

Animal Acoustic Startle
System

USERS' GUIDE

CE **DECLARATION of CONFORMITY**

Manufacturer's Name: Coulbourn Instruments, L.L.C.
Manufacturer's Address: 7462 Penn Drive
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Importer's Name: Various; Contact Coulbourn Instruments
or the authorized representative in your
country

Declares that the Product(s):

Product Name: LabLinc V System
Model Number: V15-17
Product Options: All V-Series Modules, Transducers,
And Accessories

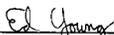
Conforms to the Following Product Specifications:

EMC: Radiated and Conducted Emissions per EN 55011, Class B at 10 Meters
IEC 801-2, ESD at 4kV Direct Contact and 8kV Indirect
IEC 801-3, RF Radiated Fields from 80 to 1000 MHz at 3 V/m
IEC 801-4, EFT at 1kV on AC Ports and 0.5kV on I/O Lines
SAFETY: EN 61010-1 : 1993

Supplementary Information:

The products herewith comply with the requirements of the EMC Directive 89/336/EEC
and the Low Voltage Directive 73/23/EEC. The products were tested in typical
configuration.

Allentown, PA, March 27, 1996


Ed Young, Chief Engineer

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Importer's Name: Various; Contact Coulbourn Instruments
or the authorized representative in your
country

Declares that the Product(s):

Product Name: Acoustic Power Amplifier
Model Number: E56-02
Product Options: None

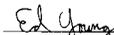
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Animal Acoustic Startle System

The startle response is used in many branches of research involving behavioral testing. Coulbourn Instruments has developed a turnkey system that enables the researcher to standardize this procedure. The data collected with this system can be repeatedly reproduced with complete reliability.

The Animal Acoustic Startle Response System from Coulbourn Instruments is simple to use and the software is user friendly. The system consists of an acoustically isolated test chamber, startle platforms, animal holders, an audio source module and amplifier, V-series modules for measuring the startle response and software.

The software allows for easy setup and operation. It is a fully configurable Windows® based software package for creating protocol and experimental design that does not require the user to learn complex programming languages.

Every effort has been made to provide a system that is both easy to setup and to use. Please take the time to read this manual as well as the *LabLine V Users Guide*. Both contain a wealth of information that will answer most, if not all, of your questions.

SPECIFICATIONS

- Number of subjects: 1 to 8
- Audio source frequency range: 20 Hz to 99 kHz
- Pre-pulse speaker (bottom of chamber) frequency range: 80 Hz to 16 kHz
- Pre-pulse speaker amplitude range: 0 to 108 dB SPL
- Startle pulse transducer (lid of chamber) frequency range: 500 Hz to 20 kHz
- Startle pulse transducer amplitude range: 0 to 126 dB SPL
- Trial protocol: Inter-Trial Interval (ITI), random or fixed range from 10 to 65 seconds
- Pre-pulse and Pulse durations: 1 millisecond (mS) to 200 mS
- Startle transducer platform calibration: static load, computer automated
- Platform weight range: 20 gm to 1 Kg (higher ranges are available)

SYSTEM REQUIREMENTS

IBM AT-compatible PC with one (1) available ISA slot, Pentium or 486, 66 MHz or faster, 16 MB RAM, hard disk with at least 2 MB free space, 3 1/2" floppy, SVGA, Windows95[®] or Windows98[®].

INSTALLATION OF THE L18-16S/C

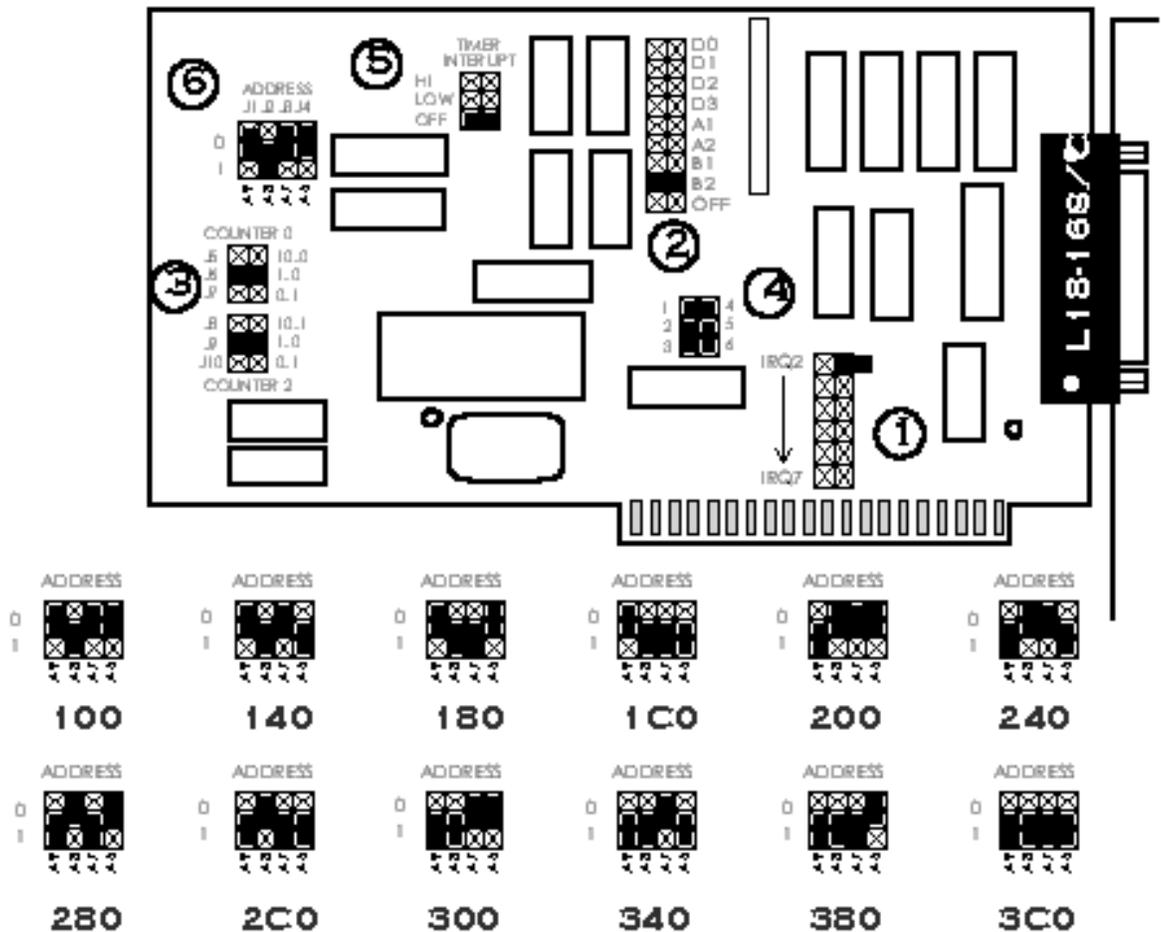
The L18-16S/C needs to be installed into an ISA expansion slot on the motherboard of the PC. Turn off the computer, unplug it from the electrical outlet and open the CPU (computer case). If you are unfamiliar with installing PC interface cards in

computers, it is strongly suggested that you get assistance from a knowledgeable person prior to proceeding.

The hexadecimal (hex) address (jumper block 6 in the diagram below) is set at the factory to 100, the default setting. Prior to installing the card, it is important to check to make sure that the card is set to the appropriate address for your computer (see additional hex address settings below). It is suggested that you use either 100 or 140 for the Interface Address (or hex address). Please record the address setting. You will need to know the hex address setting for the software setup (please refer to the CI Acoustic Startle – Interface Address procedure).

The interrupt jumper (jumper block 5) should be set to “OFF” and timer resolution must be set to 1 millisecond (mS) (jumper block 3).

