, the white noise volume, etc. See the RAPC Edit User's Guide for additional information.

To perform an experiment in a particular chamber, the Experiment Specification file must be loaded into the RAPC Experiment. Select the desired chamber using the radio button and load the desired Specification file by using the OPEN option under the File pull down menu.

The Specification file contents are loaded into the information section of RAPC Experiment. Fill in the remaining information to be stored with the experiment results.

The RAPC Experiment program instructs the operator what actions are to be performed and it collects all timing data during the individual trials. At the end of the last trial additional information about the experiment may be added and saved with the experiment results.

RAPC Experiment will save the experiment results in a tab delimited text file. The file name is automatically generated indicating time and date of the experiment. The results data files have extensions

RAPC Experiment **File** pull down list

Open	Opens a dialog box to allow selection of the desired experiment configuration file.
Save As	Opens a dialog box to save the results of the completed experiment. A file name is automatically generated based on the Animal Number, date, and time of the experiment.
Exit	Closes the RAPC Experiment program. If the experiment data has not been saved, a confirmation is requested.

RAPC Experiment **COM** pull down list

COM n	Selects the COM port to which the RAPC chamber is connected.
Off Line Testing	This communication selection is used to test RAPC Experiment program without the controller and the chamber.

RAPC Experiment **Help** pull down list

Help	Presents Windows Help for the RAPC Experiment program.
About	Presents information about the RAPC Experiment program. The window is closed by clicking the OK button.

RAPC Experiment **Diagnostics** pull down list

Volume	Presents a control panel which allows speaker volume adjustment independent of the experiment configuration file. Click Volume Up to increase the white noise volume. Click Volume Down to decrease the volume. Click Done to close the control panel window.
Clear History	Clears all data entries from Experiment, Animal Number, and Study Group lists. This feature will be removed from production version.
Debug Timers	Presents debug timers used for RAPC Experiment testing.

RAPC Experiment **Chamber Status** window

Chamber Status	<p>The Chamber Status is used to provide an overview status and selection of all system chambers.</p> <p>Chamber Status consists of a column of Chamber Status indicator boxes and a corresponding column of Chamber Selection Radio buttons.</p> <p>Non-existent chambers are indicated by gray Chamber Status Box. Active chambers may be indicated with a white, red, or green status box, depending on the status of the experiment in that particular chamber.</p> <p>White color indicates that no configuration is loaded for that chamber. Green color indicates that the experiment is in progress and the animal is moving through the chamber. Red color indicates that an action by the technician is required.</p> <p>The three colors are active for all available chambers in the system, regardless of which chamber is selected to present its detail in the main window.</p> <p>One of the active chambers is selected using the radio buttons and the information about the experiment in that chamber is presented in the main RAPC Experiment window.</p>
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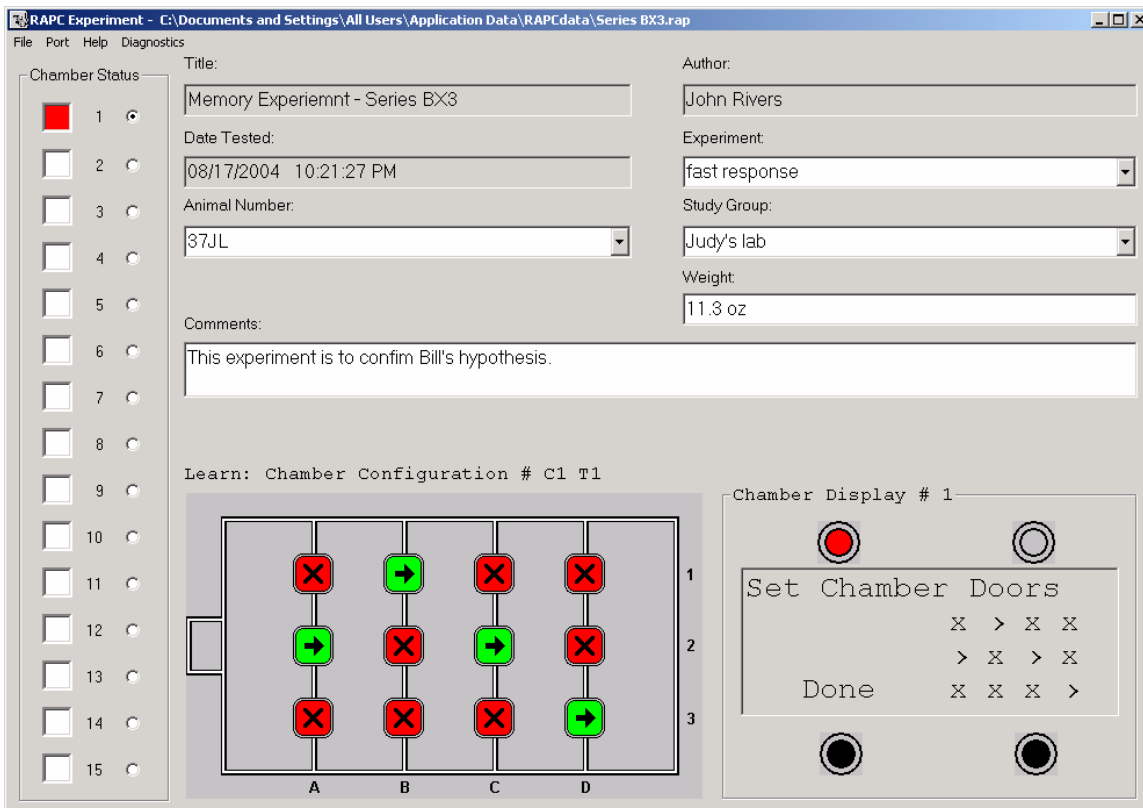
RAPC Experiment **Main Window**

