SD Instruments

SR-LAB™
Startle Response System
Installation and Operations Manual

"Designed by Scientists for Scientists"

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Chapter 1: Product Overview

Measuring Startle Response, Habituation and Prepulse Inhibition

Startle measures are used to study a wide range of phenomena including drug toxicity, auditory system physiology, neurodevelopment and behavioral genetics. Rodent studies are the most convenient and efficient for studying drug effects on or assessing the neurobiological mechanisms of startle plasticity.

The startle response is comprised of a constellation of reflexes elicited by sudden, relatively intense stimuli. It offers many advantages as a behavioral measure of central nervous system activity and can be measured in numerous species, including humans, when elicited by acoustic (noise bursts), electrical (cutaneous), tactile (air puff), or visual (light flash) stimuli.

Habituation

Defined as the exponential decrement in response when an initially novel stimulus is presented repeatedly at speeds too slow to produce sensory adaptation or receptor fatigue.[1]
This effect is called 'habituation' and is evidence of an animal's "learning not to respond".

Prepulse Inhibition

Prepulse inhibition is the normal suppression of the startle reflex when the intense startling stimulus is preceded 30 to 500 msec earlier by a barely detectable prestimulus[1]. Such prepulses reduce the magnitude of the startle response. This phenomenon is referred to as prepulse inhibition or PPI. Cross modal PPI can also be used where a visual or tactile prepulse is used to affect the animal's auditory startle response or an auditory prepulse is used to inhibit a tactile startle response.

Potentiated Startle

Startle amplitudes can also be increased by presenting the eliciting stimulus in the presence of a 'cue' (for example, a light) that has been previously paired with a foot shock. This procedure is referred to as 'potentiated startle'. This procedural enhancement only occurs after the conditioning of the animal with repeated light-shock pairings.

Although startle can be measured electromyographically, as typically done in humans, startle in laboratory animals is usually measured by recording whole body flinch. The startle reflex is time-locked and occurs within a short latency following the eliciting stimulus. Recordings of whole-body startle are usually taken for about 200 miliseconds (msec) after presentation of the eliciting stimulus.

Excerpts taken from Measurement of Startle Response, Prepulse Inhibition and Habituation by Mark Geyer and Neal Swerdflow, Current Protocols in Neuroscience (1998)8.7.1-8.7.15

The SR-LAB System

The SR-LAB system is an automated system for measuring startle responses of small animals. It can accommodate up to 16 ventilated chambers, each containing a cylindrical animal enclosure mounted on a Plexiglas base. A speaker, mounted 24 cm above the animal, provides background noise, pre-pulse stimuli and startle stimuli, all controlled by the SR-LAB software. Startle responses are transuded by a piezoelectric accelerometer mounted below the cylinder, rectified, digitized and recorded as data points on a computer. The user sets the number of data points to be recorded and the frequency of recording. Generally, the frequency used is 1000 hertz (Hz) and the number of data points recorded is 65msec in mice, rats or humans 250 millisecond onset of the stimulus.

The animal is placed in a startle enclosure and its movements are recorded by the piezoelectric sensor hermetically sealed to the underside of the animal enclosure. The animal's movements create an electrical current in the sensor. These currents are then amplified by a circuit in the SR-LAB equipment bay and are sent through the connection chassis to an A-D converter card in the controller.
Acoustic, electrical, tactile and visual stimuli may be administered, alone or in combination. The SR-LAB software controls the administration of the stimuli and records the animal responses automatically, no programming is necessary. A 'snapshot' of the subject's movements following the startle-eliciting stimulus is taken and recorded. Voluntary movements that are unrelated to the startle reflex are eliminated from the data files.

The SR-LAB software displays the selected subject's responses on screen immediately following each trial. The recording of the reflex results in a waveform that represents the pressure the animal's jump places on the piezoelectric sensor. Typically, when reducing and reporting results of the startle trial, the peak of the response, the latency to peak and the average amplitude of the waveform are used. The SR-LAB software captures a complete waveform and provides a method for the researcher to examine the accuracy of the summary point calculations. All the raw data from the experiment are captured and combined into one database file for further analysis. The SR-LAB software permits programming of all functions needed for startle response testing without the need to know a programming language. This is accomplished by allowing the user to select from a list of alternative menus presented in a logical, intuitive manner. The program will provide prompts when information is needed from the user, such as file names or values. Thus, highly complex test routines may be designed and executed merely by selecting from the options that the SR-LAB software presents.

The SR-LAB system is designed to take advantage of the Microsoft Windows operating system and its many features. Users who are comfortable working in the Windows environment will notice an immediate familiarity with the SR-LAB program.

Startle Stimulus Presentations

The startle stimulus must be both intense and sudden. In mammals, auditory and air puff stimuli are effective in eliciting startle. Light flashes are found to be effective with highly visual animals like birds.

Noises that gradually increase to high levels of volume will not induce startle. Only stimuli with very rapid rise times will elicit the reflex. The basic SR-LAB acoustic stimulus is a white noise with an intensity of up to 120 dB and with a rise time of 2 milliseconds (msec). Noises are generated by circuits contained in the equipment bay and are delivered with an amplitude and duration set by the researcher in the SR-LAB software "Trial" definition routines.

White Noise Stimulus - Levels of white noise acoustic signals are entered into the SR-LAB software "Trial Definition" menu. These numeric values are converted to output voltages by the data acquisition board (or card). Voltage-controlled amplifiers and speakers in each chamber's equipment bay deliver the sound to the animal.

Tactile Stimulus - Tactile stimuli are air puffs controlled by commands in the SR-LAB Trial Definition menu. The commands are converted to digital output signals from the data acquisition board. These signals open and close a gas solenoid connected to a source of compressed air. Copper tubes deliver the air puffs through an opening in the center of the animal enclosure – directed at the center of the animal's back. Tactile stimuli have shown to be particularly useful in startle testing of mice.

SR-LAB Components

The SR-LAB system is composed of three major units: the Control Unit, the Startle Chamber/Isolation Cabinet, and the Animal Enclosure.

SR-LAB Control Unit

The SR-LAB Control Unit provides the connection for up to 16 startle chambers. These connectors are arranged as follows:

Front Panel - on the front panel of the Control Unit there are 16 BNC connections each of which is a single chamber input connection. There are also two LEDs indicating USB and power status.

Rear Panel – on the rear panel of the Control Unit is a USB connection and a 12 VDC output connecter. There are also four connection types for each chamber including SHOCK TRIGGER First chamber and Last Chamber, AC RELAY First Chamber and Last Chamber, ANALOG First Chamber and Last Chamber and SHOCK LEVEL First Chamber and Last Chamber. There are an additional two DIGITAL output BNC connectors and a FUSE to electrically protect the SRLAB Controller.

Startle Chamber/Isolation Cabinet

The startle chamber/isolation cabinet is designed to provide sound attenuation and visual isolation of the test subject. The sound attenuation (40 dB at 1 meter) restricts the high levels of sound stimuli used in startle testing and isolates the test animal from outside sounds including interfering high frequency vocalizations that might come from other animals being tested. Each chamber includes light and fan controls.

Each cabinet is equipped with an internal light, fan, and viewing lenses. The cabinet contains a complete sound generation system to produce white noise stimuli up to 120 dB (the normal setting is 70 dB). Duration and volume of the sound are software-controlled. Separately adjustable background noise level and an Accessory Relay (ACC) for optional stimuli (e.g. lights, air puff, etc.) are also included with each station.

"ABS"- The ABS isolation cabinet is constructed of ABS hair cell panels. The effects of extraneous noise and vibrations are minimized by the use of foam filled walls. Internal surfaces are smooth, scratch resistant, and easy to clean. Each cabinet measures 13 X 13 X 19 inches and weighs approximately 22 lbs.

Rear of SR-LAB

Front of SR-LAB

Chamber Controls	Function
Aux Power	Connector supplies the +12V DC power for the shock in the potentiated Startle kit. Note: This power supply is interlocked to the cabinet door so the door must be closed for power to be applied (export models only).
AC Relay (manual)	Push button applies power at the CUE OUT connector to manually test the optional Cue Light or Tactile kits.
Fan	Switch turns the fan on and off.
Light/Cue	In the UP position, this switch directs power to the cabinet's interior light. In the center position, the light is OFF. In the

	DOWN position, the switch follows the instructions for the Cue light as directed by the SR-LAB software.
Audio Adjust	This dial can be turned to adjust the white noise level. Typically there is no need to adjust the factory setting but if necessary the noise level can be adjusted until the sound pressure level meter reflects the desired noise level.
Audio Analog In/Out	These connections control the audio signal produced by the electronics contained in the chamber. For multiple SR-LAB chambers, the connection becomes a "daisy chain" from the Control Unit to the first chamber, the first chamber to the second chamber, etc. and finally from the last chamber back to the Control Unit.
AC Relay In	The AC Relay connector links the SR-LAB Control Unit to the various SR-LAB chambers to enable the SR-LAB software to manage the administration of various types of stimuli including light and air. For multiple chambers, perform the same process of daisy chaining one chamber to the next as described above in the Audio Analog section.
Response Out	Permits each SR-LAB chamber in the configuration to be connected to the SR-LAB Control Unit enabling all chambers to be controlled by the SR-Lab software. Each chamber is directly connected to the SR-LAB Control Unit with a cable.
Cue Out	The Cue Out is a 12 VDC outlet that drives a variety of optional stimuli kits. In order to control the Cue Out, the AC Relay connections between the SR-LAB Control Unit and each SR-LAB chamber must be established. With this connection, the SR-LAB software manages the administration of various types of stimuli. Note: The Cue Out synchronizes the current among the SR-LAB stations. The 12 V are independently provided.
Response Adjust	Adjusts the amplification level of the Response Signal
Power In	This slot is where the external power supply to the SR-LAB chamber connects. **CAUTION:** Units built prior to July 2005 were designed to use a 15 VDC power supply. Units built after July 2005 are designed to use a 12 VDC power supply and should never be connected to any unit marked as a 15 VDC unit. The power supplies look similar – please

	read the labels to check the ratings before plugging them into an SR-LAB chamber.

The SR-LAB Animal Enclosure

The SR-LAB animal enclosure is designed to locate the test animal so that the body of the animal is centered over the motion sensor. It is important that the animal not be subjected to restraint. The appropriate sized animal enclosure permits the animal to turn around in the enclosure. Five standard sizes of enclosures are available with the SR-LAB. These interchangeable enclosures make it possible to change quickly from small cylinders suitable for mice to larger cylinders for rats. The mice-sized animal enclosures (small and small/medium) are equipped with an ultra-sensor base plate. Snap in doors adjust to the length of the subject being tested.

Enclosure	Length	Interior Diameter	Approximate Weight
Small (with Ultra Sensor)	3.5”	1.1”	Up to ~25 g
Small/Medium (with Ultra Sensor)	5”	1.5”	Up to ~50 g
Medium	6”	2.25”	Up to ~150 g
Large	8”	3.5”	Up to ~450 g
Extra Large	10”	5”	Up to ~800 g

The animal enclosure sits on a support base and is plugged into the amplification circuits in the SR-LAB chamber’s equipment bay. The enclosure can be connected to a calibrator for periodically checking the accuracy of the response measurement.

Chapter 2: Installation

Getting Started
Safety Instructions for Using the SR-LAB

Immediately report any shipping damage to the shipper.

Observe the orientation and pin configuration of all connectors. Connections should not require force.

DO check to make sure solid electrical connections are established.

DO NOT turn on the SR-LAB chambers without FIRST turning on the computer and configuring the SR-LAB software. Failure to adopt this practice may cause the cabinet sound level to go to its maximum and destroy the speaker. The speaker and sound generation circuitry is designed to operate at maximum output for only short periods of time. Longer periods at maximum output can cause degeneration in the sound system.

DO NOT Make connections (or disconnect cables, etc.) without turning off power to the system.

DO NOT Replace fuses with fuses that are rated higher than the rated value.

Gather Your SR-LAB System Components

Carefully remove the SR-LAB components from the shipping cartons and gently remove packing materials from the startle chamber and animal enclosure taking particular care when removing the packing material surrounding the animal enclosures. Make sure you have the following components before getting started with the installation of the SR-LAB software and hardware.

Hardware

1) SR-LAB Chamber/Isolation Chamber
2) Animal Enclosure with Door and Base
3) SR-LAB Control Unit with Cable (to connect the Control Unit to the PC or Laptop)
4) Two Coaxial Cables per SR-LAB chamber plus one extra coaxial cable (if more than 1 SR-LAB is ordered) to complete the Analog connection

AC relay cable   Coaxial cable

5) Two thin black cables for AC RELAY

6) 12 Volt Power Supply and Power Cord for control box (small)
7) 12 Volt Power Supply and Power Cord for SR-LAB box (red tape labeled)
8) Standardization Unit with Power Supply and Power Cord (optional)

Connecting the Hardware Components

1. Connect the 12 Volt power supply (red tape labeled) to the SR-LAB box.
2. Connect the 12 Volt power supply (small) to the Control box.
3. Connect the USB cable to the Control box and the computer.
4. Connect the thin cable to AC RELAY First Chamber on the control box then connect other end to AC RELAY IN on the SR-LAB.
5. Connect a coaxial cable (thick cable) to the ANALOG first chamber on the back of the control box then connect other end to the AUDIO ANALOG IN on the SR-LAB.

***if connecting two or more SR-LAB box The AC RELAY OUT will connect to the next SR-LAB AC RELAY IN on the next SR-LAB box. From there repeat step 4 until all boxes are connected creating a daisy chain effect. Once all connected, connect the last SR-LAB AC RELAY OUT back to the control box. Do the same for the Analog cables.

6. Take the last coaxial cable and connect it to the RESPONSE OUT on the SR-LAB and the other end to the front of the Control Box to CHANNEL INPUT 1. If connecting more than 1 SR-LAB continue to connect the RESPONSE OUT to the next channel number on the front of the control box. Keep in order and do not skip numbers.
7. Take the animal enclosure and place inside the SR-LAB chamber and plug into the upper left corner ceiling.

Installing the SR-LAB Software

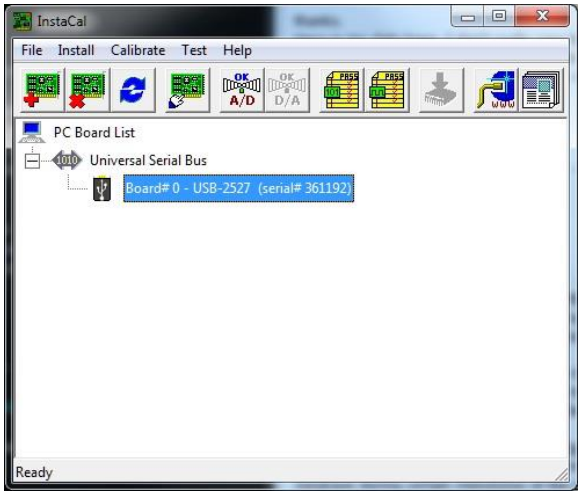
USB Stick

Leave the control box disconnected from the computer during the software installation.

NOTE: If you are installing the SR-LAB Software on a Microsoft Windows 7 computer, you will need to Turn OFF all User Account Controls and install and run the SR-LAB as an Administrator on the computer.

1. Insert SDI USB installer stick in a USB port
2. View files and click on SDIInstaller.exe
3. All install files will be copied to the hard drive in this folder:
   C:\San Diego Instruments\6300-0000_SRLAB_InstallFiles
4. The SRLABUSBInstaller will run automatically going through up to three installations:
   SR-LAB Software
   MS Access Data Base Engine
   MCC Drivers
   Follow the prompts on the screen
5. When the SRLABUSBInstaller completes, restart the computer and upon completion of the restart plug the USB cable from the control box into the computer.
   All cords should be connected, plugged in and turned on at this time.

6. Run from the start button Start➔All Programs➔InstaCal➔ let the system recognize the board. It will go through some questions that you answer yes to so it can recognize the board.

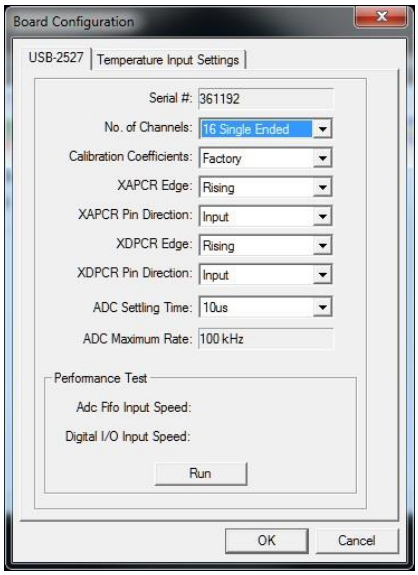


7. Once the board is recognized Board#0 - USB-2527 (serial#.....). Write down this serial number and keep it in a safe place.

8. Double click on it to bring up the Board Configuration dialog:

a. Change No. of Channels: to 16 Single Ended (This will allow 16 input channels to be used). Do this step regardless of how many SR-LABs you have.