L18-16S/C INTERFACE CARD

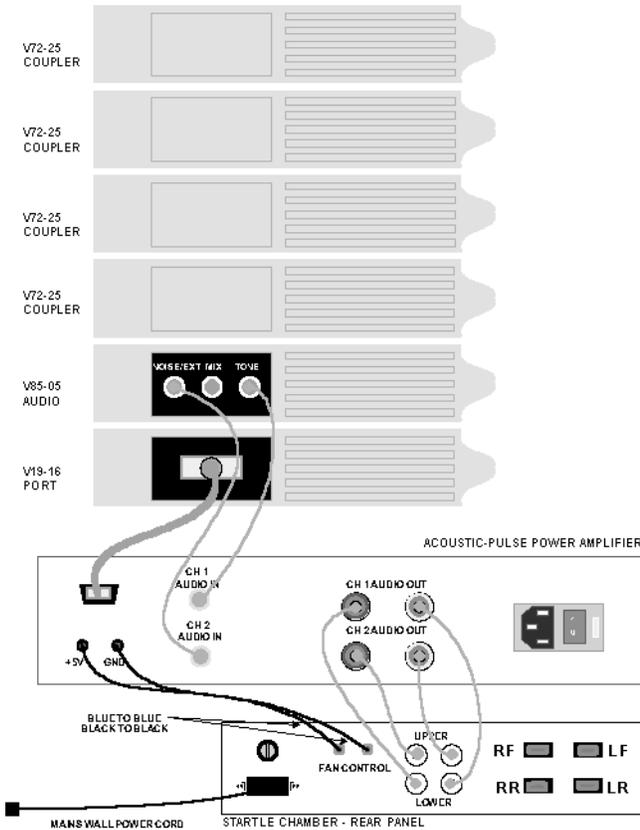


The computer is connected to the V19-16 using a 25 pin D-sub cable, supplied with the module.

INSTALLATION OF THE V-SERIES MODULES

The diagram below shows the suggested order in which the V-Series modules should be stacked. Also shown are the connections to/from the power amplifier and Startle Chamber.

MODULE LEFT-SIDE CONNECTIONS, PORT & AUDIO TO AMPLIFIER & CHAMBER



Module 6 – V72-25A Resistive Bridge Transducer Coupler (LR) Platform 1

Module 5 -- V72-25A Resistive Bridge Transducer Coupler (RR) Platform 2

Module 4 -- V72-25A Resistive Bridge Transducer Coupler (RF) Platform 3

Module 3 -- V72-25A Resistive Bridge Transducer Coupler (LF) Platform 4

Module 2 – V85-05 Audio Source

Module 1 – V19-16 General Purpose Port

Diagram of the back panel of the E56-02 Power Amplifier

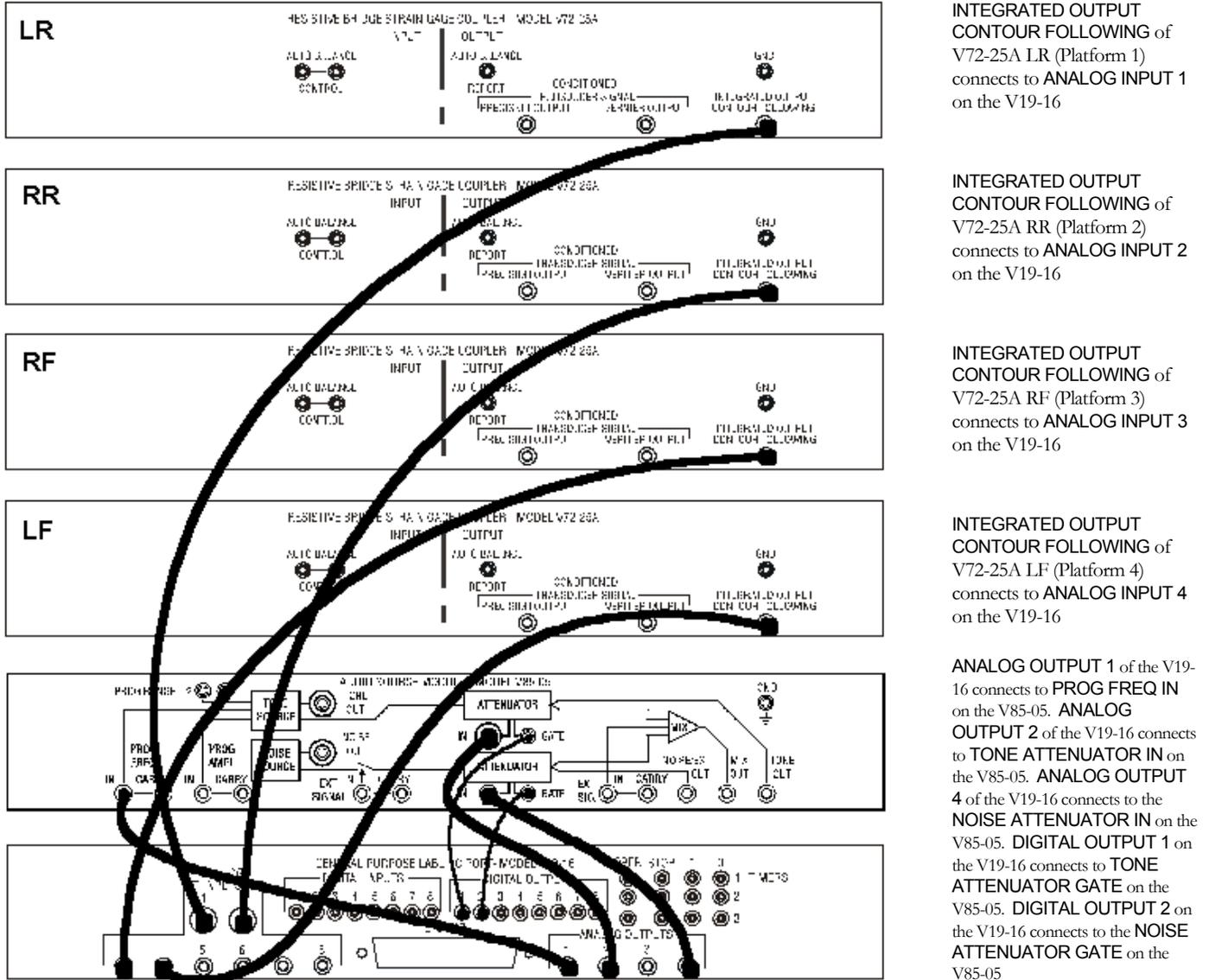
Diagram of the back panel of the E10-24 Startle Chamber

The *LabLinc V Users Guide* includes important information regarding the setup options and performance specifications of the individual modules. Please refer to the manual for information regarding basic setup, options and installation.

For Animal Acoustic Startle, the actual setting on the modules and connections between the V-Series, power amplifier and Startle Chamber are critical. If the settings and connections, described below are not used, the system will not perform to specifications. In addition, for systems shipped prior to October 15, 1998, there are additional requirements and setup procedures used for the V76-23 Multi-function Integrator used with each of the V72-25 Resistive Bridge Transducer Coupler. Newer systems are shipped with the V72-25A Resistive Bridge Transducer Couplers with integral contour following integration (fixed time constant of 10 mS).