Title	Presents the experiment title as defined in the experiment specification file.
Author	Presents the experiment specification author as defined in the experiment specification file.
Date Tested	The system automatically enters the time and date when the experiment is performed. The time and date values are based on the PC's clock.

Experiment	Enter a new experiment identification or select an existing identification from a pull down list. The new identification is automatically added to the pull down list for use in future experiments.
Animal Number	Enter a new animal number or select an existing animal number from a pull down list. The new animal number is automatically added to the pull down list for use in future experiments.
Study Group	Enter a new study group name or select an existing study group name from a pull down list. The new study group name is automatically added to the pull down list for use in future experiments.
Weight	Enter the animal weight.
Comments	Enter any general comments about the current experiment.
Chamber Activity Window	<p>The current Component and Trial of the experiment is identified above the window. C identifies the component number and T identifies the Trial number.</p> <p>The chamber door status is presented in the window. The locked doors are presented in red, the unlocked doors are presented in green. The symbols on the door (X, ⇌) are initially presented in black. When a door is pushed open (sensor disengages), the lock symbol color changes to white. While the door is pushed and the sensor is disengaged (door may open or not, depending on the lock selection) the entire door symbol is gray. When the door closes and the sensor engages again, the door symbol color is restored back to red or green, but the lock symbol color is permanently changed to white.</p> <p>The door lock configuration changes as defined by Learning and Performance components of the ongoing experiment. the configurations have been set during the experiment design.</p>

<p>Chamber Display</p>	<p>The chamber display is an image of the selected chamber controller, including the red and green LEDs, the LCD screen, and the two push buttons.</p> <p>The red LED indicates that the chamber needs to be serviced.</p> <p>The green LED indicates that a run is in progress.</p> <p>The LCD area presents information and instructions for the operator to set the chamber door locks and service the chamber through the experiment. The image is the same on the computer screen and on the controller's LCD.</p> <p>The two push buttons may be activated on the computer screen by clicking them or at the controller by pushing them.</p>
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RAPC Experiment Screen Example