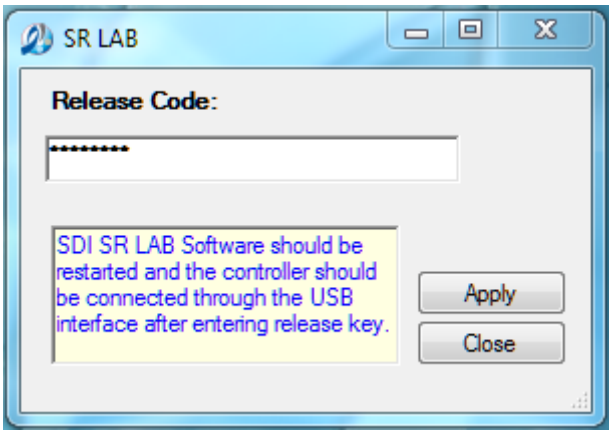
b. Change Settling Time: 10us (this will prevent ADC input channel crosstalk) Click OK then close the window.



(For SR-LAB Part 11 software skip to #10)

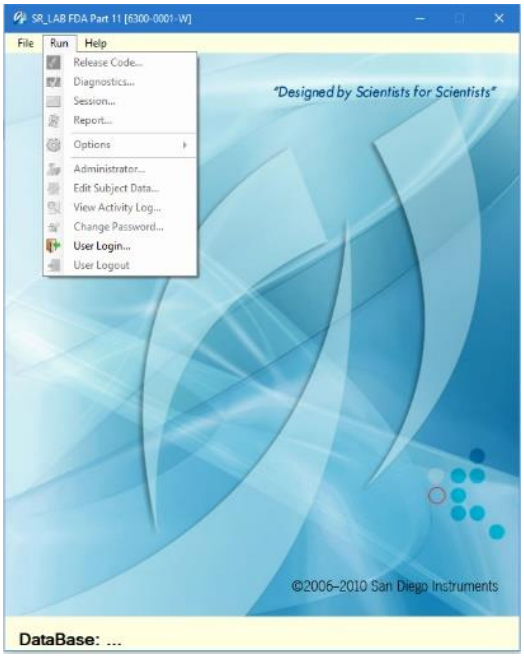
9. Start the SR-LAB software and enter the release code to combine the software with SR-LAB controller. From the main menu select Run➔Release Code… This will open a dialog to enter the supplied release code.

The release code is listed on the Left Inside cover of the Manual and on the bottom and top of the control box

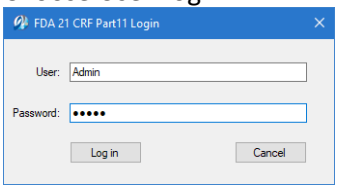


Click apply; then close, to close the window.

10. Start the SR-LAB software Part 11 and click Run

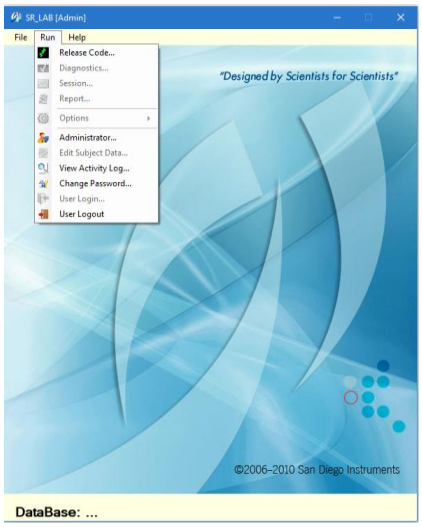


Choose User Login



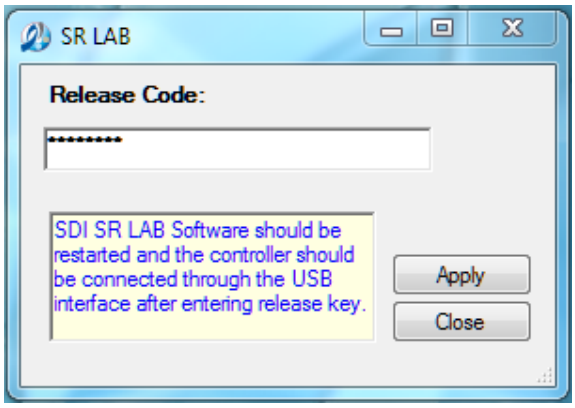
Enter User: Admin and Password: admin(Both are case sensitive)
These are default Administrator User and Password, exposed to all SR-LAB Part 11 Users, see #12 below for replacing the defaults

11. Click Run on the main menu and click Release Code



The Release Code dialog box appears, enter the release code and click Apply.

***The release code is listed on the Left Inside cover of the binder and on the bottom



and top of the control box***

12. At this point refer to the User Manual Appendix F: FDA Part 11 Compliance to setup Users, Passwords and Permission levels. Do not delete the default Administrator User and Password until you have set up a unique Administrator.

Reinstallation

As part of step 3 above, this icon will be placed on the Desktop. Clicking it will start the SRLABUSBInstaller Reinstallation

Chapter 3: SR-LAB Software

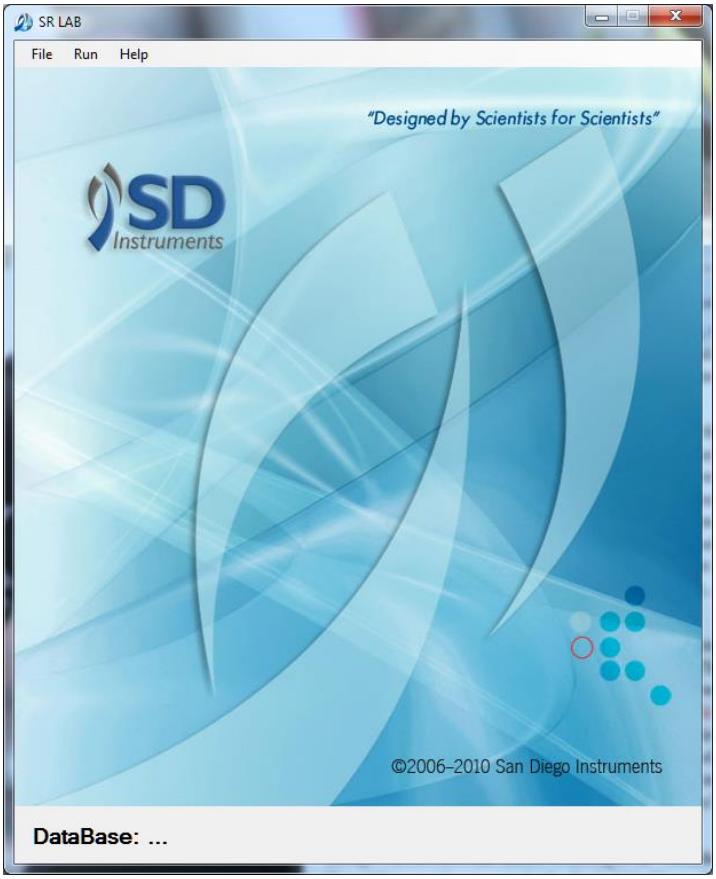
How the software works

The SR-LAB takes user defined trial and session definitions to create test sessions within a study database. SR-LAB uses Microsoft Access database to collect data and session reports can be exported to Microsoft Excel or a tab separated text file. Also, the raw data collected at session test can also be exported to an Excel or, alternately, to a "tab" separated text file which can then be imported by a variety of statistical software packages.

Before getting started it is **crucial** you run the diagnostic program that will test components, aid in calibration and act as an aid when troubleshooting any hardware issues.

SR-LAB software also provides a post session data analysis program that will analyze the raw data given user defined parameters.

SR-LAB Main Screen Overview



The SR-LAB main screen is a single screen configuration that allows access to define, diagnose, run tests and view reports. All selections are from the Main Screen Menu and when a database has been opened the title of the database file will appear on the window.

File ➔ Menu Item	Function
Define Default Data Directory…	Allows the user to define the default directory to store the study database files. When installed the default data directory is: **C:\Users\Public\San Diego Instruments\Data**
Create New Study Database…	Creates a new study database. The created database will reside in the default data directory.
Open Study Database…	Opens a study database. Any study database can be selected but if the selected database does not reside in the current default data directory it will be saved in the directory from which it was selected.
Definitions…	Selection to define unique trials and sessions. This data is stored in a separate database. There are also selections to backup and restore definitions. This feature allows for different researchers to each maintain their own definitions as well as backing up definitions before reinstalling updated versions of SR-LAB software. The last selection is "Convert Definitions…". This allows users to convert the older *.TAS and *.SAS definition files to the newer format. Please see Appendix G for information.
Create Sessions…	Selection to allow user to define sessions for test. This selection is only available when a study database has been opened.
Create Subjects…	Selection to bring up window that will allow subjects to be assigned to sessions and chambers. This selection is only available when a study database has been opened.
Save As…	Allows study database to be saved to a different filename. This selection is only available when a study database has been opened.
Save	Save currently opened database. This selection is only available when a study database has been opened.
Exit	Closes SR-LAB program

Run ➔ Menu Item	Function
Diagnostics…	This selection brings up a diagnostic window to verify and calibrate the SR-LAB. It is not necessary to Open a study database to run the diagnostics. However, some diagnostic/calibrations functions require a separate diagnostic database to be loaded in the Diagnostics program.
Session…	Opens window to run previously created sessions
Report…	Opens a report window that displays the results of completed sessions

The SR-LAB Diagnostics Screen

The first time the SR-LAB system is used and before beginning a session run, ensure that the connections from the SR-LAB chambers and their animal enclosures are working properly. From the Main Screen Menu select Run➔Diagnostics and the screen below appears. Continue to the steps below.

Diagnostic Screen Item	Function
File	Menu selection to Create or Open a diagnostic database. This database collects data during a diagnostic run.
Channel List	Checkbox listing to enable which chambers to be tested. Each channel represents a chamber. Best practice would be to identify each chamber to the corresponding channel. Ex: Channel 1 ➔ Chamber 1
In Millivolts	Value to define the max voltage level on the waveform chart.
Channel Name	Dominate channel selection for the waveform chart.
Current Signal Avg:	Average value (millivolts) of the selected Channel Name.

Stimulus...	Button to open the Cue stimulus window for diagnostic purposes.
Sound Level…	Button to open a window used to document conversion values to decibels.
SR-LAB Chart	Chart to display the current response waveform.
Response Table	Table displaying current response results.
Remove All button	Erases all current entries in the Response Table.
Samples per Channel	Number of samples. NOTE: Sample rate is fixed at 1 kHz therefore number of samples can be inferred to be the length of time for the time in milliseconds (X-Axis).

Setting up your SR-LAB for Sound, Response, and Stimulus

Sound Level Diagnostics:

Sound Level Diagnostics is a screen to test analog levels and keep a listing of analog values to decibel levels. Within the dialog is a chart that gives an estimation conversion chart for **reference only**. **User is responsible to verify and record in the "User Lab dB Conversion List" the values determined by diagnostic testing.** Once the list has been created it can be referenced in the Trial Definition screen and where ever trial definitions are displayed in the program.

Take the Analog Sound Input Level and input 700 in the level box. Click the Trigger On button to make sure the sound is working. This will be loud. It will automatically turn off after 1 sec. If no sound comes out of the SR-LAB go back and make sure your cords are attached correctly. Once confirmed sound is present and cords connected correctly more to SR-LAB Calibrating Sound

Sound Level Item	Function
Analog to dB Conversion Chart	Example chart demonstration the relationship of Analog input to decibel level. It is the user's responsibility to determine the specific system's relationship and enter these values in the User Lab dB Conversion List.
User Lab dB Conversion List	Table to store current lab conversion values from analog sound level to actual dB level determined by the Sound Calibration procedure.
Analog Sound Input	Slide controls to set the Analog Level and time duration
On Time	Time (seconds) for sound to be on. NOTE: when slider bar is all the way to the right the sound on time is continuous.
Trigger On	Button to initiate sound diagnostic test. Once Analog Sound Input levels have been set the trigger button will turn on/off the Analog sound.
Repeat Every…	Allows for sound to repeat until hitting the Trigger Off

SR-LAB Calibrating Sound

The SR-LAB uses an indirect sound level system due to environmental differences. The chart displayed in the Sound Level Dialog shows the relationship of Analog level (value used in Trial definitions) and dB level based on the environment at San Diego Instruments. This chart should be used as a guideline to prepare a listing of Analog levels to be used to create Trial definitions at your location. The Analog level listing will be used to periodically check and calibrate the sound levels of the SR-LAB

Sound Meter Positioning

Instructions on how to work the Extech meter are included in its packaging. Make sure that the sound meter level is set to "A" scale and FAST mode. When using the Extech meter, remove the enclosure and stand up the sound meter below the speaker inside the SR-LAB cabinet. Close the door completely. You will read the meter through the peep hole in the door. Do not talk when looking through the door as this will affect the meter reading. Also do not have anybody walking around the lab while calibrating sound as this will also affect the reading.

Determining an Analog level for a 120 dB startle pulse

1. Place meter on, and in the box, with door closed like discussed above.

2. Using the chart on the screen, find an Analog level approximately equal to 120 dB (it does not have to be exact as you are going to adjust the sound such that the chosen value equals 120 dB).
3. Enter the chosen value in the level box Sound Level Diagnostic screen.
4. Slide the On Time arrow all the way right till it shows Continuous On Time
5. Hit the Trigger On.
6. Read the meter and if it is not at 120 dB adjust turn the Audio Adjust dial on the test station until the meter reads 120 dB. Write down this Analog level in the Lab dB Conversion Chart and label it accordingly.
7. Click on the Trigger off button when finished and move to the next SR-LAB cabinet

When calibrating multiple boxes it is important to set the Lab dB Conversion Chart on one box. Once you have the chart filled out move to the second box. When you calibrate the additional box your dB levels should match ±2. If it does not use the Audio adjust dial to bring it within range. Do not adjust the Lab dB Conversion Chart to get the correct dB reading.

NOTE: SR-LAB chambers leave San Diego Instruments with a 720 analog level to obtain a 120 dB. This chart is intended to serve only as a general guide. The actual sound pressure levels produced by the Analog command may be substantially different. It is important to check with a sound level meter for each of the noise levels used in a test session. You can use the Audio adjust dial if need be to calibrate the chamber but most of the time it is not necessary to use the Audio adjust.

Determining the Analog levels for each of your desired PPI levels and the Background level.
(Note for these sound points the Audio Adjust dial is not used)

Ambient

Since Background and PPI levels are set relative to the ambient noise level in the lab this level should be determined. Take a reading of the ambient noise level in your lab and write it down.

Background

Using the Analog to dB chart in the manual, determine an approximate Analog value for your desired dB level for the Background level in the Session definition. Do the following paragraph.

Enter the chosen value in the text box on the Diagnostic screen. Slide the On Time bar all the way to the right so it stays on continuous. Click trigger and read the dB level on the sound meter. If it is either low or high from your desired dB, click on Trigger Off and enter a different Analog level in the text box on the Diagnostic screen and hit the Enter key. Read the meter. Repeat the process of changing the Analog level until you get the desired dB level. Write down the final analog level.

PPI Levels

As there are generally several PPI levels the following process will have to be repeated using different Analog levels to determine each PPI level.

Using the Analog to dB chart determine an approximate Analog value for the desired dB level for a PPI level. Enter the chosen value in the Level text box. Slide the On Time bar to the right so it shows continuous and hit the Trigger On button. The sound will turn on and remain on until the Trigger Off button is hit. Read the dB level on the sound meter. If it is either low or high from your desired dB,

repeat the process of changing the Analog level until you get the desired dB level. Enter Analog level for each of your PPI points in the User Lab dB Conversion list and select the Update button to save. This list can be referenced whenever trial definition windows are available.