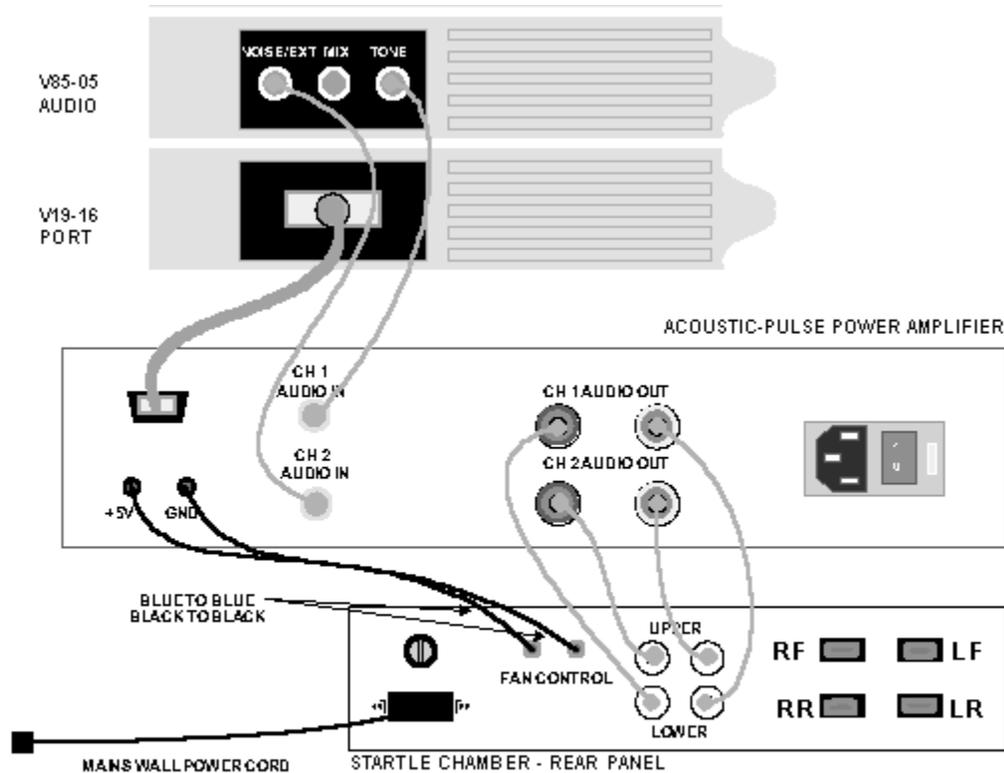
Please refer to the following diagram for the specific connections between V-series modules. The heavy black lines represent the analog connections. These are made with the gray analog leads (V12-90) supplied with the system. Digital connections are represented by the thin black lines and are made with the black digital leads (V12-10) included with the system.

MODULE INTERCONNECTIONS FOR STARTLE RESPONSE SYSTEM



The E56-02 power amplifier (shown below) is connected to the V19-16 port and V85-05 in the following manner:

1. Connections between the V85-05 and the power amplifier are made using the cable with the dual RCA to RCA plugs. The Tone output of the V85-05 is connected to Channel 1 Audio Input of the power amplifier and the Noise is connected to Channel 2.
2. The V19-16 is connected using the cable with the D connectors, supplied with the E56-02.



INSTALLATION OF THE POWER AMPLIFIER AND STARTLE CHAMBER

The power amplifier has two (2) types of connections to the Startle Chamber:

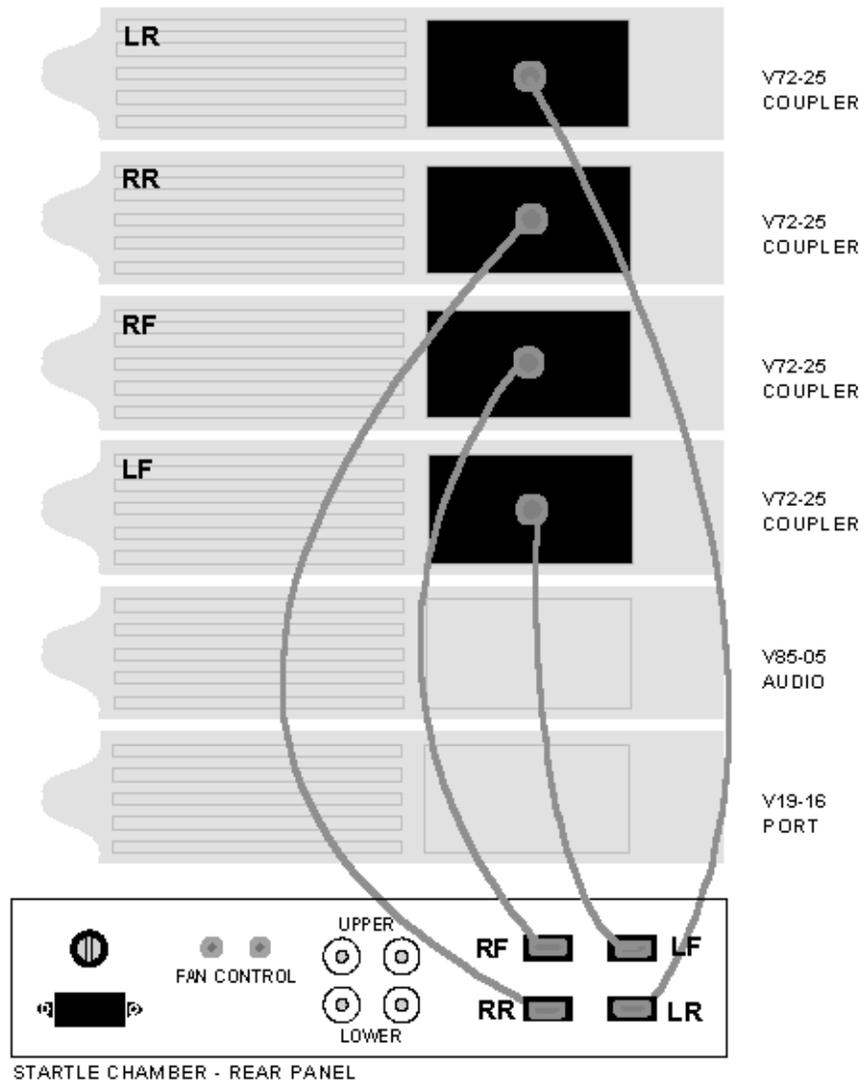
1. Audio – First connect the Audio Out for Channel 1 (on rear of power amplifier) to the Lower speaker on the rear panel of the Startle Chamber using the speaker cables provided. Be sure to connect Red (nut) to Gold (wire) and Black (nut) to Silver (wire). This is generally used for Tone or S1 and is connected to the low power speaker in the bottom of the Startle Chamber. Next, connect the Audio Out for Channel 2 to the Upper speaker on the Startle Chamber. This is used for

Noise or S2 and is connected to the high power transducer in the lid of the chamber.

2. Fan Control – The final connection between the power amplifier and the Startle Chamber is the power line for the ventilation fan control. Make this connection using the dual-lead cable with 0.080” pins (supplied with system). The black pin is plugged into the +5 V and the blue pin is plugged into the GND (-).

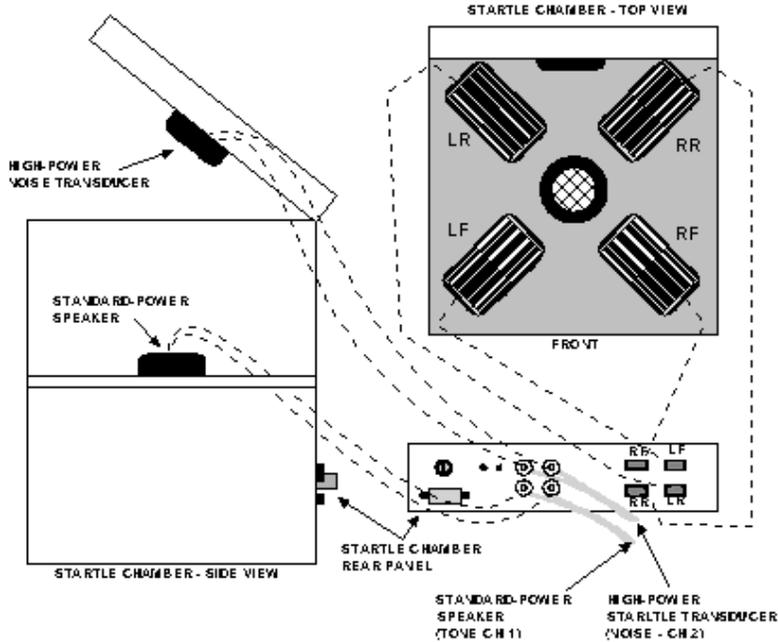
The connections from the platforms in the Startle Chamber to the V-Series coupler modules are made in the following manner. Connect the platform output connectors on the back panel of the Startle Chamber to the V72-25A using the V94-98 cable supplied with the system.