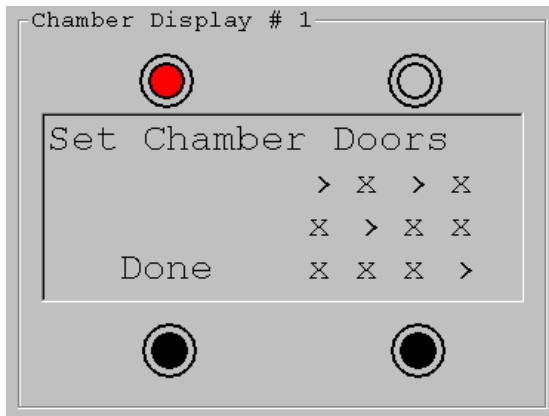


Running Experiments

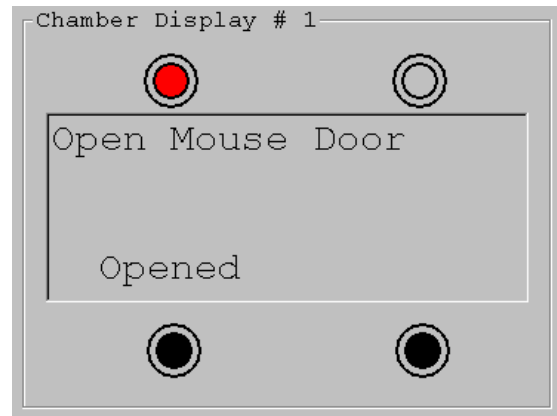
1. Create a experiment configuration using RAPC Edit program.
2. Save the new configuration in a desired file.
3. Start RAPC Experiment program.
4. Load the desired the experiment specification file,
5. Open the desired configuration file by using the Open option under the File pull down menu.
6. Fill in the remaining information to be stored with the experiment results.
7. Select the COM port to be used for communications with the chamber controller under the COM pull down menu.
8. The chamber controller should be connected to the computer, the chamber, and its power pack.
9. Turn on the power to the chamber controller by pressing the power switch to the ON (I) position.
10. The controller's display reflects the first operation in the experiment.
11. The operator completes the instructions and can either click the indicated button on the controller, at the chamber, or click on the indicated button on the display of the controller in the RAPC Experiment window.
12. The display indicates to the experimenter what to do next.
13. The completion of the action is signaled to the system by pressing the indicated key or clicking on it on the screen.
14. The red LED indicates that the chamber needs to be serviced by the experimenter.
15. The green LED indicates that the experiment is in progress.
16. At the end of the experiment a window for Final Comment is automatically opened.
17. The experimenter may add additional information or simply click the OK button.
18. The Save AS dialog box is automatically opened.
19. The desired experiment result data file name is automatically generated.
20. The data is saved in the indicated file and the just completed configuration is cleared from the chamber.