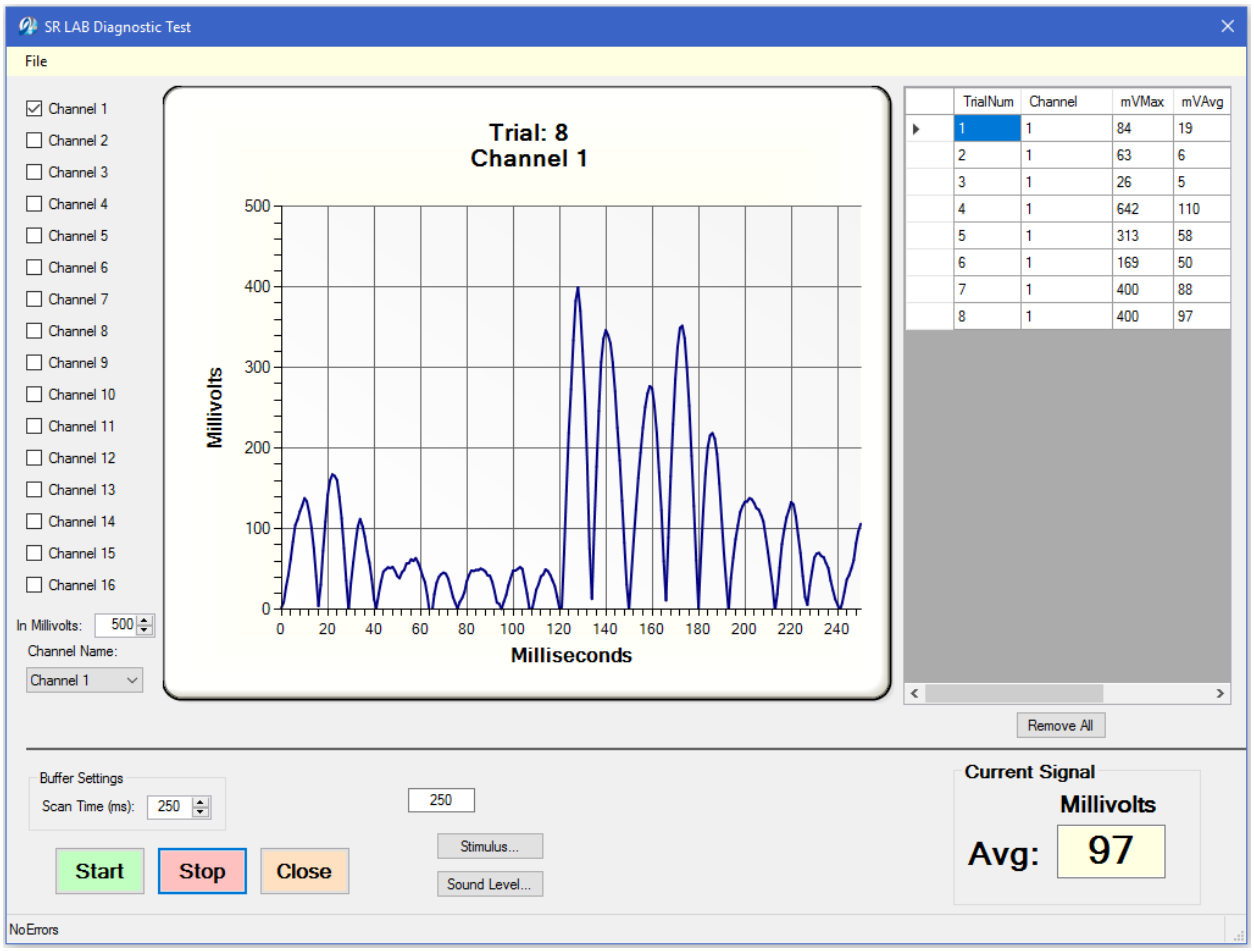
Conclusion

Once you have completed the above steps you have developed a sound curve to be used on your system. Publish the Analog levels for each dB level you have determined (Background, some number of PPI levels and a Startle pulse level) and let all users know to use these Analog levels in their trials. Periodically check the sound levels to make sure they match your selected Analog levels and adjust if necessary. As the system gets older you may have to develop a new sound curve and publish it.

Response Standardization

You want to make sure the response from the animal platform will record when the animal startles. To do this go back to the diagnostic main screen →Select channel 1→Click start

Tap your finger on the platform and make sure you see a peak appear on the screen like the below screen shot. This confirms the channels are connected and getting activity.



If only testing one chamber move on to Stimulus Diagnostics.

Startle Calibration with the Standardization Unit

Only necessary if you have more than 1 SR-LAB

The goal is to provide the same baseline response for each test station using the Standardization Unit (vibrator). The recommended starting values for the AVG reported by the "moto" session is 200 ± 4 for adult rat size enclosures (Medium, Large or Extra Large) and 700 ± 14 for mice/juvenile rats size thick wall enclosures (Small or Small/Medium). If using the Ultra-Sensitive thin wall Small or Small/Medium enclosure calibrate to 2500 mV. These values have shown that in most species you will get a good startle response. However, if you find that you have a low/high responding species you may want to standardize at a higher level such as 900 +/- 18 or a lower level 150 +/- 3 for example. The only way to determine this is to start with one of our guideline values, run several animals through a startle session and review the results. If you are getting peaks that the software can score then you may want to stay with the guideline value. If you are getting a response with low or no peaks you may want to standardize at a higher level. After standardizing at the new level you will need to re-run some animals and check the startle response.

The standardized level can be anything, but once it is determined and set, all animals should be tested at the determined standardized level. There is no way to overload the interface card so you can standardize as high as you desire.

Components:

- Standardization Unit – handle gently!
- Cable to connect Standardization Unit to power jack mounted in ceiling of cabinet (older test stations need to connect to Aux Power jack on side of SR-LAB Cabinet)
- Hardware for mounting the calibrator to the animal enclosure plate

Steps

1. Remove the animal enclosure from the base.
2. Attach the round standardization unit to the animal enclosure by screwing in the standardization unit with the screws provided. Make sure the clear doors on the animal enclosure have been removed.
3. Plug the power cable into the Standardization Unit before plugging it into the power jack.
4. Put the enclosure and Standardization Unit in the center of the SR-LAB chamber.

5. Plug the power cord into the power jack. On newer units there is a power jack in the ceiling at the front. On other units the Aux Power jack on the side of the cabinet is used. If using the cable to the Aux Power jack on the side of the test station drape it over the top of the cabinet to remove the weight of the cable.
6. For the most precise standardization, allow the unit to warm up for 15 to 20 minutes
7. Create or Open a diagnostic database.
8. Select the chamber(s) you wish to record

9. In the lower left corner, below the list of chambers, you can adjust the height of the Y axis to correlate higher or lower depending on your species to be able to see the full wave form.

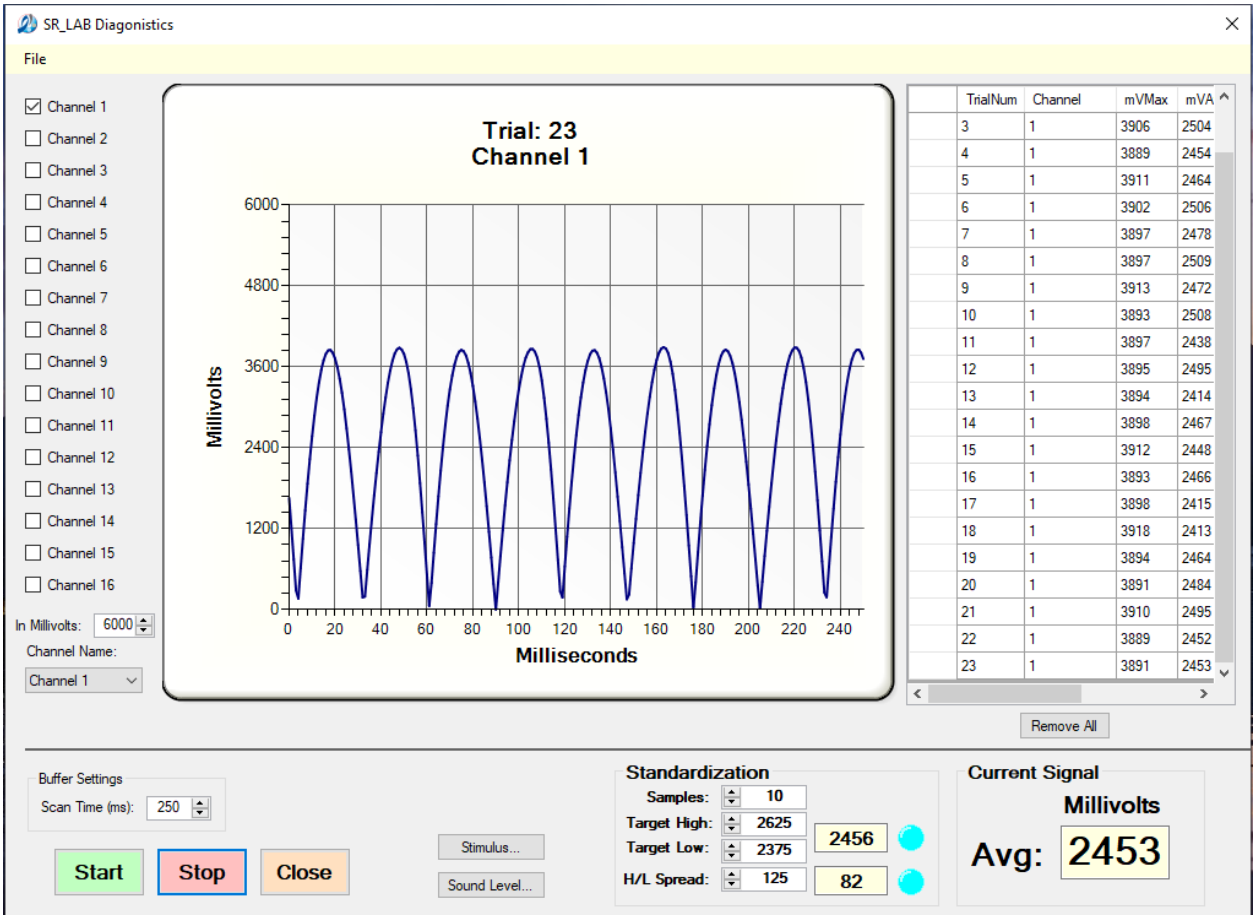
10. Set the 10-turn Response Adjust nob to gain control on the front of the SR-LAB chamber to an initial value of 5.0.

11. Select the Start button to begin the calibration process.
12. Observe the average response value reported on your monitor (for the chamber being calibrated). You can see it in the lower right of the screen. Adjust the 10-turn Response Adjust gain control on the front of the chamber for your desired average reading. When the average response is stable for 10 trials(recommended), (shows you mVAvg in the chart on the right) lock the Response Adjust control. When the standardization unit is operating within range you will see green status indicators. When the values are not within range the indicators are black.

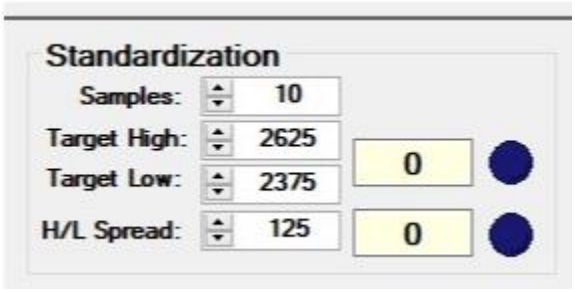
The Response Adjust control should not be changed between calibration sessions.
13. Select the Stop button to end the calibration process.
14. Proceed to the next chamber and repeat the steps above to standardize it.

Make sure to complete all standardization between chambers as quickly as possible to gain accurate readings. The motor inside the standardization unit can over heat causing it to not generate a good wave form.

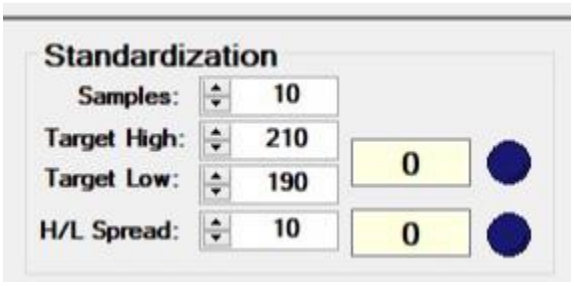
Once all chambers are standardized, take the standardized unit and place back in box and store carefully. You will want to standardize frequently to make sure your readings are still accurate.



Refer to the following settings for SMALL and SMALL/MEDIUM animal enclosures.

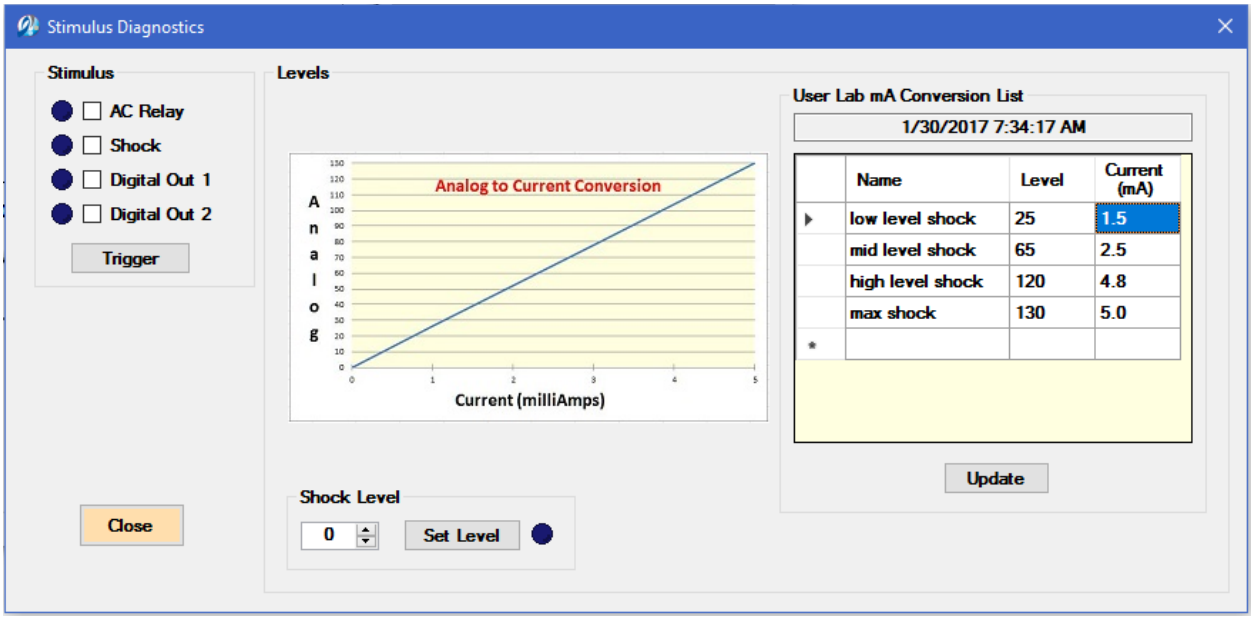


Refer to the following settings for MEDIUM, LARGE, and EXTRA LARGE animal enclosures.



NOTE: Animals of different sizes may require an increase or decrease in amplification to obtain normal data. The user may adjust the response gain (amplification) as high or as low as the dial will allow, to a level suitable for their needs, and establish new standardization values based on these. It is important that the calibration value is equal across all SR-LAB cabinets.

Stimulus Diagnostics:



Stimulus Diagnostics	Function
Stimulus	Test the digital outputs on the SR-LAB controller. There is a checkbox for each digital output and the trigger button. Check the output to test and select the Trigger button. When triggered on the LED will turn Cyan when triggered off the LED will turn blue. When triggered on the output can be measured using a volt meter.
Analog To Current Conversion	Linear graph similar to the White Noise graph. This displays a linear relationship between an Analog level and a corresponding Current (mA). This graph is an estimate for information only.
Shock Level	Analog level to use.
Set Level button	Button to set the Analog Level. When the Analog Level is set the LED will turn CYAN. NOTE: This does not necessarily mean that the shocker is outputting the corresponding mA. To get shocker output the Stimulus Shock should be checked and the Trigger button pressed.
Trigger button	When the check box is checked and Trigger button pressed the corresponding digital output will be on. If unchecked the digital output will be off.
User Lab mA Conversion List	A notepad table where Analog Level and corresponding mA output can be documented. This table can be

	referenced in the Trial Definition window as well as other windows in the program.

1. Click on the Stimulus button on the bottom of the diagnostic screen
2. There is a checkbox for each digital output and the trigger button.
3. Check the output to test and select the Trigger button. For example, click on the AC RELAY box and click trigger. The overhead light inside the SR-LAB will turn on if connected correctly.
4. When trigger is ON, the circle will turn Cyan when trigger is OFF the circle will turn blue as shown.
5. When triggered ON the output can be measured using a volt meter.

NOTE: Analog Shock Level output range is 0 to 130 which represents a 0 to 5.0 milliamp output irrelevant of the 2mA/5mA hardware selector switch on the shocker. For example, if the selector switch is set to 2mA and the analog shock level is 130, the output will still be 5.0 mA.

CHAPTER 4: Setting Up an Experiment

SR-LAB Definition Screens

When the main menu File➔Definitions… is selected there are two definition screens to choose from; Trials and Session. The definitions are saved in a separate definition database so that any study database that is created with SR-LAB can access the definition data.

There are also two menu selections to backup and restore the definition files. This backup will allow different users to define specific definitions and store/reload when necessary. **NOTE:** It is necessary to back up the definition file before installing an upgraded version of SR-LAB.

The first definition screen to open should be the Trials. Once a Trial definition has been created and saved then the Session definitions should be opened. Session definitions require Trial definitions.