MODULE RIGHT-SIDE CONNECTIONS, TRANSDUCER TO STARTLE CHAMBER



To complete the installation, place the Startle-Tremor Platforms inside the Startle Chamber and connect the lead from the platform to the plug in the chamber. The following is a suggested arrangement of platforms:

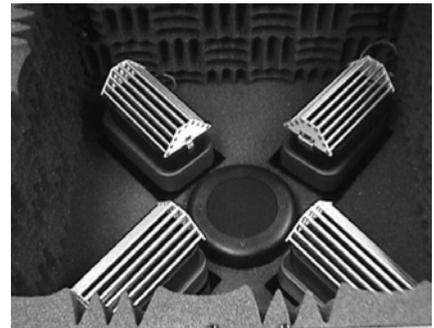
THE INTERNAL CONNECTIONS OF THE STARTLE RESPONSE CHAMBER



Detail of Optional Video Cameras w/IR Illuminators



Suggested placement of platforms in Startle Chamber



HARDWARE CONSIDERATIONS

Settings/Calibration Procedures for the V72-25(A) Resistive Bridge Transducer Coupler

The following settings are suggested for the V72-25(A):

1. Transducer: Excitation: 10 V; Coupling DC (for calibration) AC (for running subjects)
2. Coupler : Balanced (see below)
3. Sensitivity: 1000 (Vernier knob should be turned all the way to the right)
4. Raw (Precision Output) and/or Integrated (Integrated Output Contour Following) signals are available for testing. The integration time constant is set at 10 mS (factory default). Other time constant settings are available. For those

systems purchased prior to October 15, 1998 the Time Constant should be set to 10 mS (knob should be turned all the way to the left).

Prior to use, each V72-25(A) and Startle-Tremor Platform will need to be calibrated. The Calibration procedure will be explained later in this manual. For calibration, the V72-25(A) coupler(s) must be in the DC coupled mode. In this mode, the coupler's output directly follows the input from the platform, which is the mode required for static weights. In the AC coupled mode, the output of the coupler will be at "0" until a change occurs. The AC coupled mode is preferred for running an experiment.

Each of the couplers must be balanced. The couplers should be balanced with the animal holder on the platform. By placing the animal holder on the platform the weight of the holder is "subtracted" from the response waveform, so that only the subject's weight will offset the signal from "0".

In either case, (with or without the weight of the animal holder) the LED indicating that the unit has been balanced must be illuminated prior to calibration. Use the BALANCE switch on the coupler for this purpose. Press down on the switch and release it. When the unit is balanced, the LED will be on. Several attempts may be necessary before the unit is successfully balanced.

Settings for the E56-02 Power Amplifier

The following setting should be used for both Channel 1 and /or Channel 2

1. Acoustic Pulse Power: Gain = 5
2. Noise Suppression: NDP/HLH (Noise Distortion and Power/High Low High)

Settings for the V85-05 Audio Source Module

The Frequency and Frequency Range settings will be discussed later in this manual. The amplitude knob (both Tone and Noise) should be turned all the way to the right. The FOLLOW/MANUAL switch for both Tone and Noise must be set to the "FOLLOW" position.

The most appropriate setting of the Rise Fall (Gate) Time (in mS) will depend upon the tone frequencies and the durations used. A stimulus presentation of 65 mS using a Rise Fall Time of 50 mS will not produce much, if any Tone or Noise. Setting the Rise Fall Time too short may cause the perception of a "click".

To prevent this, use the following settings:

- If all Tones are above 2000 Hz – use 10 mS
- If some Tones are below 2000 Hz but above 500 Hz – use 5 mS

- If some tone are below 500 Hz – use the minimum setting of “0” (actual rise/fall time is ≈ 1.3 mS)

If tone is presented as S1, alone or paired with an S2 of Noise, the V85-05 requires a reset time of 10 mS (attenuation only) between presentations. In these situations, the minimum ISI is limited to 10 mS.

However, if both S1 and S2 are presented as Tone, the V85-05 requires a reset time of 65 mS to change frequency. This limits the ISI, in these cases, to a minimum of 65 ms.

Software Installation & Setup

Installation

The Acoustic Startle System software is distributed on three (3) diskettes. Place the diskette marked *Acoustic Startle System Disk 1 of 3* into the appropriate drive [A:] and run the program called *SETUP*. This will be accomplished differently depending upon which version of Windows is in use. In Windows95®, click on the *Start* button and then on the *Run* in the pop-up menu. Type A:\SETUP in the *Open:* window (substitute the correct drive designation, if necessary) and then click on *OK*.

Follow the on-screen instructions to complete the installation. It is suggested that all of the default options be accepted during the installation.

Main Menu



WSTART

Start the program by double clicking on its icon. The program begins by displaying the main menu screen. The following is a brief description of each of the menu items; the remainder of this manual will provide detailed explanations of the functions of each of the items on the menu.



Create/Edit Trial Parameters

This portion of the program is used to specify the nature of stimuli to be presented on each trial and to arrange their temporal aspects. An experiment file is created trial by trial and then stored on disk for future retrieval. These files may also be edited in this section of the program.

Data File Notes

Use this option to enter up to ten (10) lines of text into the data file for the session. Another option enables the entry of fixed headers for each line.

Run Session

This section of the program runs a session. The user specifies the needed input files and the root name to be used for the data files. The program runs the session according to the specifications in these files and collects and stores data in disk files.

View Data

An analog data review capability is included in the software; it is accessed via this routine.

Options

With this option, the user may select values for several session parameters. These include the length of the adaptation period, whether or not analog waveforms will be saved, the number of platforms in use, and the cycling of the ventilation fan in the test chamber.

Calibrate Platforms

The transducers in each of the startle platforms require calibration. The routine accessed by this option will perform these calibrations.

Calibrate Sound

It is necessary to calibrate the transducers to be used for the presentation of the auditory stimuli. These routines will allow the user to adjust the frequency, amplitude, and duration of tone presentations and the amplitude and duration of white noise bursts so that the calibrations may be accomplished. In addition, values required for stimulus specification are provided by this part of the program. (Note: Do not click on this item if the interface address has not been properly entered.)

Create Notes Template

To avoid the need to enter fixed text repetitively, this option may be used to enter the unchanging headers for each of the text lines to be included in the data files.

Interface Address

The entry point for the address of the L18-16S/C interface board.

Create/Edit Pairing Protocol

It is possible to create and execute paired presentations of stimuli in order to implement protocols such as fear-potentiated startle. This option is used to create and edit such pairing protocols.

Run Pairing Protocol

This option is used to run the protocols described in the previous section.