RAPC Experiment Controller Screen Examples

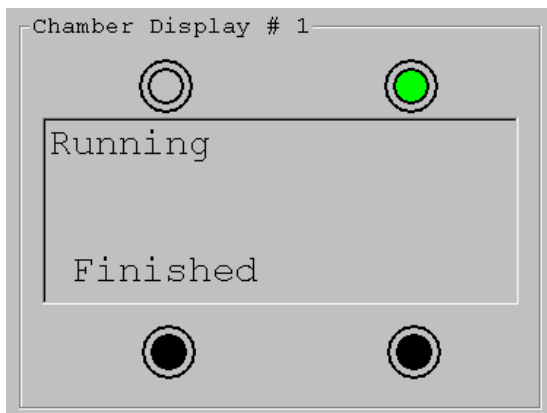
Screen 1 Set doors for a trial



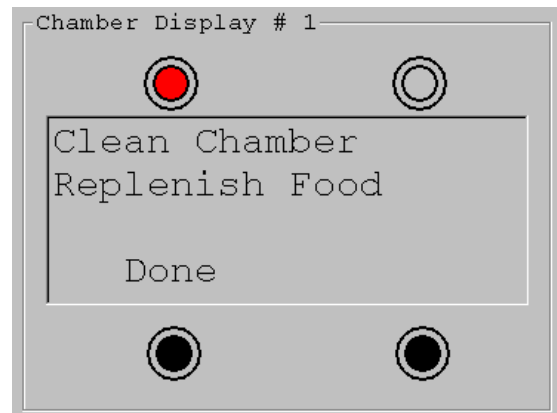
Screen 2 Open mouse door



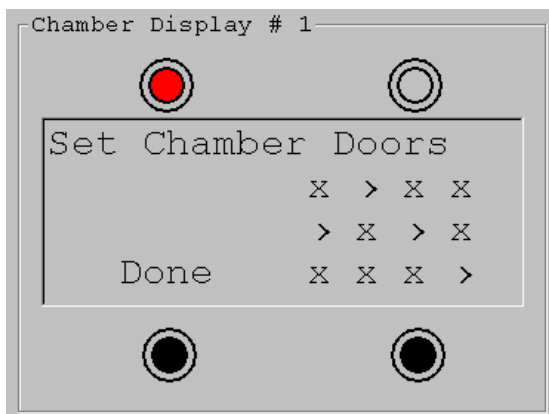
Screen 3 Run in progress



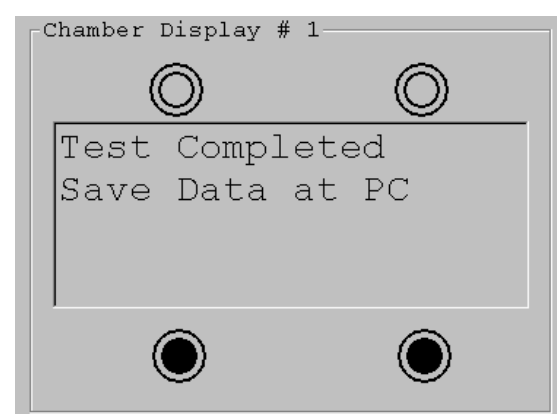
Screen 4 Run completed



Screen 5 Set door for the next trial.



Screen 6 Last trial completed

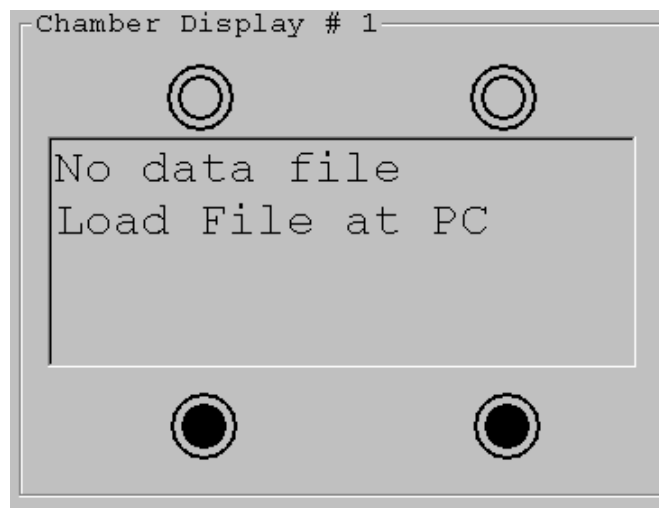


Problems Encounter While Running Experiments

► Experiment Configuration Not Loaded

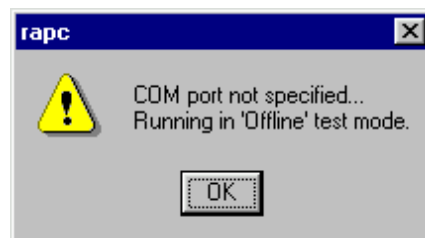
The RAPC Experiment has just been started and no experiment specification file has been loaded. Open the desired experiment specification file using the OPEN option under the FILE pull down menu.

Same condition exists if the current experiment has been completed and data has been saved. In order to run another experiment a new experiment specification file must be loaded at the PC.



► Wrong COM Port Selected

The COM port selected in the RAPC Experiment program is not correct. Choose a different COM port using the options under the COM pull down menu.



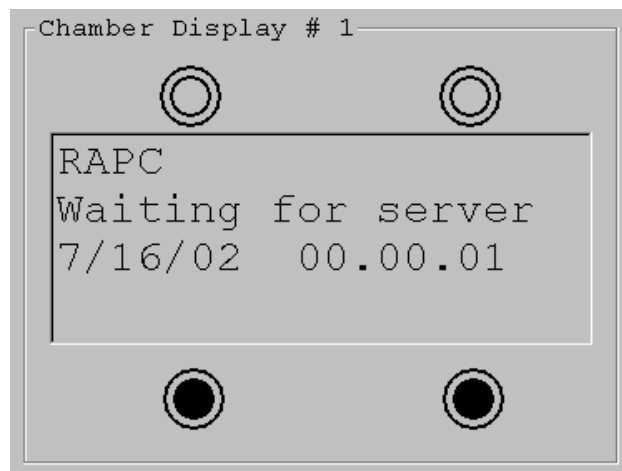
► Chamber Not Found

The computer is not able to establish communications with a chamber over a valid COM port. The 9 pin communications cable is not installed or connected to a wrong COM port. The cable should be connected to SERIAL IN port on the back of the controller and to the selected COM port on the back of the computer.



► Computer Not Running

The controller is on but the computer is not on or the RAPC Experiment program is not running. Turn on the computer and start RAPC Experiment. This display occurs only on the controller.