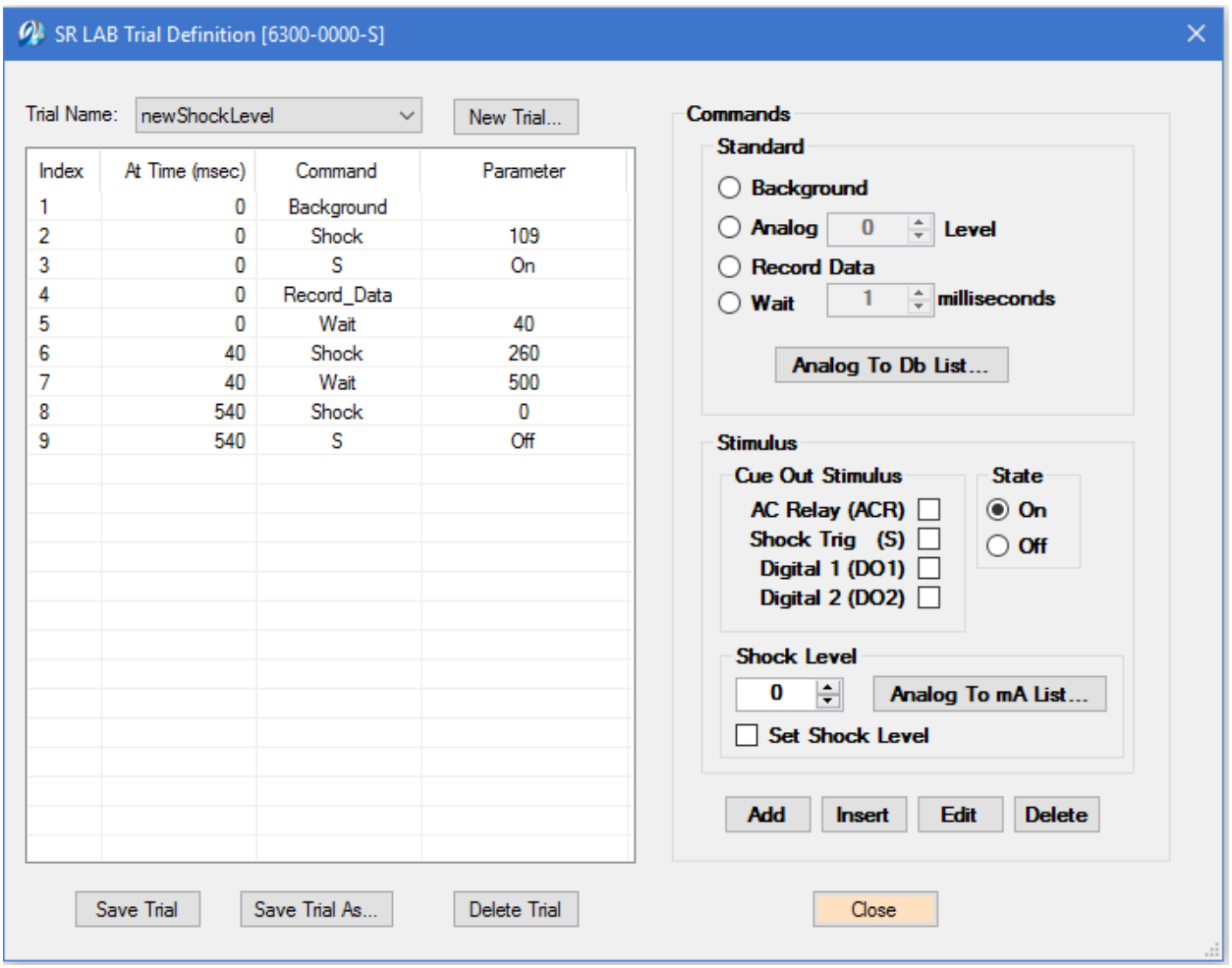
The flow for setting up an EXPERIMENT is Trials-Session-Create Database.

SR-LAB Trial Definition Screen

The process of building Trials and building Sessions can be compared to the stringing of beads--the individual beads you make are "Trials" and the string and spaces between the beads are the "Sessions." A Trial is a discrete test with a stimulus and response recording. A Session is a series of Trials (usually in the range of 40 or 50) run on one subject or one group of subjects all stored in a data base.

Defining a Trial

Creating an SR-LAB Trial definition can be likened to building a timeline. At various points along the timeline (or milliseconds in the case of SR-LAB trials) you are telling the SR-LAB software/hardware to perform various tasks. The trial definition tells the SR-LAB system what to do at what time.



1. Name the trial by clicking on the New Trial button.
2. Enter in the name or ID you wish to call this trial and click OK. The name will appear in the Trial name box at the top.
3. Now you will build your trial by selecting the commands one at a time and hitting the Add button below to move it over to your List View on the left. An example would look like this.
    - **Example of a Startle Trial using Acoustic Stimuli (sample only)**
    - Trial Name: startle
    - At 0 Milliseconds: Background
    - At 0 Milliseconds: Sound Level: 725
    - At 0 Milliseconds: Record Data
    - At 0 Milliseconds: Wait Length (msec): 20
    - At 20 Milliseconds: Background

    - **Example of a Prepulse Startle Trial using Acoustic Stimuli (sample only)**
    - Trial Name: ppi
    - At 0 Milliseconds: Background
    - At 0 Milliseconds: Sound Level: 475
    - At 0 Milliseconds: Wait Length (msec): 10
    - At 10 Milliseconds: Background

- At 10 Milliseconds: Wait Length (msec): 90
- At 100 Milliseconds: Analog Level: 725
- At 100 Milliseconds: Record Data
- At 100 Milliseconds: Wait Length (msec): 20
- At 120 Milliseconds: Background

4. When done creating your Trial select Save Trial. Repeat steps to create another Trial. All Trials will show in the drop down for Trial Name.
5. When done creating trials proceed to the Session Definitions.

Screen Item	Function
Button New Trial…	Button selection to create a new trial name
Trial Name	Drop down list box to select and display any currently defined trials
List View	Sequential listing of the trial definition. Listing defines sequential index, sequential time when command will happen, command and the command parameter
Standard Commands	
Background	The sound level is set to the background level identified in the "Session Definition" screen. Background sound is default and fixed to a White Noise type.
Analog	Command to produce sound. When Analog is the selected item it will be enabled to allow the user to select a millivolt level from 0 to 750 mV.
Level	Sound level in millivolts (mV). Sets the amplitude of the acoustic stimulus. A table showing the conversion from the software units to the resulting decibel level (dB) is included on page 21. This is enabled when sound is selected. It also defaults to the Analog level of the currently selected Sound ID from the drop down list.
Button Analog To Db List…	This table is created in the diagnostics window by you to show your levels you wish to use. This button opens a dialog where a system specific acoustic level table can be viewed. This table can be referenced throughout the rest of the software dialogs where needed.
Record Data	Command to start recording response signal. Data will be recorded for the length of time stipulated in the Session definition. NOTE: each trial definition must contain a Record Data command. This feature is built into the SR-

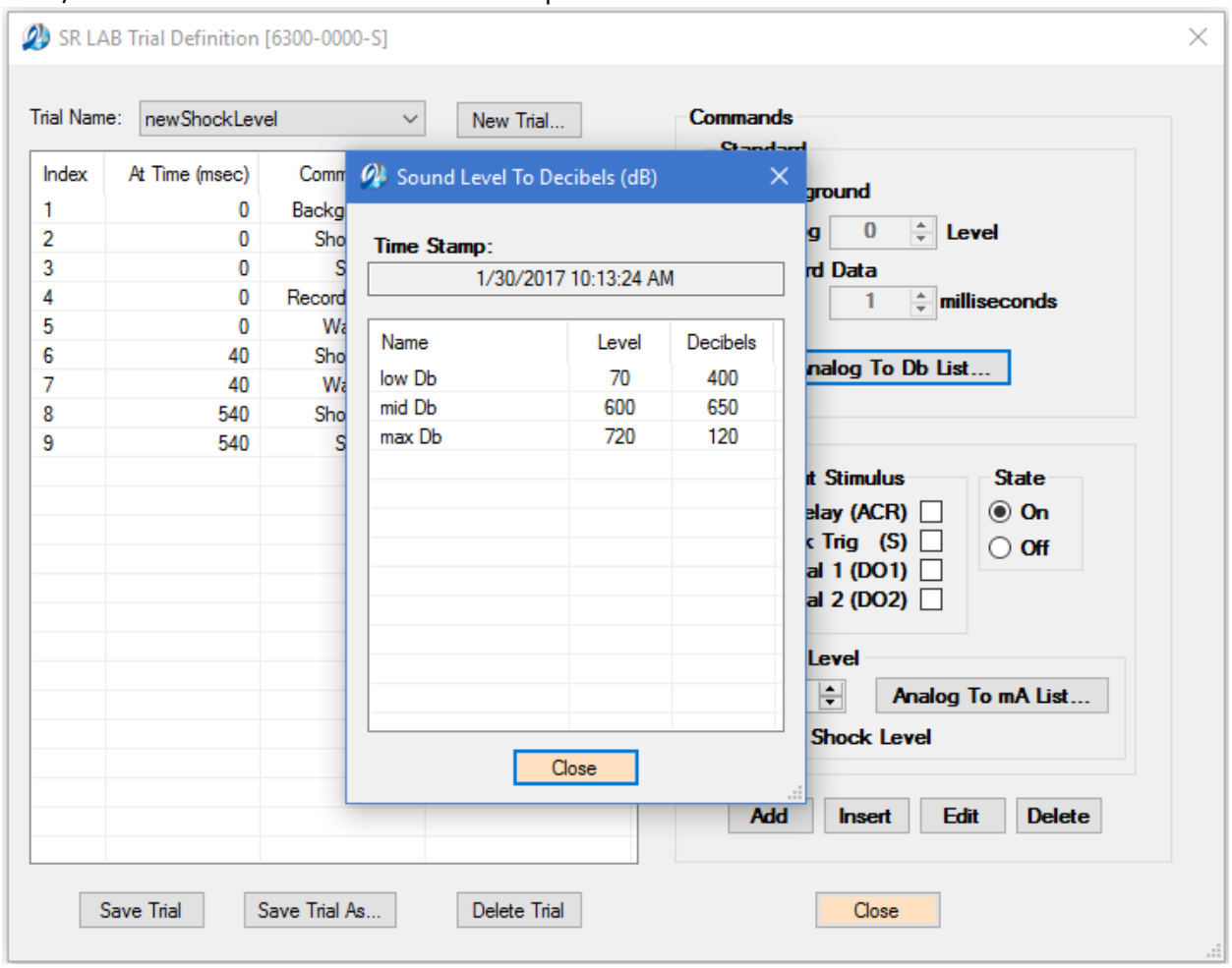
	LAB software to prevent an inadvertent trial definition that contains no provision for the recording of data.
Wait (msec)	Sets a wait time before the next command is executed or the end of a trial. The maximum wait length in any one entry is 60000 milliseconds (1 minute). If longer wait periods are required, several wait commands may be listed in sequence.
Stimulus Commands	**NOTE:** All stimulus commands are matched with the On/Off radio button to define the state of the stimulus.
Cue out stimulus	Each Cue out selected controls a +5V ttl output. Each Cue out can be connected to an external cue stimulus. These check boxes must be matched with the Stimulus State On/Off radio button. When On is selected cue will be initiated, when Off is selected, cue will be turned off.
AC Relay (ACR)	Signal to turn on/off AC Relay output from the control panel enabling the use of user defined accessories.
Shock (S)	Signal to turn on/off shock signal. Note: this triggers the on off of the shock ttl signal. The shock level must be set and turned on at least 2 msec before initiating this Shock trigger.
Digital 1 (DO1)	Digital output 1. Will turn on/off +5V ttl output to user defined equipment.
Digital 2 (DO2)	Digital output 2. Will turn on/off +5V ttl output to user defined equipment.
Shock Level Commands	Parameters used to set a specific shock level current value
Shock Level	Value to assign to the shock level desired. Value is 0 to 130 inclusive.
Set Shock Level	Check Box to set the current shock level value defined
Button Analog To mA List…	This table is created in the diagnostics window by you to show your levels you wish to use. This button opens a dialog where a system specific shock level table can be viewed. This table can be referenced throughout the rest of the software dialogs where needed.
Command Buttons	Command buttons aid with the design and building of a trial script. Once the Commands have been selected use one of the Command buttons to build the trial script.
Add	Add the command to the last line of the script
Insert	Insert the command into the script. First select a line in the script then select the Insert button. This will insert the command into the script at the selected line and all other commands will be moved down. The “At Time” column

	will be modified depending on the newly inserted command line.
Edit	Edit the currently selected command line. Highlight the command line to be edited, make command editions and then select the edit button. The "At Time" column will be modified depending on the newly edited command line.
Delete	Delete the command line selected. Highlight the line to be deleted and select the Delete button. The "At Time" column will be modified depending on the newly deleted command line.
General Trial Screen Buttons	
Save Trial	Saves currently selected Trial to the definition database.
Save Trial As…	Saves currently displayed Trial Sequence to a different Trial Name.
Delete Trial	Removes currently selected Trial from the definition database.
Close	Closes the SR-LAB Trial Definition window. If the trial has not been saved the program will ask the user if they wish to save the current trial.

Using Shock Level in a Trial Definition

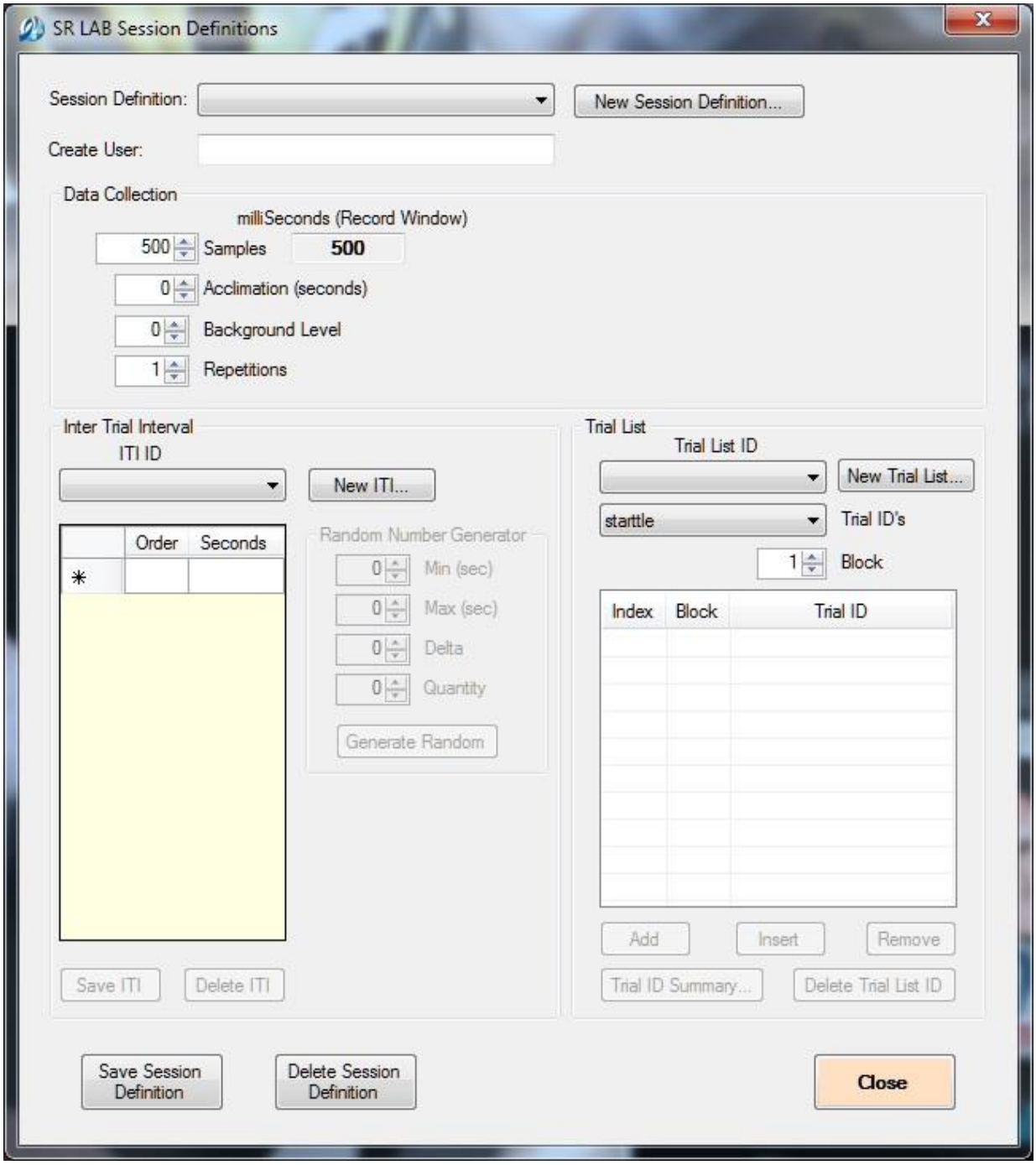
Shock Level Setting is a mutually exclusive entry for the Trial Definition Sequence. When the Shock Level checkbox is checked the Standard and Stimulus Commands will be unchecked. Enter the Shock Level Analog value, check the Set Shock Level Box and press either the Add, Insert or Edit button to update the Trial Definition.

The user can select the Analog To mA List… button to bring up the Shock Conversion Dialog. If a list was created in the Stimulus Dialog window this list will show up here. The user can highlight a line and when the close button is hit the shock level value will be transposed to the Set Dialog number and the checkbox will be checked. This is a convenient and accurate way to maintain the correct Shock Level/mA conversion in the Trial Definition Sequence.



SR-LAB Session Definition

The purpose of the Session Definition is to continue the process of designing test sessions to run. The session definition defines the Record data window, trials to use, Inter Trial Intervals (ITI), Acclimation time and Background Level. All trials can be review in the Session Definition window.
From the main screen select File-Definitions-Sessions to get the screen below



Read through the chart below to become familiar with all the options on this screen.