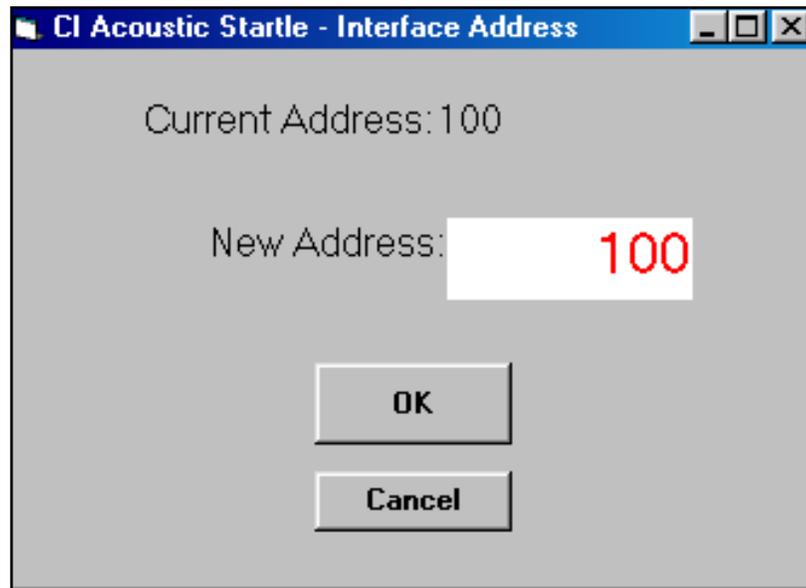
Quit

Selection of this option causes an exit from the Acoustic Startle System software.

The following sections of the manual will discuss each of the menu options in detail. The options are not discussed in the order in which they appear in the menu so that the user may gain familiarity with the software in a more instructive manner.

Setting the Interface Address

Before attempting to use any feature of the software, the interface address must be stored in a disk file. Click on the *Interface Address* item on the menu. The window that opens will show the current address (most likely 100 or 140). This screen allows you to set the address to match the interface address (hex) on the L18-16S/C. Enter the address and then click on *OK*.



Calibrating the Audio Signals (Transducers)

Click on the *Calibrate Sound* option. On entry into this window, click *Initialize*. The window that is shown will provide the options of turning the tone and noise signals on and for adjusting their characteristics. Clicking on either the *Tone Pulse* or the *Noise Pulse* bars should turn on the associated signal. After presenting a tone or noise, the system requires 2 seconds to reset before you can present another tone or noise. Note that the starting duration for both tone and noise are 50 mS.

To adjust the durations of the tone and noise pulses, click on the spin buttons to the right of the *Tone Duration* and *Noise Duration* bars. The white spin buttons will increase and decrease the duration in 1 mS steps, and the red spin buttons will create 10 mS changes. The maximum allowable duration for either pulse is 200 mS.

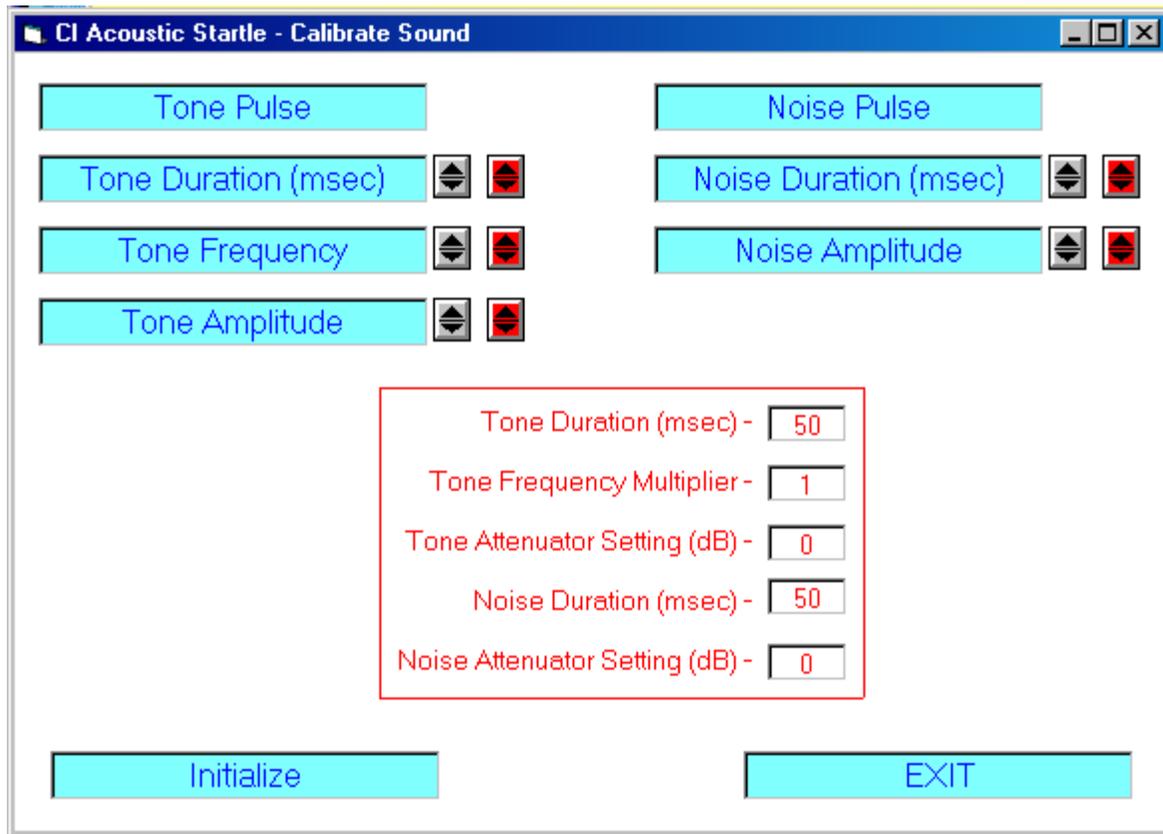
The tone frequency that is to be presented is first set on the V85-05 (Audio source Module) and can be further modified using the *Tone Frequency Multiplier*. The initial settings for the *Tone Frequency Multiplier* is “1” and the *Tone Attenuator Setting* is “0.”

To change the frequency, click the up arrow in the white spin button associated with the tone frequency. Each time this button is clicked, the frequency multiplier increases by 0.01. The multiplier indicates by what value the base frequency set on the Audio Source Module will be multiplied. Thus if the base frequency is 2000Hz and the multiplier is 1.5, the frequency of the tone that will be presented in the Startle Chamber will be 3000Hz. The down arrow in the white spin button lowers the frequency multiplier in steps of 0.01. The red frequency spin button also produces steps of 0.01 but at a much faster rate. Each time the *Tone Pulse* bar is clicked, the frequency of the tone should reflect the current duration and frequency settings.

The white amplitude spin button raises and lowers the attenuator setting in steps of 1 dB. The down button increases the attenuator value, thus decreasing the tone amplitude. Conversely, the up button decreases the attenuator value, thus increasing the tone amplitude. The maximum amplitude is attained with a setting of “0” dB. The attenuator setting is shown in the *Tone Attenuator Setting* box.

The spin buttons associated with noise have parallel effects on noise duration and amplitude.

As you calibrate the audio signals, make note of the duration, attenuator and frequency multiplier settings. These values will be required when stimulus specifications are entered into experiment files.

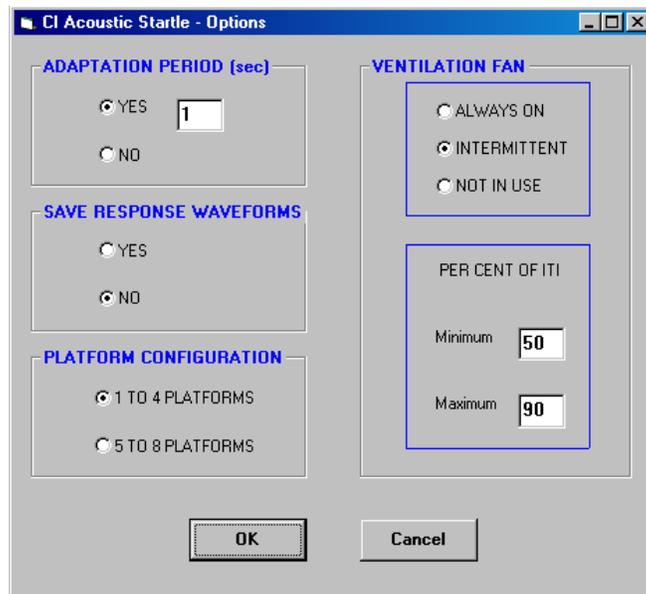


The *Initialize* bar returns all settings to their starting values. [See figure on the next page].