Diagnostics

The chamber controller and the chamber operation can be tested independently from the computer. The controller is placed in the diagnostic mode by pressing and holding both A and B switches down while turning on the power to the controller.

- The controller's internal software version is displayed.
- The B key is used to increase the white noise volume.
- The A key is used to decrease the volume.
- The red LED lights when the A key is pressed.
- The green LED lights when the B key is pressed.
- The display indicates the state of all door sensors.
- Under normal closed conditions all door sensors should be engaged and indicated by "-" symbol.
- Each door sensor can be tested by lifting up the corresponding door.
- When the door is lifted, the display symbol changes to "□".
- All sensors must be engaged when the chamber is at rest on a level surface.
- All sensors must be disengage when each door is lifted, even in the locked position.
- All sensors can be tested by first locking all doors and then tilting up the entire chamber by lifting it at the Start House end until the chamber is at about 45° angle.
- All doors should swing open, stop against the door locks, and the sensors should disengage.
- When the chamber is set back on level surface, all doors should close and all sensors should engage.

Repairs

► Door Adjustment

If a door sensor fails to disengage when the chamber is tilted, the problem may be an adjustment of the door position or dirt in the door's hinge.

To adjust the door sensor position, loosen the two #10 screws using the supplied large Allen L-Key wrench. The door may be moved sideways. Adjust the door's position to set a 1 mm gap between the sensor (in the sensor tube) and the magnet (on the door). Confirm satisfactory sensor action in closed, locked, and unlocked position. Do not over-tighten the screws, but tighten the door screws securely.

► Door Replacement

If the door's hinge is contaminated with dirt, the entire door assembly must be replaced. Remove the two #10 screws using the supplied large Allen L-Key wrench. Replace the door assembly with a new one (Bridgekey Part # 10241). Adjust the door position as described above.

► Sensor Tube Replacement

If a sensor element fails, the entire sensor tube must be replaced. Remove the three #10 screws holding the acrylic divider cover using the supplied large Allen L-Key. Remove the acrylic divider cover. Unplug the cable at the top of the sensor tube. Remove the two #8 screws using the supplied small Allen L-Key wrench. Install the new sensor tube (Bridgekey Part # 10243), first by installing the lower screw (with a lock washer) and then installing the upper screw (with a flat washer). There is no adjustment on the sensor tube position. Do not over-tighten the screws, but tighten the sensor tube screws securely. Insert connector into the tube connector. Adjust the corresponding door position as described above. Replace the divider cover making sure that no wire are pinched between the cover and the divider wall. Secure the cover with the three #10 screws.

► Speaker Replacement

Remove the three #10 screws holding the acrylic divider cover using the supplied large Allen L-Key. Remove the acrylic divider cover. Unplug the signal connector. Remove four Phillips screws holding the speaker to the four standoffs inside the chamber. Install the new speaker assembly (Bridgekey Part # 10263) and replace the four screws with lock washers. Connect signal connector. Replace the divider cover making sure that no wire are pinched between the cover and the divider wall. Secure the cover with the three #10 screws.

► Door Lock Adjustment

If the door lock becomes too loose or too tight after some time of use, adjust the door lock screw setting with the large Allen L-Key. The door lock screws use a special self locking thread. Tighten the door lock screw until the lock is difficult to rotate, then back off the screw slightly until the door lock operates smoothly, but with some resistance. Note that the door lock screw will present resistance when backing off - this is normal.

► Door Lock Replacement

Removing the door lock screw using the large Allen L-Key. Remove the lock washer and flat washer, replace with a new door lock and adjust as described above. The flat washer is placed inside the door lock well first, followed by the lock washer, followed by the screw. The flat washer is a special small diameter washer.

Bridgekey Part Numbers

- Door Assembly 10241
- Sensor Tube Assembly 10243
- Chamber Top Cover, with end stops 10253
- Chamber Floor, with corner mounting blocks 10254
- Speaker Assembly 10263
- Chamber Base Retaining Knob 10354
- Controller / Computer Cable (9 pins) 10355
- Chamber / Controller Cable (25 pins) 10356
- Small Allen L-Key wrench (3/32") 10364-001
- Large Allen L-Key wrench (1/8") 10364-002

Door Assembly



Sensor tube Assembly



Speaker Assembly