Screen Item	Function
New Session Definition…	Button selection to create a new Session ID name.
Session Definition	Drop down list identifying the current session definitions
Create User	Edit box to identify creator of the Session Definition.
Data Collection Entries	Data collection entries define the number of samples and sampling rate. Given this data the software will calculate the time window for recording of response data. NOTE: Sampling rate is a fixed rate of 1 kHz.
Acclimation	Time to wait before starting the trial. This time allows the subject to acclimate to its new surroundings. Acclimation period will be the same for every chamber connected to the system.
Background Level	Analog level to set the background sound. Level range is 0 ➔ 750 which relates from 0 to 100% sound level. By default, background sound is white noise only. This background white noise level will be used whenever a Background command is encountered in the Trial Definition.
Repetitions	Number of times to repeat the session run. Both Trial list and the ITI list will run to the end of the list and then cycle back to the beginning of the list to complete the number of repetitions entered.
Trial List Parameters	
New Trial List… Button	Selection button to create a new trial list
Trial List ID	Drop down box displaying a list of current Trial Lists
Trial ID's	Drop down box displaying a list of trials defined in the SR-LAB Trial Definition Screen.
List View	A List view of the currently selected Trial List ID.
Trial List Buttons	
Add	Add currently selected Trial ID to the List View
Insert	Insert the currently selected Trial ID into the List View. Highlight a line in the list view and select the Insert button. This will insert the Trial ID into the list at the selected line.
Remove	Remove the currently List view line selection from the view. Select the line to remove and click the Remove button.
Trial ID Summary…	Display the parameters of the currently highlighted Trial ID in the list.
Delete Trial List ID	This button will delete the Trial List ID from the definition database.
Inter Trial Interview (ITI)	
New ITI…	Button to create a new IDI ID
ITI ID	Drop down box to display currently defined ITIs
List View	ITI time listing displaying currently selected ITI ID.

Random Number Generator	Random number generator to create ITI times. Enter a minimum time (seconds), maximum time (seconds), Delta (seconds) and quantity. NOTE: Delta is defined as the minimum time difference between two successive entries. Quantity is the number of ITI times to generate.
Save ITI	Saves ITI to the Session Definition database. **NOTE:** it's necessary to save the ITI separate from saving the session definition.
Delete ITI	Deletes ITI from the Session Definition database.
Save Session Definition	Saves currently selected Session ID to the Session Definition database.
Delete Session Definition	Deletes currently selected Session ID from the Session Definition database.

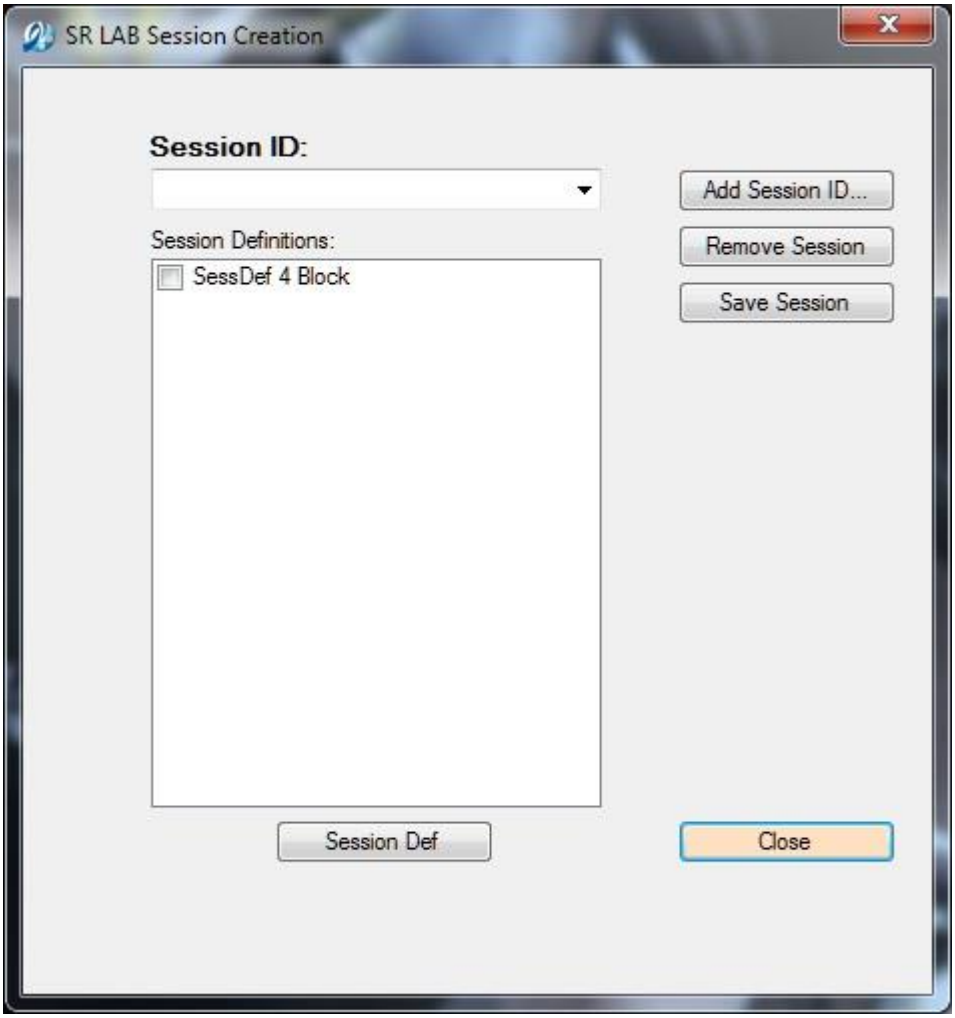
1. Click on the New Session Definition to name your definition.
2. Set your Data Collection options. You may wish to increase the repetitions.
3. Click on the new trial list and define the test.
4. Add your trials in the order you wish for them to test by selecting the drop down Trial IDs, selecting your trial and clicking on ADD.
5. Click on New ITI and name your Inter Trial Interval
6. Select your order and seconds for the trial OR use the Random Number Generator. Once complete click on Save ITI for future use.
7. Click Save Session Definition
8. Click close. This will take you back to the Main Screen.

SR-LAB Session Creation Screen

You will need to create a database by starting on the Main Menu Screen. Select File-Create new study database-and name it. Make sure to write down where it is saved.

SR-LAB Session Creation screen creates and identifies sessions to be run. Each session ID will be associated with one Session Definition that was created in the SR-LAB Session Definition Screen. Session Definitions can be reviewed in this screen.

Next, select from the Main Menu FILE-Create Sessions to get the screen below



1. Click on the Add Session ID and name your session
2. Check the box from the list of session definitions names for the session definition to use
3. If you wish to review any session definition check the box and select the Session Def button.
4. When satisfied with the specific session definition to use with the session click the Save Session button and close the window returning you to the Main Menu.

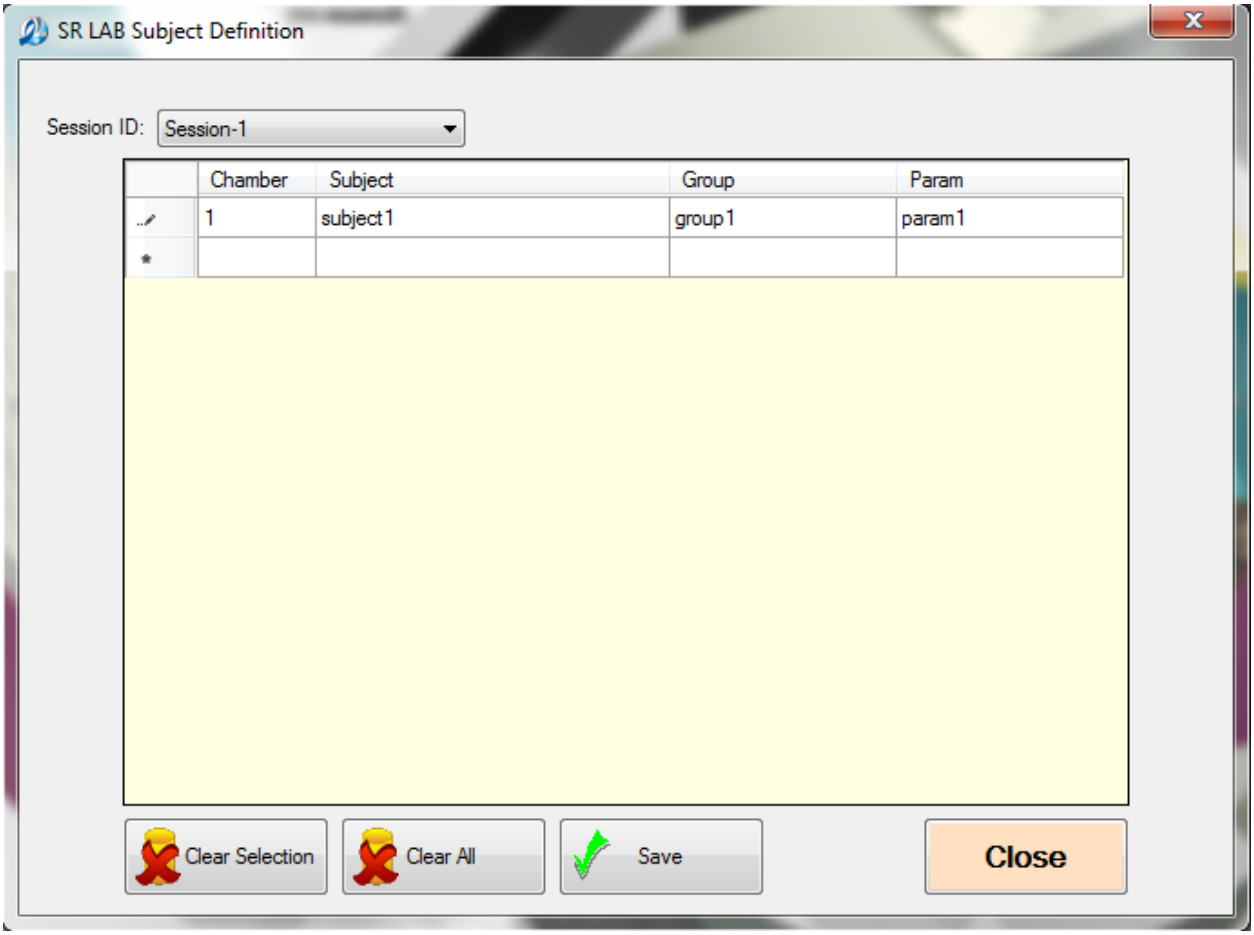
If user wishes to remove a session, select the session ID and select the Remove Session Button. This will permanently remove the session ID from the study database.

Screen Item	Function
Session ID	Drop down list of currently identified sessions
Add Session ID… button	Add a new Session ID
Session ID:	Drop down box identifying currently selected Session
Remove Session	Button to remove the currently selected Session ID from the study database.
Save Session	Button to save the currently selected Session ID to the study database.
Session Definition check box list	A checkbox listing of all defined Session Definitions. One, and only one, session definitions will be selected to be used the currently selected Session ID.
Session Def button	Button to display the currently checked session definition
Close	Close the Create Session screen. If the Session has not been saved the user will be prompted to save the Session ID

SR-LAB Create Subjects Screen

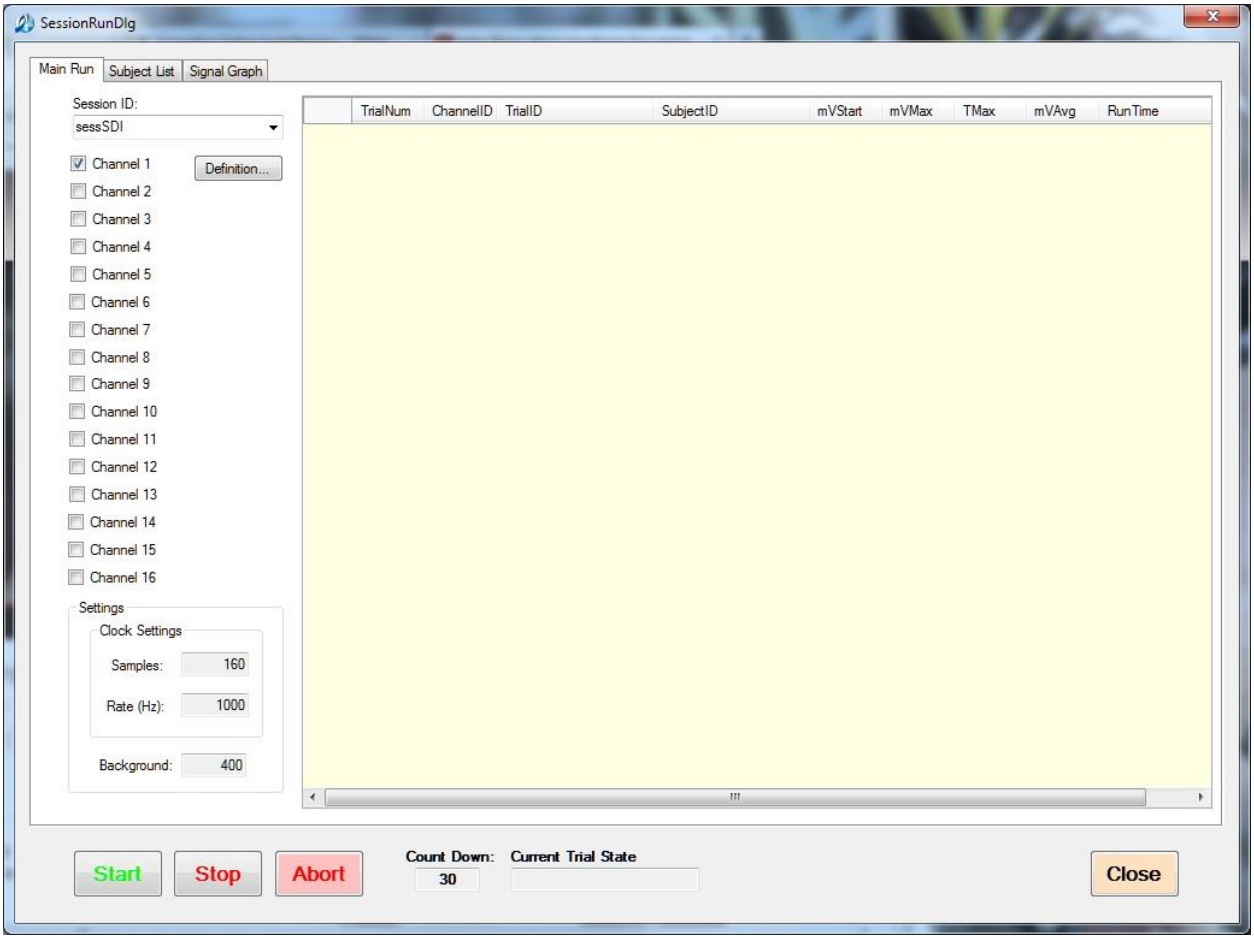
Main menu-File-Create Subjects

On this screen, enter the information about the test subjects. The “Chamber” field allows the user to enter the chamber where the subjected will be tested. This value should be chamber 1 to 16 and must correlate to the SR-LAB channel being used with the control box. Enter identifying information in the Subject, Group and ID fields. When all the information is entered, you have a choice to “Clear”, “Clear All”, “Save” or “Close”. If there is a problem with the entered data you can highlight the line and click on “Clear” button and start over again.



The SR-LAB Session Run Screen:

The Run Startle Session screen (Main Menu-Run-Session) contains information on the trials being run as part of the session, a chart of the feedback (in amplitude and milliseconds), the Current Trial State, a Start button, Abort Session button, Run and Close buttons and a countdown timer (seconds) for the acclimation period and subsequently for the time left before the next trial (inter-trial interval timing). There is a checklist of channels (chambers) to use in the session. The channels must match the channels identified with the subject definition. The screen also contains information on the Session Name, Trial Name. Also, there is a table containing the results of the session run.



There are multiple tabs on this screen to assist the user in configuring the session run.

- Main Run: main session run window.
- Signal Graph: window to display the graphs of the selected channel.
- Subject List: window that displays a list view of subjects with their corresponding Channel/Timer

Countdown Timer:

During runtime, a countdown to the next trial will be displayed in the lower left part of the display.

Abort Session:

Clicking on the Abort Session button will immediately end the Session. Data to the point at which the Session was aborted will be saved with the filename selected.