The *Exit* bar is used to return to the main menu screen.

Options

Clicking on the *Options* bar displays the following screen:



The first option deals with the adaptation period – the period of time between the start of the experiment and the start of the first trial. If no adaptation period is to be used, click the *NO* option, and the duration entry window will be disabled. If an adaptation period is to be included, click the *YES* option and enter the duration of the adaptation period (in seconds) in the data entry box.

The second option deals with whether or not response waveforms will be saved for later viewing. To *View Data* after the experiment, click “YES”. Note that the *View Data* option requires the response waveforms.

Next, click the option that reflects the number of platforms in the system (i.e., 1 to 4, etc.).

The final option deals with the use of the ventilation fan in the Startle Chamber. The prime consideration when the fan is used is that neither its onset nor offset serve as a cue with regard to the upcoming trial. If the fan is “ALWAYS ON” or “NOT IN USE”, this problem is avoided.

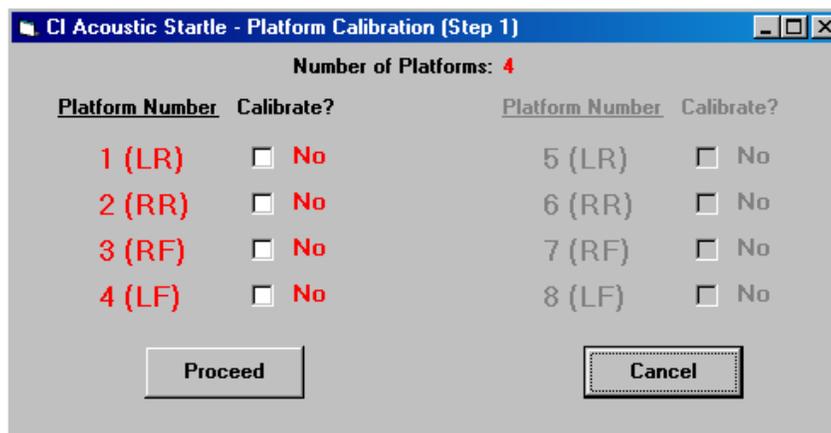
If, however, the fan is used intermittently, especially in the case of invariant inter-trial intervals (ITI), care must be taken to avoid a predictable relationship between the fan activity and the startle stimuli. For intermittent fan use, the fan is turned on following stimulus presentation (i.e., at the onset of the ITI). The per cent of the inter-trial interval for which the fan remains on is determined by the entries in the *PER CENT OF ITI* data entry area. For each trial, a random value between these set values will be chosen for the fan to be turned off. In this way, the fan is turned off and on randomly with respect to the stimulus presentation even in cases in which the ITI is fixed.

Prior to exiting this window, click the *OK* button to save the options.

Calibrating the Platforms

When this option is clicked, the program will display a screen entitled *Platform Calibration (Step 1)* [See figure on next page]. The total number of platforms selected in the *Options* menu (i.e., *PLATFORM CONFIGURATION*) will be displayed in red (i.e., enabled). Each platform number is followed by a label (LR, RR, RF and LF) which indicates the usual position of that platform in the Startle Chamber. The labels indicate Left Rear (LR), Right Rear (RR), Right Front (RF) and Left Front (LF). While there is no requirement for the platforms to be distributed in this way, it will make their physical placement match the on-screen labels.

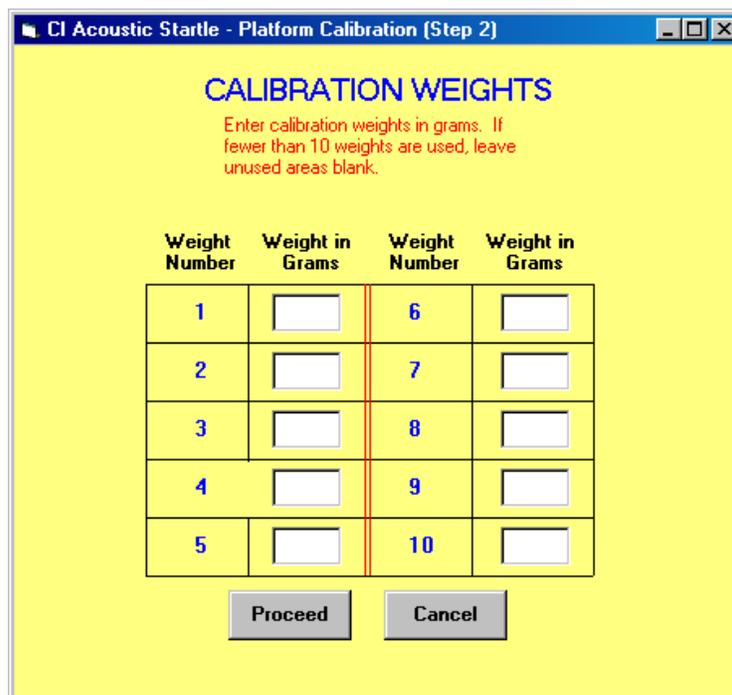
Indicate which platforms are to be calibrated by clicking the appropriate check boxes. Click *Proceed* when platform selection is complete.



If 5 to 8 platforms are in use, all platform numbers will be in red and all check boxes will be enabled.

Note: If a calibration file already exists and platforms have been added or replaced, check only the boxes for the added or exchanged platforms. There is no need to recalibrate those for which calibration data remain current.

The next screen, entitled *Platform Calibration (Step 2)* allows the user to enter the values for the calibration weights that will be used during platform calibration. At least two (2) weights are required, and one (1) of these may be “0.” Enter the values in ascending order. When this process is completed, click *Proceed*.



Hardware Considerations

First, the coupler must be in the DC coupled mode for calibration. In this mode, the coupler's output directly follows the input from the platform, which is the mode required for static weights. In the AC coupled mode, the output of the coupler will be at "0" until a change occurs. While this mode is often preferred during an experiment, static weights will always result in a "0" at the output of the coupler in the AC mode.

Second, each of the couplers must be balanced. This may be done with no weight on the platform or with the animal holder in place. The advantage of the latter procedure is that the weight of the platform will be "subtracted" from the response waveform and only the subject's weight will offset the signal from "0."

In either case, the LED indicating that the unit has been balanced must be illuminated prior to placing the calibration weights on the platform. Use the BALANCE switch on the coupler for this purpose. Press down on the switch and release it. When the unit is balanced, the LED will be on. Several attempts may be necessary before the unit is successfully balanced.

The following are suggested settings for the V72-25A Coupler(s):

Transducer:

Excitation	10 V
Coupling	DC

Coupler Must Be Balanced

Sensitivity

Range	1000
Vernier	Cal (knob should be turned all the way to the right)

The following are suggested settings for the E56-02 (Power Amplifier) for both Channel 1 and Channel 2:

Acoustic Pulse Power

Gain	5
------	---

Noise Suppression

NDP/HLH (Noise Distortion and Power/High Low High)
--

The final screen for platform calibration is titled *Platform Calibration (Step 3)*. If a calibration file already exists, the calibration values in the file will be displayed in the *SLOPE* and *INTERCEPT* rows. The leftmost column will contain the values for the calibration weights to be used. The remaining columns correspond to the eight (8) possible platforms.

Those that are to be calibrated are enabled and an 'X' will appear in the rows for each of the weights. Clicking on the X will perform a calibration run. This consists of taking 100 samples from the A/D converter for the platform. While sampling is taking place, the X will be replaced by the word *WAIT*. When sampling is complete, the sum of the 100 samples will be displayed in place of *WAIT*.

Clicking on a cell for which calibration has already been performed will cause the program to repeat the calibration. When all calibration runs have been completed, click on *Fit Lines* at the bottom of the screen. The program will then perform a least-squares linear regression to the calibration data and will display the slopes and intercepts for the fitted lines for each of the platforms. If calibration values were already on file, the new values will replace the old ones on the screen and in the calibration file.

The software distinguishes an "Active" from an "Inactive" platform based upon the contents of the calibration file. Any platform for which the slope is "0" is declared "Inactive." For this reason, reset any platform not in use to "0" by double-clicking the red *ZERO* button at the bottom of the window.

Click on OK to write the displayed calibration values to the calibration file.

Creating Notes Templates

Clicking on this option will display a screen with ten numbered data entry areas. Each of these corresponds to one of the text lines that may be included in the data file. If a constant type of text is to be added to all data files, the template may be used to enter the constant text. If, for example, the first line will always contain the date, the first template line might contain the text *Date:* ; this will serve as a prompt for date entry when the *Data Notes* option is used. Each line may be annotated in this way; some or all of the text lines may be left blank.

Creating Experiment Files

The first option in the main menu, *Create/Edit Trial Parameters*, is used to create, edit, and store experiment files. When this option is selected, the program will display a window containing a central grid, an upper text-entry row, and ten (10) control buttons. [See Example on next page]

The values for each trial are entered in the text boxes at the top of the window. Each of the boxes corresponds to the label just below it in the grid. The meanings of these labels are as follows:

Trial Ty (trial type) A number used only as an identifier so that different types of trials may be separated for analysis.

S1 Ty (stimulus type) This value determines if the first stimulus (pre-pulse) will be tone “1”, white noise “2”, or absent (blank or “0”).

S1 Fre (stimulus frequency) If the first stimulus is tone, enter the frequency multiplier. If pre-pulse stimulus is noise, this may be left blank.

S1 Att (stimulus attenuation) Enter the value to be used to determine the amplitude of the first stimulus. “0” equals minimum attenuation.

S1 Dur (stimulus duration) The duration of the first stimulus, in milliseconds (mS), is entered here. The maximum allowable duration is 200 mS; any entry longer than this will be converted to 200 mS.

ISI (inter-stimulus interval) This value represents the duration, in milliseconds, of the interval separating the offset of the first stimulus (pre-pulse) to the onset of startle (or second) stimulus.

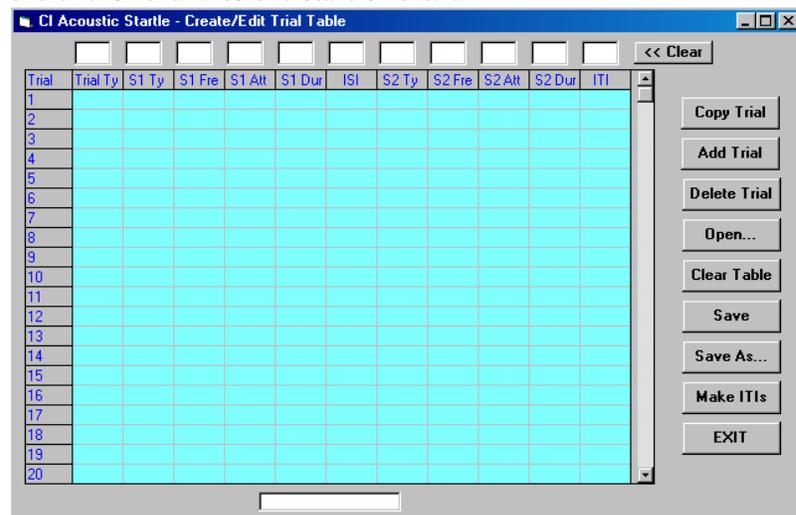
S2 Ty (stimulus type) This value determines if the second stimulus (startle) will be tone “1”, or white noise “2”.

S2 Fre (stimulus frequency) If second stimulus is tone, the frequency multiplier must be entered here. If startle stimulus is noise, this may be left blank.

S2 Att (stimulus attenuation) Enter the value to be used to determine the amplitude of second stimulus. “0” equals minimum attenuation.

S2 Dur (stimulus duration) This specifies the duration, in milliseconds, of the second stimulus. The maximum allowable duration is 200 mS; any entry longer than this will be converted to 200 mS.

ITI (inter-trial interval) Enter the duration, in seconds, of the interval separating the end of trial n to the start of trial $n+1$.



As an exercise, we will create an experiment consisting of three trial types. Trial 1 will be a pre-pulse trial. A tone of 100 mS duration (set to the base frequency and attenuated by 10 dB) is followed by a white noise 50 mS long attenuated by 5 dB with a 500 mS interval in between. [See Below].

NOTE: either the mouse or the Tab key may be used to move from box to box in this row. THE "0" (IN THE S2 FRE) COLUMN MAY BE LEFT BLANK WHICH IS EQUIVALENT TO "0."

In our example, we will create an experiment in which the three trial types will be presented in blocks of four trials each. Trial Type 1 will be presented on trials 1 through 4, Trial Type 2 on trials 5 through 8 and Trial Type 3 on trials 9 through 12.

With the values for Trial Type 1 showing in the entry row, click on any box in the first row of the grid. This will copy the values from the entry row to the grid; these then become the values for Trial 1.

Two methods are available for creating trials 2 through 4. Clicking on each of the appropriate rows will replicate Trial 1 since the values are still showing in the entry row. Trials (data in the grid) may be copied by using the *Copy Trial* function.

When the *Copy Trial* function is clicked, a window will open with entry areas for the trial to be copied from and the range of trials to which the data are to be copied. In our present example, we would enter '1' as the Trial to be copied from, '2' as the start of the range and '4' as the end of the range.

Trial Type 2 will contain only noise as the Startle Stimulus and we will use the same values for this stimulus as in Trial 1.

Begin by clicking on the << *Clear* button to clear the entry row. Then enter the values for stimulus 2; since there is no stimulus 1, all entries referring to this stimulus, as well as the ISI, may be left blank or specified as 0.

2 0 0 0 0 0 2 0 5 50 10

Either method described above may be used to copy these data into trials 5 through 8.

Finally, Trial Type 3 will consist of two noise presentations. The first stimulus will be a noise attenuated 30 dB. The stimulus will be 75 mS long and will be separated from the second stimulus by 250 mS. The second stimulus will be the same noise used in Trials 1 and 2.

Without clearing the entry row, change the first entry to 3 and make the following entries in columns 2 through 6

2 0 30 75 250

Now use these values to create trials 9 through 12.

This completes the table for the experiment, and it may be saved as a disk file by clicking on the *Save As* button. Use any name up to eight characters long. Do not include an extension, as the program will add an extension for purposes of identification.

Click on the *Clear Table* button. The program will ask for verification that the table is to be cleared; click on *OK*. The remainder of this exercise will consist of making modifications to the first experiment file.

To begin, open the file by clicking on the *Open* button and selecting the experiment file. Note that the path to the selected file is now shown in a small text box below the grid.

If we wanted to add a trial of Type 3 between the current Trials 2 and 3, we first need to make space for the additional trial. Click on the *Add Trial* button, and enter '3' as the location for the new trial. The grid is changed so that a blank trial now appears at Trial 3. To complete the task, we will use an additional feature of the *Copy Trial* button. Click on this button and indicate that the data from Trial 10 should be copied to Trial 0 (specify only that '0' is the starting range). The data from Trial 10 are copied into the data entry row. We may now simply click on the blank row of the grid to insert the data into Trial 3. This method is far easier to use in cases in which a particular trial type is to be added in many places in an already existing experiment file.