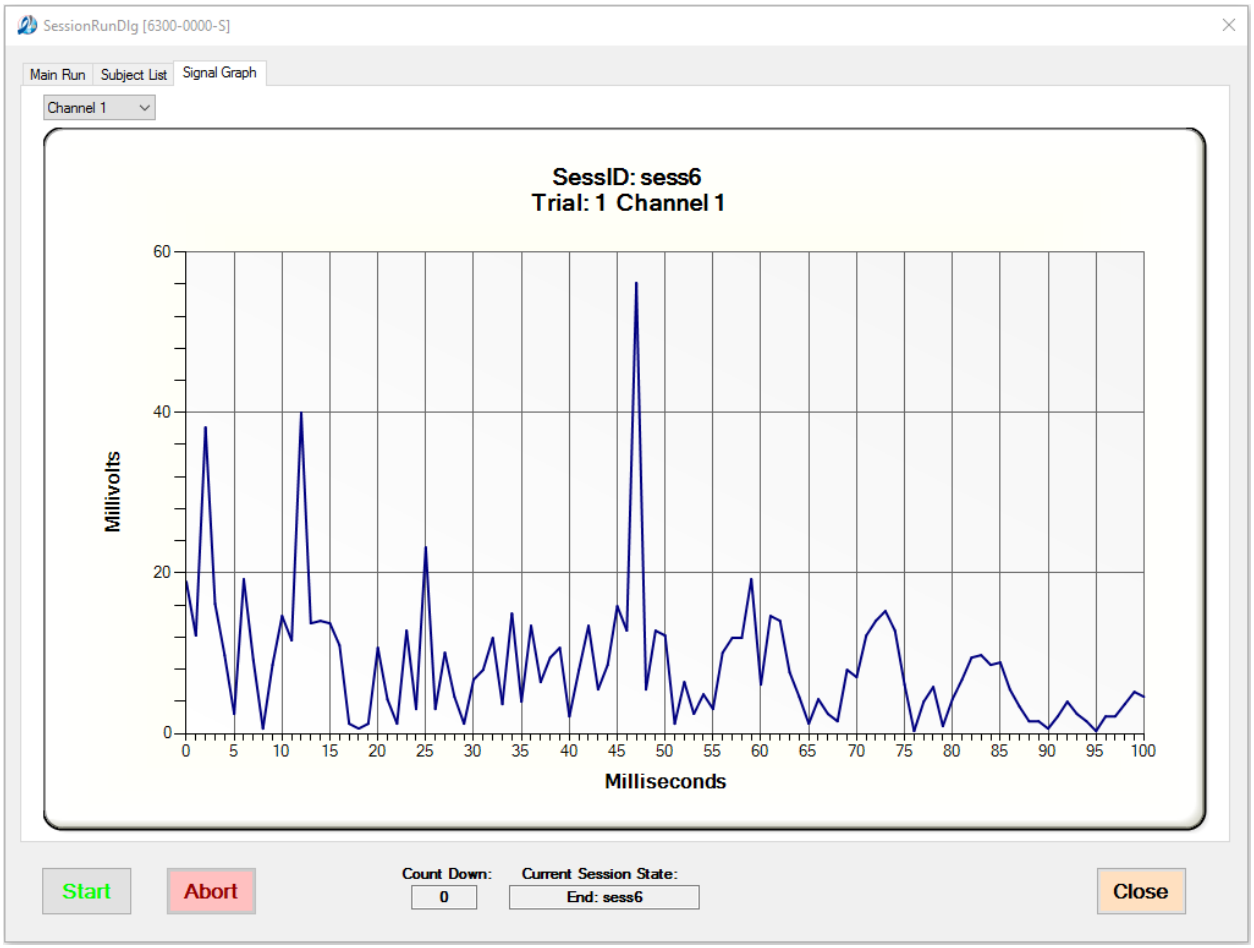
Report Screen Item	Function
Main Run Tab	Main session run view
Definition Button	Button to bring up a read-only window that displays the current session and trial definitions.
Channel List	A checkbox listing to enable specific channels/chambers to use. **NOTE:** These selections must match the channels/chambers listed in the Subject List View. Also these channels/chambers must be connected to the SR-LAB controller.
Clock Setting Samples	Read only box defining the number of data samples to be read. Since the Rate is fixed at 1000 Hz Samples can also be defined as milliseconds (1 millisecond per sample).
Clock Setting Rate (Hz)	Frequency definition. NOTE: this value is set at 1KHz. This value is used so that the number of Samples calculates to be the response window time in milliseconds. Ex: 250 samples at 1000 Hz gives a response window time of 250 milliseconds.
Background	Background level of White Noise sound to be used during acclimation and ITI
Current Trial State	Text box displaying current state of the trial
Response Table	Table that collects response results from the trial run.

Start Your Session

Check and make sure your Session ID is correct on the main run tab.
Click the channels you wish to record data and your subjects labeled on the subject list are correct per channel.
When all the animals are in their chamber, place the enclosures in the center of the SR-LAB unit, close the door, and click start and the countdown clock will run showing you when the session will start.

Signal Graph Window:

The Signal Graph window contains a single chart of the selected channel.

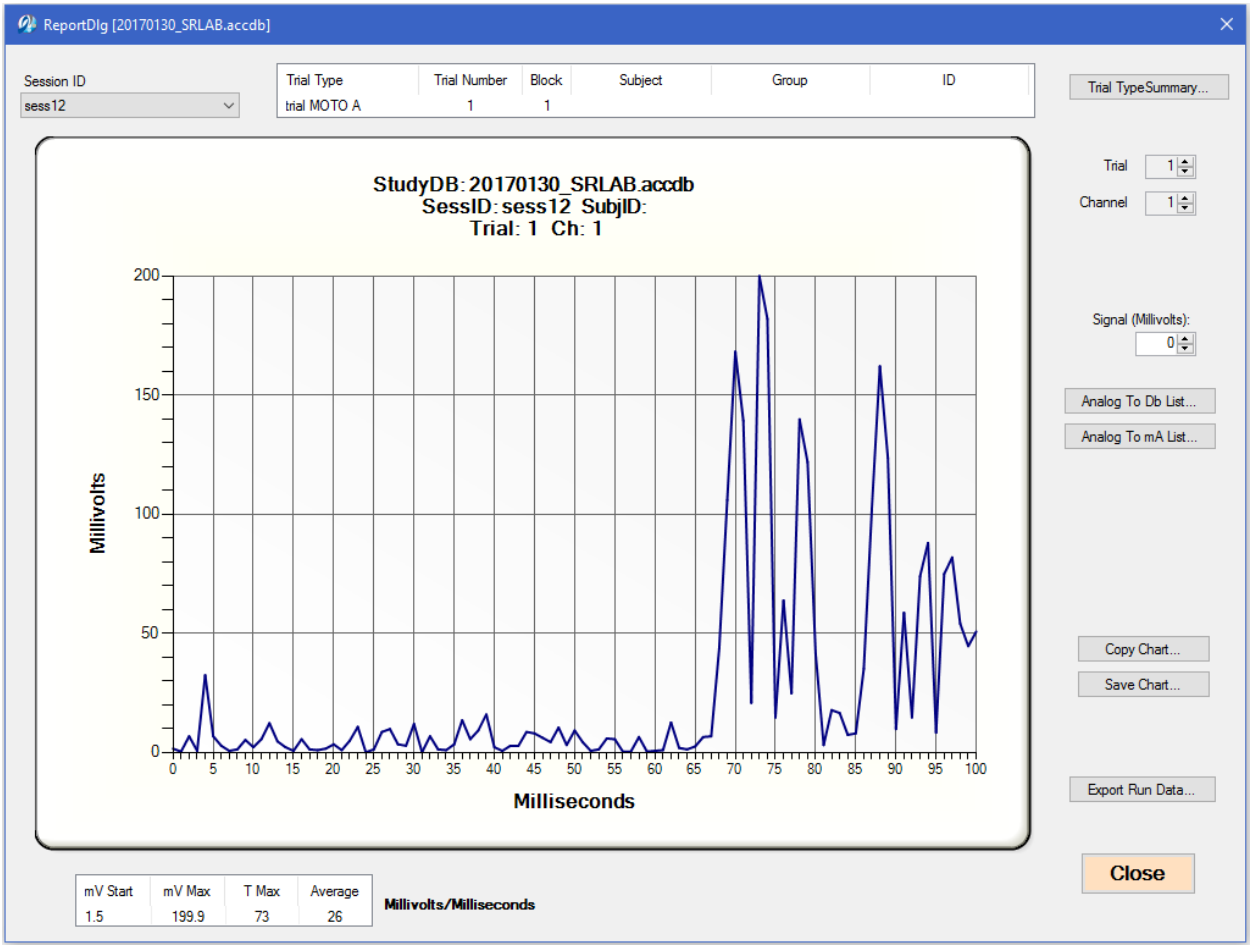


The SR-LAB Report Screen:

The Data Report Screen can be reached by the main menu selection of Run➔Report. All sessions that have completed running their trials can be viewed in the report window.

The full waveform of the response is shown in the graph display. The horizontal axis of the graph auto scales to the number of Record Samples contained in the Session Definition. The vertical axis represents the amplitude of the response in millivolts. The waveform is automatically scaled to the peak voltage recorded. If a fixed Y-Axis amplitude is desired it can be set by adjusting the Signal (mV) value.

The report window contains the Trial Type name, Trial number, subject name, Group and ID. There are selections to change trials and channels. Only one waveform can be viewed at a time. If data have been collected on more than one SR-LAB chamber, you can choose the channel to view by clicking in the Channel field. Particular trials that are part of the test session may be selected from the Trial box. The purpose of the report window is to view data points recorded at session run time.



Report Screen Item	Function
Session ID	Select session to view
Close	Button to close the window.
Trial Info bar	Trial Info bar is upper bar above the Chart and contains the following information: Trial Type: Name of Trial Definition used in trial run Trial Number: Number of currently displayed trial Subject: Name of subject in currently displayed trial Group: User supplied subject identifier parameter Defined at Subject Definition window. ID: User supplied parameter defined at Subject Definition window
Data Info bar	**Located bottom left of the window**
mV Start	Voltage at the start of the response window. This value represents the voltage unit recorded in the first millisecond of the response window. It is intended only as a "stability" check which can signal that the subject, before having time to respond to a startle stimulus, was moving, or making other motions that might interfere with the proper recording of a startle response. Thus if this value is high (approaches the "Average") on a Trial, the user may choose not to include the Trial's data in an analysis. Note that this value, because it is based on only a single millisecond will likely be quite variable.
mV Max	Highest voltage during the response window. This is the "peak" of the response.
T Max	Time in milliseconds after the start of the response window at which the Time Max response occurred. This is the "latency" to the "peak" of the response. Note that the time recorded, because the response is "rectified", may be the time to either the positive of negative phase of the response and latencies and may therefore, be bimodal. It is recommended that this data be carefully examined before being reported as averages.
Average	The voltage across the entire response window. The sum of the voltages recorded for each millisecond in the Response Window divided by the number of milliseconds in the Response Window. NOTE that voltages are reported by the software in millivolts.

Trial box	Allows you to select which trial to view
Channel	Allows you to select which channel to view
Signal (millivolts)	This defines the max value for the Y Axis in the waveform chart. Note: when value is 0 the chart Y Axis is variable dependent upon the signal response.
Analog To Db List	This button opens a dialog where a system specific acoustic level table that was recorded when the session trial occurred can be viewed.
Analog To mA List	This button opens a dialog where a system specific shock level table that was recorded when the session trial occurred can be viewed.
Copy Chart	Copies the waveform chart to the windows clipboard. This can then be pasted into any documents.
Save Chart	Saves the waveform chart to a file.
Export Run Data…	Button to export the results. Button opens a dialog to select specific sessions and other export parameters.

Chapter 5: Analysis Software

The SR-LAB Analysis:

The SR-LAB Analysis is similar to SR-LAB Report Screen but it is a separate, stand-alone software package that allows for independent analysis of the data. This allows the researcher to take the study database and perform analysis on a computer separate from that which is operating the SR-LAB equipment. It also allows exporting both raw data and scored data. Three additional data points can be calculated (scored) with this software; The Onset of the first response peak, the amplitude of the first response peak and the time (latency) to the first response peak. NOTE: It is not always the case that the maximum amplitude occurs at the first peak.

The SR-LAB SR Parameters:

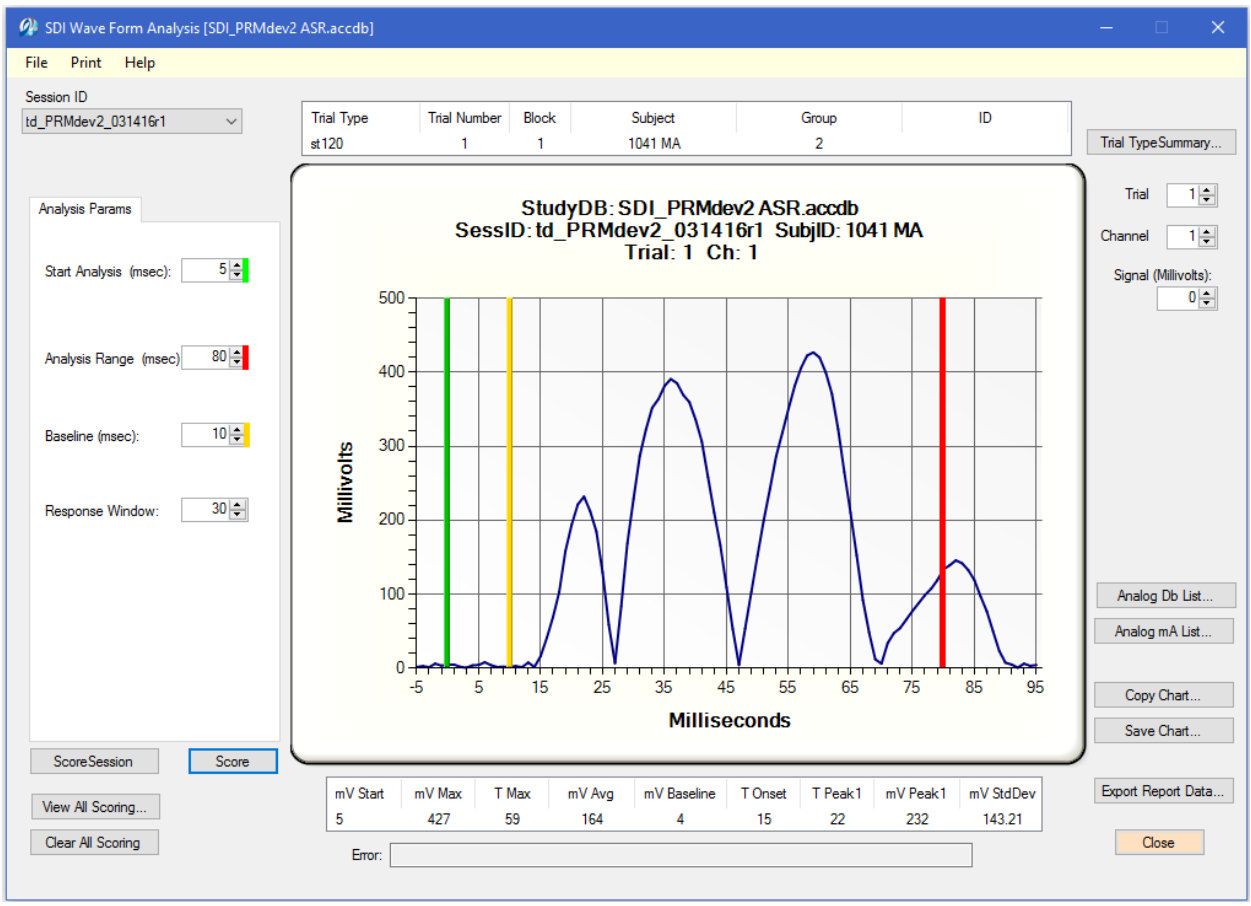
The Analysis Parameters can be adjusted to determine (score) the Onset of the first response peak, the amplitude of the first response peak and the time (latency) to the first response peak.

The algorithm used to define the onset to the first response peak is to first find the peak, which is to locate the most consecutive incrementing data points, up to the highest data point that is within the Response Window. That last, highest data point is considered the peak. Then work back down the curve to find the lowest of consecutively decrementing data points that is greater than or equal to the calculated baseline average. Any data points within the baseline window are not considered for an onset value.

1. Open SR_Analysis.exe icon on your desk top
2. File-Open Study Data Base-Select your Data Base
3. Set your GREEN at the time you wish to start your Analysis
4. Set your RED at the time you wish to stop your Analysis
5. Set your Yellow at the base right before the first peak.
6. Click Score to get your results.

You will see at the bottom of the graph your numbers for that Trial.
Use the Trial and Channel option on the right of the graph with the arrows to move between all your trials and channels to get your results.

See picture below


SDI Wave Form Analysis [SDI_PRMdev2 ASR.accdb]
File
Print
Help
Session ID
td_PRMdev2_031416r1
Trial Type
Trial Number
Block
Subject
Group
ID
st120
1
1
1041 MA
2
Trial TypeSummary...
Analysis Params
Start Analysis (msec):
5
Analysis Range (msec)
80
Baseline (msec):
10
Response Window:
30
StudyDB: SDI_PRMdev2 ASR.accdb
SessID: td_PRMdev2_031416r1 SubjID: 1041 MA
Trial: 1 Ch: 1
Millivolts
Milliseconds
Trial
1
Channel
1
Signal (Millivolts):
0
Analog Db List...
Analog mA List...
Copy Chart...
Save Chart...
ScoreSession
Score
View All Scoring...
Clear All Scoring
mV Start
mV Max
T Max
mV Avg
mV Baseline
T Onset
T Peak1
mV Peak1
mV StdDev
5
427
59
164
4
15
22
232
143.21
Export Report Data...
Error:
Close

Analysis Parameters	Function
Start Analysis (msec)	Start time in which to begin analyzing the data. Start Analysis is displayed on the plot as a vertical green line. If Start Analysis is zero (at the beginning of the original plot) the green line will not be shown. Otherwise the Start Analysis will show the green line and this will become the new 0 point of the plot.
Analysis Range	End time (msec) of analysis data. End Analysis is displayed on the plot as a vertical red line. If End Analysis is the max value of the plot the red line will not be shown.
Baseline	Window of time (msec) in which to analyze baseline data. This window begins at Start Analysis and ends at Start Analysis + Baseline.
Response Window	The max time (msec) after an onset (before Peak1) for the peak detection. This forces program to ignore a peak response that may occur too long after a stimulus to be attributed to the stimulus.

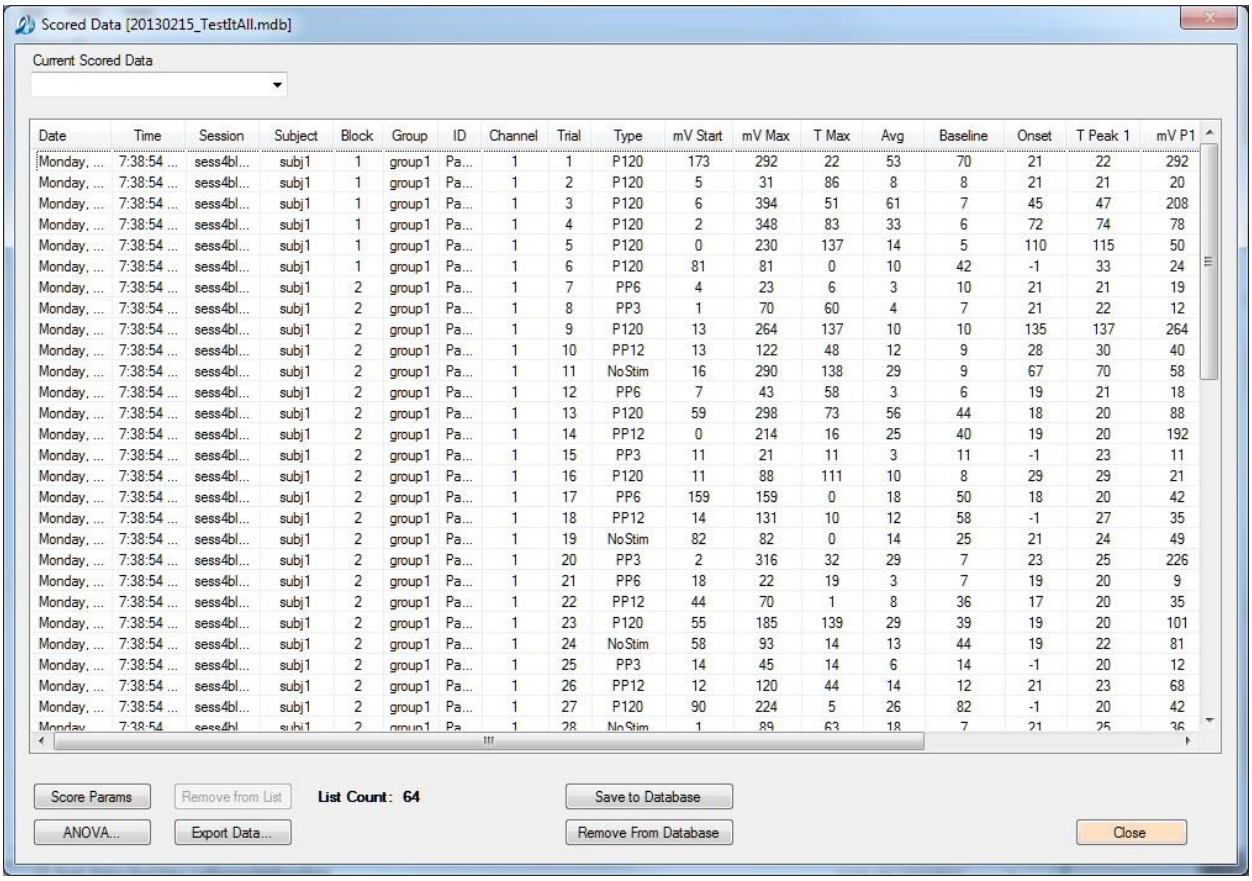
The following table describes the functions of the other controls in the Analysis window:

Analysis Window	Function
Session ID	Drop down box identifying the current session ID
Trial Scroll Control	Scroll window to identify which signal response to display in the waveform chart
Channel Scroll Control	Scroll window to identify the trial signal response from the channel (chamber).
Signal (millivolts)	This defines the max value for the Y Axis in the waveform chart. Note: when value is 0 the chart Y Axis is variable dependent upon the signal response.
Trial Info Bar	Trial info bar contains information for the currently displayed trial
Trial Type	Trial Type name as stated in the trial definition
Trial Number	Index number of the displayed trial
Subject	Subject name for current trial
Group	Group name from Subject window
ID	Parameter ID from Subject window
Scored Data Bar	Scored data bar displays the results of scoring the currently selected trial given the input Analysis Parameters.

mV Start	Voltage level at start analysis
mV Max	Maximum voltage within analysis range
T Max	Time (msec) at maximum voltage
mV Avg	Average voltage within the analysis range
mV Baseline	Average voltage with the baseline range
T Onset	Time of the onset to Peak 1
T Peak1	Time of the first peak within the analysis range
mV Peak1	Voltage level of the first peak within the analysis range
mV StdDev	Standard deviation of the voltage values within the analysis range
Buttons:	
Score	Start time in which to begin analyzing the data. Start Analysis is displayed on the plot as a vertical green line. If Start Analysis is zero the green line will not be shown.
Score Session	Score Session button will score all trial in the session
View All Scoring…	Button to display a table of all scored trials
Clear All Scoring	Button to clear all scored trials from the view table
Export Raw Data…	Button to export the Raw data to Excel or a tab separated (*.txt) file. Data can be exported in row or column format
Close	Close the analysis program
Chart Buttons:	
Analog Conversion…	This button opens a dialog where a system specific acoustic level table that was recorded when the session trial occurred can be viewed.
Copy Chart…	Copies the waveform chart to the windows clipboard. This chart can then be pasted into any documents.
Save Chart…	Saves the waveform chart to a file.

The SR-LAB Scored Data Window:

The Scored Data Window displays the result of all presently scored trials. Click on the **View All Scoring** button. This window provides the opportunity to review the data and also export the viewed data to an Excel or a tab separated (.txt) file. Also, any scored data can be removed by highlighting the line(s) and selecting the Remove button. Data can be sorted on each column in ascending order by clicking on the column header.



Date	Time	Session	Subject	Block	Group	ID	Channel	Trial	Type	mV Start	mV Max	T Max	Avg	Baseline	Onset	T Peak 1	mV P1
Monday, ...	7:38:54 ...	sess4bl...	subj1	1	group1	Pa...	1	1	P120	173	292	22	53	70	21	22	292
Monday, ...	7:38:54 ...	sess4bl...	subj1	1	group1	Pa...	1	2	P120	5	31	86	8	8	21	21	20
Monday, ...	7:38:54 ...	sess4bl...	subj1	1	group1	Pa...	1	3	P120	6	394	51	61	7	45	47	208
Monday, ...	7:38:54 ...	sess4bl...	subj1	1	group1	Pa...	1	4	P120	2	348	83	33	6	72	74	78
Monday, ...	7:38:54 ...	sess4bl...	subj1	1	group1	Pa...	1	5	P120	0	230	137	14	5	110	115	50
Monday, ...	7:38:54 ...	sess4bl...	subj1	1	group1	Pa...	1	6	P120	81	81	0	10	42	-1	33	24
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	7	PP6	4	23	6	3	10	21	21	19
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	8	PP3	1	70	60	4	7	21	22	12
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	9	P120	13	264	137	10	10	135	137	264
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	10	PP12	13	122	48	12	9	28	30	40
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	11	NoStim	16	290	138	29	9	67	70	58
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	12	PP6	7	43	58	3	6	19	21	18
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	13	P120	59	298	73	56	44	18	20	88
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	14	PP12	0	214	16	25	40	19	20	192
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	15	PP3	11	21	11	3	11	-1	23	11
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	16	P120	11	88	111	10	8	29	29	21
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	17	PP6	159	159	0	18	50	18	20	42
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	18	PP12	14	131	10	12	58	-1	27	35
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	19	NoStim	82	82	0	14	25	21	24	49
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	20	PP3	2	316	32	29	7	23	25	226
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	21	PP6	18	22	19	3	7	19	20	9
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	22	PP12	44	70	1	8	36	17	20	35
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	23	P120	55	185	139	29	39	19	20	101
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	24	NoStim	58	93	14	13	44	19	22	81
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	25	PP3	14	45	14	6	14	-1	20	12
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	26	PP12	12	120	44	14	12	21	23	68
Monday, ...	7:38:54 ...	sess4bl...	subj1	2	group1	Pa...	1	27	P120	90	224	5	26	82	-1	20	42
Monday	7:38:54	sess4bl	subj1	2	group1	Pa	1	28	NoStim	1	89	63	18	7	21	25	36

Scored Data Window	Definition
Date	Date Stamp when data was scored
Time	Time Stamp when data was scored
Session	Session ID
Subject	Subject Name
Block	Block number from Trial List defined in the Session Definition window
Group	Group information from Subjects window
ID	Parameter information from Subjects window

Channel	Channel/Chamber Number
Trial	Trial number
mV Start	Voltage (mV) at start of Analysis Chart
mV Max	Maximum Voltage (mV) within range of Analysis Chart
T Max	Time (msec) for mV Max
Avg	Average voltage (mV) for data points within Analysis Chart
Baseline	Window of time (msec) in which to analyze baseline data. This window begins at Start Analysis and ends at Start Analysis + Baseline.
Onset	Time (msec) where signal curve begins to rise to first peak
T Peak 1	Time (msec) where signal reaches first peak
mV P1	Voltage (mV) for first Peak
Error	Error string if algorithm is unable to locate Onset and first peak because of the input parameters.
E Code	Error code defining Error string
Button Descriptions	**Definition**
Score Params	Selection will bring up a window displaying the analysis parameters used to score the response(s)
Remove From List	Selection will remove all highlighted lines from the scored data.
Export Data	Selection will export the data to either an Excel or Tab separated (*.txt) file. Data can be exported in either row or column format.
Save To Database	Selection to save the current scored data to the database. When saved the Scored Data Name will be displayed in the Current Scored Data dropdown box
Remove From Database	Selection will remove the currently identified Scored Data from the database.
Close	Selection will close the scored data window. User will be asked if they wish to keep the scored data.

Chapter 6: SR-LAB Animal Shocker

SR-LAB Animal Shocker (Potentiated Startle Kit)

The SDI Animal Shocker, or Potentiated Startle Kit, is a multi-function, solid-state unit that administers scrambled shock with 8 unique outputs. The unit is designed to provide feedback-controlled, constant current shock with an output composed of bi-polar, square waves with a frequency of 11 Hz (max voltage 250 V). The unique display shows the current levels actually being administered to the subject. The display is also used to monitor current levels while in the "Adjustment" mode.

The Animal Shocker Current Level can be set in two ways: (1) in 'manual' mode where you adjust the shock level using the Current Adjust knob on the front of the shocker; or (2) in 'program' mode where the shock level is established in the trial definition. The shock ON and OFF command in the Trial Definition is available in either mode.

SR-LAB Animal Shocker (Potentiated Startle Kit)

Hardware

The SR-LAB Animal Shocker includes three basic components: the shocker control unit, the shock grid (to be placed in the SR-LAB animal enclosure) and a cue light. Power to the shocker is applied by plugging the power supply into the Aux Power socket on the side of the SR-LAB Test Station.

The power switch is located at the left rear of the shocker control unit. See the photos below for an explanation of the connections required to fully install the SR-LAB Animal Shocker(s).

Cue-light

The included cue light is used for light/shock pairing sessions. It is mounted via Velcro to a side wall of the chamber in view of the subject. The wire is passed through the rubber stopper at the rear and plugged into the Cue Out jack on the side of the cabinet. The on/off of the light is controlled by the cue command (DO1 or DO2) in the trial definition.

Installing the Animal Shocker

1. Set the shocker unit on the top of the SR-LAB Cabinet.

2. Plug the power cable from the shocker into the Aux. Power jack on the side of the cabinet

3: Connect the shock trigger cable to the shockers.

Connect Shock Trigger First Chamber to Remote Operate + on the back of the first shocker. Run a trigger cable from Remote Operate – on the first shocker to Remote Operate + on the second shocker. Continue this pattern until you go from Remote Operate – on the last shocker to Shock Trigger Last Chamber on the control box.

(The Program Input connectors are used with the Potentiated Shock Level Control System. These connectors are currently not active (see setting shock level manually below)

4. Place the shock grid inside the animal enclosure and run the wire through the rubber stopper on the back of the chamber. Plug the cable into the round Shock Out connector.

Animal Shocker Front Panel Display and Control Knob

The Animal Shocker control unit front panel contains the shock intensity display reading in milliamps (mA) with a resolution of 1/100 mA. The display is active during the adjustment of the shock levels using the Adjust switch and when shock is directed to the shock grids. The current Adjust knob sets the shock amplitude when the unit is in manual mode.

Front Panel Switches

Program/Manual Switch – the position of this switch determines whether the source of the shock amplitude is from the setting of the Current Adjust knob (manual) or from a programmed 8 bit signal to the Input plug at the rear of the unit. Note: For the programmable shock, the Potentiated Startle Kit Shock Level Control System must be installed.

Range Switch – the setting of this switch determines the total range of the shocker output, 0-5 mA or 0-2 mA. Note: In 'Program" mode only, the 5mA scale is used even if the switch is set to 2 mA.

Initiate/External/Adjust – This switch selects the source of the signal that starts the shock. "Initiate" starts the shock from the shocker control unit panel. This is a "momentary" switch - shock will be sent to the Shock Connector for as long as the switch is held in the up position. An "External" switch setting starts the shock when a 4-20 mA current signal is applied at the "Remote Operate" plugs in the rear panel. The "Adjust" switch directs the shock to the front panel meter. Current will be directed to the meter as long as the switch is in this position.

Front Panel Indicators

There are 3 indicator lamps on the front panel. The lamps illuminate as follows:

- Power - is lighted when there is power to the unit.
- Shock- is lighted when shock is being delivered at the rear panel's Shock Out connector.
- Adjust - is lighted when the signal source switch is in the Adjust position.

Rear Panel Connections

Power In - for plugging in the power supply converter

Remote Operate - Connections for remote initiate signal. This signal is provided by the Shock ON instruction in the SR-LAB Trial Definition (a 4-20 mA signal). The Shock OFF instruction drops the signal turning off the shock.

Shock Out - Connector for 8 unique, scrambled shock outputs, connected to the SR-LAB animal enclosure shock grids.

Program Input for Shock Level Connector (DB-25)
Note: This setting is only used with the Potentiated Startle Shock Level Control System.

Input J3 (top) – Connection for expansion of the system by adding additional shockers. This connection links the Control Box to the first shocker or from a previous shocker unit.

Output J4 (bottom) - Connector for 8 bit input for programmed shock amplitude. These are signals provided by the Port Command in the SR-LAB Trial Definition. This connection links to the next shocker input (J4) for daisy-chaining multiple animal shockers together.

Adjusting Shock Levels

Determine the range of shock desired and set the range switch accordingly (0-2 mA or 0-5 mA). NOTE: The Range switch setting is overridden in the Program Mode to 5 mA.

Manual Mode - Place mode switch in "Manual", set Source switch to "Adjust", then turn adjustment knob until desired intensity appears on display.

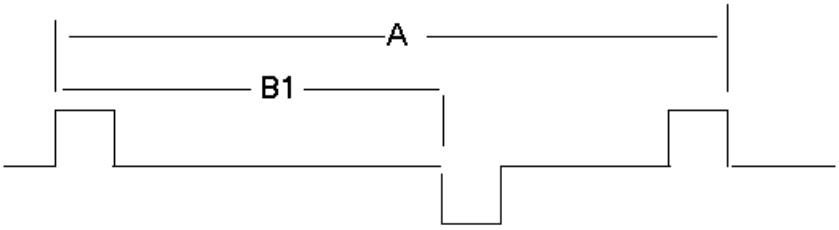
Program Mode - Future feature. Currently not implemented.

Validating the SR-LAB Animal Shocker Current Level

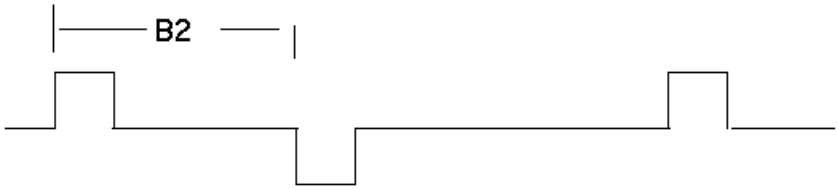
The information contained in this section explains how to manually check the current level. As an alternative to the manual method described below, San Diego Instruments supplies the Shock Level Tester (P/N 2325-0224) which automates current level adjustment. Please contact SDI if you are interested in the Shock Level Tester.

To validate the SR-LAB Animal Shocker current level you will need a load resistor.

50 kOhms, an oscilloscope and a differential probe. Simply take voltage readings (see wave shape drawing below) and calculate the instantaneous current with Ohms Law. This is a relatively simple procedure and can be done periodically for the sake of validation. Follow these steps:



Example 1 (grid 1 to grid 2)



Example 2 (grid 1 to grid3)

WARNING: SHOCK HAZARD IS PRESENT DURING TESTING. THIS PROCEDURE MUST BE PERFORMED ONLY BY TRAINED PERSONNEL.

Steps for Validating the Animal Shocker Current

1. Attach a 50 kOhm resistor (any wattage) across any two-grid bars.
2. Place the INITIATE switch in the ADJUST position.
3. Attach the oscilloscope across the load resistor using the differential probe.
4. Adjust the shock level knob on the SR-LAB until the meter reads the desired level.

5. Hold the INITIATE switch in the INITIATE position.
6. Take a reading of the "Peak" DC voltage displayed on the oscilloscope.
7. Calculate the current using Ohms Law: I = E/R. For example at a 20 V peak with a load of 50 kOhms, the real time value of the current would be .4 milliamps (mA)
8. Compare the Meter reading with the Oscilloscope reading.