The *Delete Trial* button is used to delete a trial from the grid. Click on the button and indicate which trial is to be deleted.

The *Make ITIs* button may be used to set the inter-trial intervals for ALL trials in the grid. Click on this button and enter the upper and lower limits for the intervals. If all ITIs are to be the same, use the same value as the upper and lower limits. If the upper and lower limits are different, the program will select random values within the bounds specified and fill in the ITI column of the grid. Any entry may be changed manually via the data entry row.

If only the ITI is to be changed, it is easiest to first copy the trial data into the data entry row, make the change to the ITI, and then copy the data back to the trial row in the grid.

Entering Data File Notes

Click on this option to enter text that will be written to the data file. The program will display ten data entry areas, each of which will be associated with a label if one was entered via the *Create Notes Template* option discussed above. When the text is written to the data file, both the label and the text entered via this option will be written on the same line. If, for example, DATE: was written as the label for the first line, it will appear to the left of the first data entry line in the *Data File Notes* entry screen. If 3/20/98 is entered as the first notes line, the first line of the data file will read as follows:

*Date: 3/20/98

Note that each of the first ten lines of the data file will begin with an asterisk to make identification of the text header lines easier.

Click on OK to save the file notes.

Running a Session

Clicking on the *Run Session* button displays a window in which the user specifies the files to be used during the session. These include the experiment file containing the trial by trial specifications and the root name for the data files to be created.

Click on the *Select Experiment File* button to see a list of the experiment files that are available. When a file is selected, its contents will be displayed in a grid for verification. Click on *OK* to complete file selection.

Click on *Designate Data File* to see a list of the data files which can be located. The file name display is presented in two windows. The left window shows the numeric data files (*.DAT extensions) and the right window shows the raw analog data files (*.A2D extensions). The contents of these files will be discussed below. Enter the root name to be used in the text box, then click on *OK*. The program will not allow the use of a duplicate file name for either file type.

To review the selections, click on the *Current File Names* button. If any selections are incorrect, use the appropriate button to modify the selection. When all selections are correct, click on *OK* in the pre-session window.

The experiment monitor window contains an area for the display of the trial by trial data as they are collected, and buttons to control the start and abort functions. When the *BEGIN* button is clicked, the experiment begins with the adaptation period if one has been scheduled. An on-screen counter will display the time remaining in the adaptation period. (If the ventilation fan has not been specified as NOT IN USE, it will be activated for the duration of the adaptation period.) Also displayed on the screen will be areas for the plotting of the response waveforms from each of the active platforms as well as display numeric data for the most recent trial for each active platform.

Following the adaptation period, the first ITI will begin. The fan will be controlled according to the settings specified in the *Options* screen. At the end of the ITI, the first set of stimuli will be presented and data will be collected from each active platform.

Data are collected for 200 mS following the onset of S2; waveforms are digitized at 1KHz. For each platform, the data displayed on the screen will be the peak response (in grams) and the latency (in mS) to the peak response. These data will also be written to the data file. If the waveforms are saved, the 200 samples for each platform will be written to the analog data file. Complete descriptions of the data files are given on the following page.

Also presented on the screen are the number of trials remaining in the session, the number of trials completed and the time to the next trial. When all trials have been completed, DONE will be displayed in place of the Next Trial counter.

When the experiment is complete, click on *EXIT* to return to the main menu. An experiment may be aborted by using Ctrl-Alt F1 (hold down the Ctrl and Alt keys and press the F1 key). The experiment will be terminated immediately during an ITI or at the start of the next ITI when the *ABORT* button is clicked. Any data collected up to that point will be preserved. Note that ABORT causes an end of program execution and a return to the Windows desktop.

Creating and Running Pairing Protocols

Click on the Create/Edit Pairing Protocols option to use this facility of the software. The screen which is displayed has entry points for the number of trials, S1 type (tone, noise, or user-defined types), inter-stimulus interval, S2 type (as above for S1), and inter-trial interval. (Note that the stimulus frequency and/or amplitude entries will be disabled when these parameters do not apply.)

CI Acoustic Startle - Create/Edit Pairing Protocol

Number of Trials

Number:

Stimulus 1

Type (1-5):

Frequency:

Amplitude:

Duration (msec):

Inter-Stimulus Interval

Duration (msec):

Stimulus 2

Type (1-5):

Frequency:

Amplitude:

Duration (msec):

Inter-Trial Interval

Minimum (sec):

Maximum (sec):

Open Save Exit

When all entries are complete, use the Save button to write the specifications to a file. Enter only the root portion of the file name, as the program will append the extension “*.tpr” which identifies it as a pairing protocol file.

The Run Pairing Protocol option is used to run the trials. Click on this option, then on the Select Protocol button. Select the desired protocol from the displayed list, then click on the BEGIN button. The trials will be presented as scheduled with on-screen displays of the number of scheduled trials and the number of trials completed. When all trials have been presented, click on the EXIT button to return to the main menu.

The Data Files

Numeric data are written to a file with a *.DAT extension; the root name of the file is the one provided by the user in the pre-run screen. A file with *.A2D as its extension will also be created if the waveforms are saved. Descriptions of these files follow.

The *.DAT files begin with ten lines, each of which begins with an asterisk. These are the text entries described above. If no text entries are made, ten lines consisting solely of the initial asterisks will be written.

The next line is a label: NUMBER OF PLATFORMS that is followed by a line which contains a single entry – either 4 or 8.

The next line is a label: CALIBRATION CONSTANTS that is followed by either 4 or 8 lines (depending upon the number of platforms) each of which contains a slope and intercept for a platform.

The next two lines are labels: SORTED BY TRIALS PLATFORM, TRIAL NUMBER, TRIAL TYPE, PEAK, LATENCY that are followed by the trial-by-trial data. In this first data section, the data are presented based upon trial sequence. If there are four platforms, the first line will be for Platform 1, the second for Platform 2, the third for Platform 3, and the fourth for Platform 4. These four lines will contain the data for the first trial. Following these lines, there will be four lines for each trial. In the eight-platform case, there will be eight lines of data per trial. This sequence will be repeated until data for all trials have been written.

The next two lines are labels: SORTED BY PLATFORM PLATFORM, TRIAL NUMBER, TRIAL TYPE, PEAK, LATENCY that are followed by the data for Platform 1 across trials, for Platform 2 across trials, and so on.

The *.A2D files begin with the number of platforms and the calibration values and then contain 200 samples per trial per platform. Inactive platforms are represented by 200 entries of 0. In order to keep the data file structure constant, each trial will contribute 800 samples when four platforms are in use and of 1600 samples in eight-platform systems.

Reviewing Analog Data

The *View Data* option is used to review analog data files. The window displayed includes a *Select File* button. Click here to open a window showing the available *.A2D files. Select a file by clicking its name. The screen will show the name of the selected file and the number of trials in the file. Click the *Next Trial* button and the peak and latency data will be displayed. The current trial number will be shown in the *SHOWN* text box.

Use the *Next Trial* and *Previous Trial* buttons to move through the data file. Note that moving backward through the data file may take some time, especially with long data files.

The displayed matrix shows the numeric data for the trial. For this reason, the *.DAT file corresponding to the *.A2D file being examined must be available to the program. Use the spin buttons to move a cursor (a blue vertical line) through the displayed data. The red buttons move the cursor ten steps per click; the white buttons move the cursor one step per click. The *HOME* and *END* controls move the cursor to the beginning and end of the data respectively. The data displayed in the *VALUE* column of the matrix are the intersection points of the cursor and the data waveforms. The cursor position is also displayed below the spin buttons. Note that the *VALUE* data are in Volts rather than in the converted form of the *.DAT file.

Click on the *Exit* button to return to the main menu.