The shocker uses polarity switching DC pulses, with phase shifts between grids

(This is what enables shock between any two grids). Look at the difference between time B1 and time B2 on the drawing. The voltage applied is from a constant current source. This means the circuit will adjust the voltage to the necessary value needed to deliver a specific and constant current. One particular point of interest is that the meter displays the "real time" value of the shock, i.e., the meter displays the current at the instant of the pulse. Duty cycle is defined as the percentage of the time the signal is present. The shocker has a duty cycle of approximately 25.

NOTE: the SCALE switch on the shocker is truly a GAIN switch, i.e., when the switch is changed from 2 mA to 5 mA, the output will be increased by a factor of 2.5. For example, with the SCALE on 2 mA and the setting at .2 mA the output will be .2 mA. The output will increase to .5 mA (and will be indicated on the meter) when the SCALE is set to 5 mA.

Appendices

Appendix A: San Diego Instruments Product Warranty

Products purchased from San Diego Instruments (SDI) are warranted free from defects for a period of one year. SDI agrees, for one year from the date of shipment, to replace or repair, at SDI's option, at the SDI factory (9155 Brown Deer Road, Suite 8, San Diego, CA 92121-3248) any defective products or components. San Diego Instruments, at its discretion, reserves the right to make repairs and/or replacements at the customer's site.

San Diego Instruments will also provide, for one year from date of shipment, general revisions to system software that are appropriate to the client's system.

This Warranty does not cover damage due to misuse, and is void if San Diego Instruments' products are subjected to service or modification by anyone other than San Diego Instruments or an Authorized Representative.

San Diego Instruments' liability under any Warranty is limited to the original purchase price of the system.

Repair or replacement as provided under this warranty is the exclusive remedy of the customer. SDI will not be liable for any incidental or consequential damages for the breach of any express or implied warranty on SDI products. Except to the extent prohibited by applicable law, any implied warranty of merchantability or fitness for a particular purpose on this product is limited to the duration of this warranty.

NOTE: Please inspect all shipments for damage upon arrival. If shipping damage are observed, contact SDI as soon as possible and RETAIN THE SHIPPING CARTONS for inspection by the carrier. Check goods received against the "Expanded Packing List" included with the shipment.

Claims for missing components will not be honored beyond 30 days after institution has received shipment at loading dock.

Appendix B: Troubleshooting & FAQ's

Where does my data get stored?
Your data will be stored in a data directory named C:\Users\Public\SanDiego Instruments\Data

Where can I find my release code?
Your release code will be on the inside cover of your quick start manual and on the bottom of your control box.

Where do I find my serial number?
The serial number for San Diego Instruments is a black and gold sticker. You will find them on the back panel of the control box, the back top right corner of the SR-Lab and on each animal enclosure. If you have a standardization unit the black and gold label will be around the barrel of the unit.

Why am I not getting any readings from my SR-LAB?
The Coaxial cables may be reversed at the IN/OUT connection. Change them on the control box. Verify that the units have power (check that light and fan goes on). Check all connections per the manual.

When does the SR-LAB test stop?
Once the time duration has completed the script will stop and data will be displayed. Script can also be stop by selecting the Stop button.

Why doesn't my trial work as expected? Why does a stimulus unit stay on after completion of a trial?
Any commands that terminate after the "Record Window" are ignored. Extend the "Record Window" or move the "Record Window" in the Trial.
Example Trial Definition (assume a 200 msec recording window):
DO NOT USE THIS TRIAL
0 msec Background
0 msec Wait 50
50 msec Analog 600
50 msec Record
50 msec Wait 300
350 msec Background
end of Trial
In the example provided above, the Analog signal will stay on because the Background command at 350 msec won't be processed due to the fact that the Record Window went from 50 m to 250 msec. To correct this problem, in the Trial Definition, you would change the Wait 300 Command to Wait 200.

For More Information
Please refer to our website at www.sandiegoinstruments.com, send us an e-mail to support@sandiegoinstruments.com or give us a call at 858-530-2600.

Appendix C: Using Pure Tone Features

Set up

The Pure Tone system utilizes an external function generator and audio amplifier to deliver tones. The speaker used for the Pure Tone is an external isodynamic tweeter which is mounted in the top of the SR Lab cabinet. The tone is generated by applying an analog voltage level to the function generator which outputs the corresponding sine wave frequency to the audio amplifier for output.

- Connect a BNC cable to the Pure Tone Connection on the rear of the SR_LAB control box in Figure 1.
- Connect the other end of the BNC cable to the VCG INPUT (left) of the BK PRECISION function generator shown in Figure 2.

Figure 1

Figure 2

- Connect a separate BNC cable from the BK PRECISION function generator OUTPUT to the RCA splitter cable. Connect the RCA splitter cable to the CD ports, located bottom left of the amplifier back panel. Use supplied BNC to RCA splitter. See Figure 3 and Figure 4

If you have more then four (4) speakers a second amplifier will be sent with your order. You will need to attach an included T adaptor to the OUTPUT channel on the function generator and connect two BNC cables to each RCA splitter cable on the respected amplifier.

Figure 3

Figure 4

- Most amplifiers have an “A” “B” and “A + B” mode. Make sure dial on front is set to A+B. This allows a total of four (4) speakers to be run off one amplifier.

- Connect the speakers to the four available connections. Note polarity when connecting speakers so that text on wire is always connected to positive. Turn screw adjust open, thread exposed wire into opening and screw down to tighten. Continue until all speakers are connected. Reference Figure 6

Figure 5

Figure 5

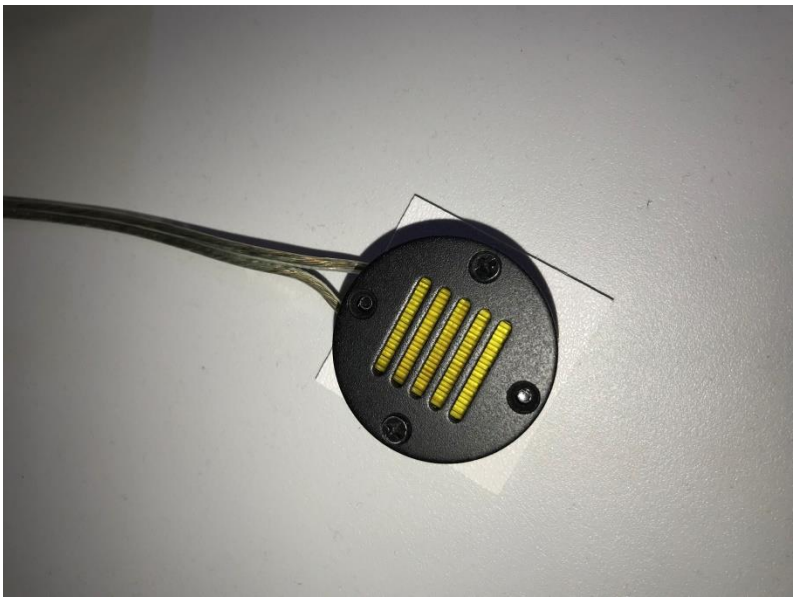


Figure 6

- Mount the included speaker to the desired location inside the cabinet using the adhesive backing of the speaker.

Overview:

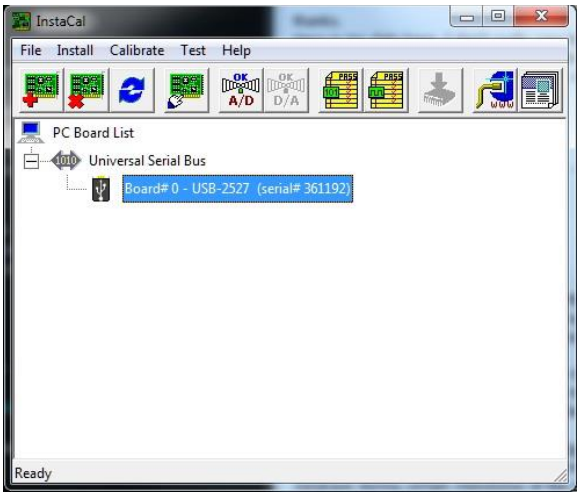
SR-LAB can be used in conjunction with a function generator to produce a specific sine wave frequency tone which be used when assessing frequency discrimination in mice and/or rats.

Setting Control Box and Driver Software:

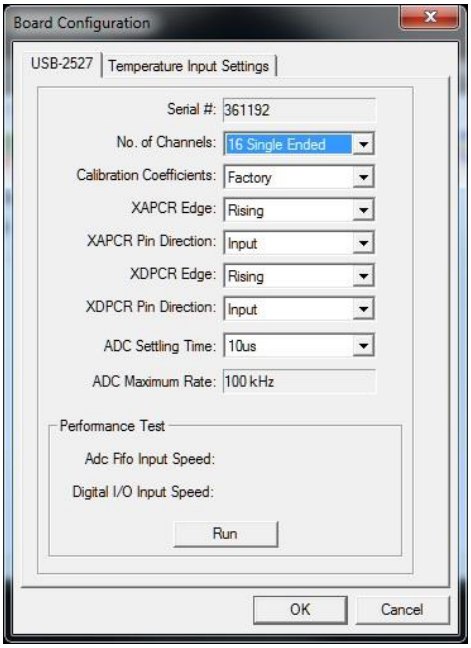
The SR-LAB control box consists of 16 Analog input channels on the front panel, 1 Analog output to produce white noise sound, 1 Analog output to produce a shock level, 1 Analog output to produce the Pure Tone frequency level as well as 4 digital (ttl) outputs on the rear panel. These are dedicated outputs so when using the control box for Pure Tone use the appropriately labeled output on the control box.

Before connecting the USB from the control box to the computer install the MCC DAQ Software. Once the MCC drivers have been installed plug in the SRLAB MCC controller (USB).

1) Run from the start button Start➔All Programs➔Measurement Computing➔ let the system recognize the board. It will go through some questions that you answer yes to so it can recognize the board.

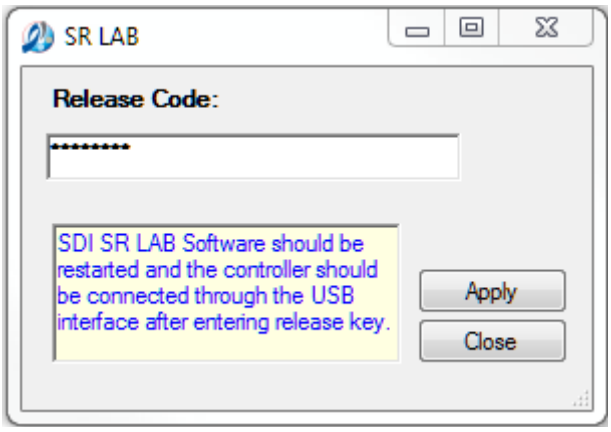


2) Once the board is recognized Board#0 - USB-2527 (serial#.....). Double click on it to bring up the Board Configuration dialog:
    a. Change No. of Channels: to 16 Single Ended (This will allow 16 input channels to be used)
    b. Change Settling Time: 10us (this will prevent ADC input channel crosstalk)



Configure software for Pure Tone testing:

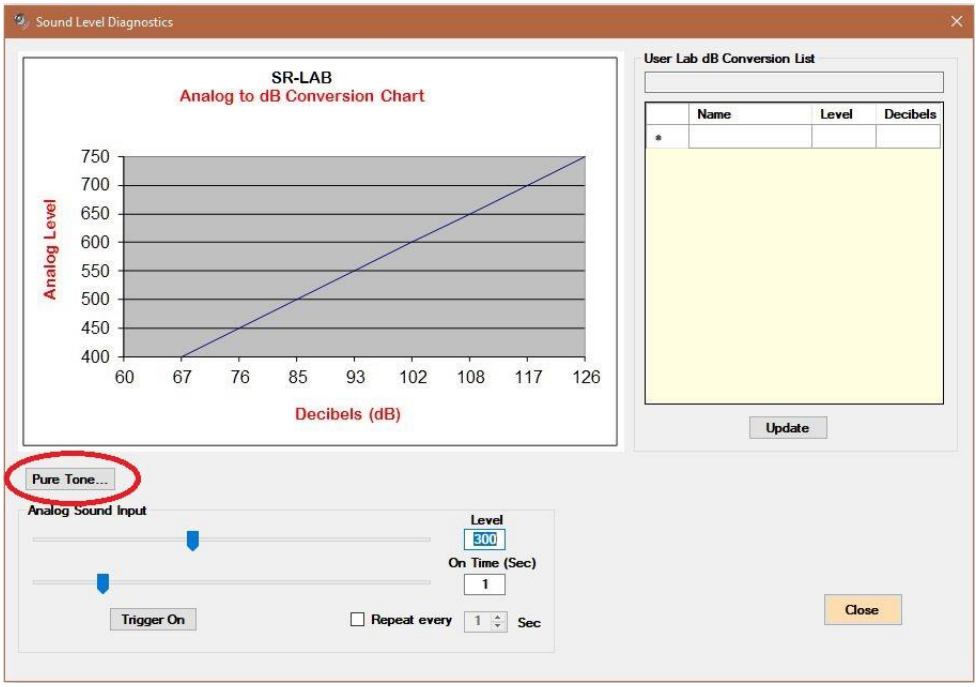
San Diego Instruments will provide a release code number to unlock the pure tone feature. To enable Pure Tone run the SR-LAB software and from the menu select Run➔Release Key… This will open a dialog to enter the code number provided.



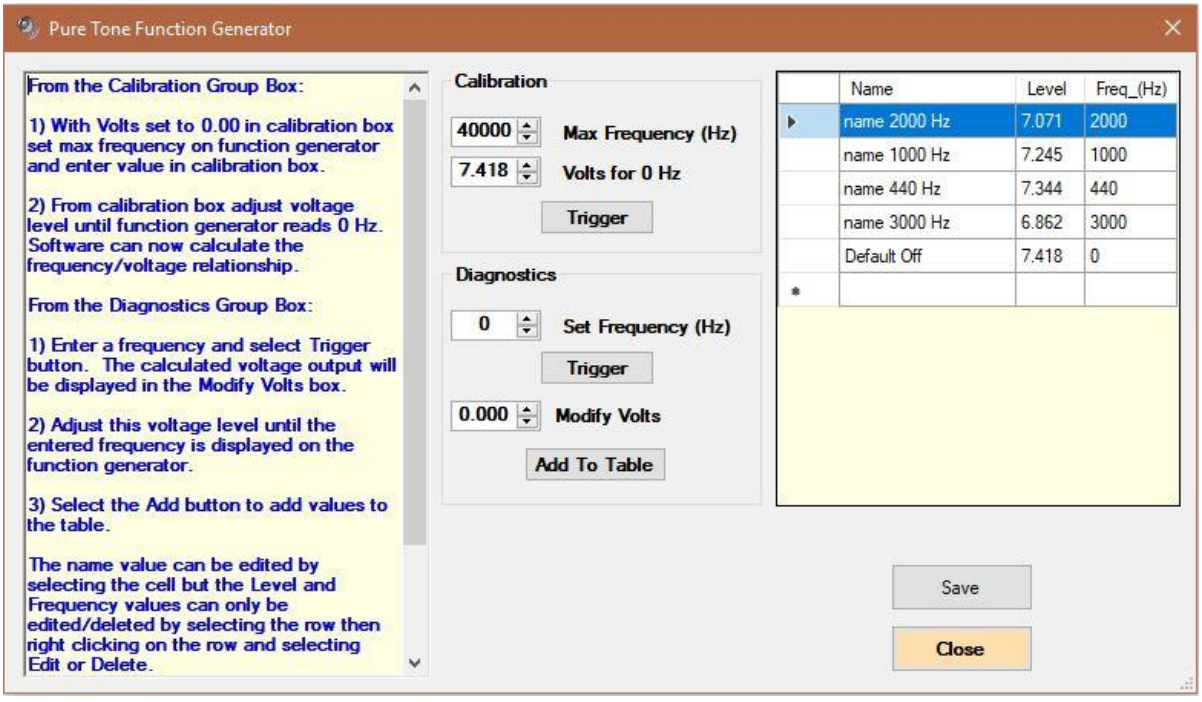
This key should be kept in a safe place in case software is reinstalled or updated. Once the release code has been entered the SR-LAB software should be restarted.

SR_LAB Pure Tone Diagnostics:

The SDI SR-LAB software can be used with Pure Tone to diagnose and setup the Pure Tone feature. From the main menu select Run➔Diagnostics… This will bring up the Sound Level Diagnostics screen which will have a Pure Tone… button located above the Analog Sound Input group box.



Select the Pure Tone… button to bring up the Pure Tone Calibration/Diagnostics window.



In this window there are instructions for calibrating and setting up pure tone frequencies. The best default is to set the function generator range set to 50k and output to sine (∿).

The purpose of the calibration group box is to enter min/max values so the software can create a linear relationship to determine an estimated voltage level for a specific output frequency.

From the Calibration group box:

1. In the "Max Frequency (Hz) box enter a value to represent a maximum frequency. With function generator set to 50K 40,000 is a good entry. In the "Volts for 0 Hz" box enter 0 and use the adjustment knobs on the function generator to set the output to 40K.

2. Once these values have been synced enter an estimated voltage (0 – 10V) and select Trigger. Adjust the "Volts for 0 Hz" until the readout on the function generator is 0.00.

From The Diagnostics group box:

1. Enter a desired frequency and hit the Trigger button. The algorithm will determine a voltage based on the calibration values. This will show the frequency readout on the function generator.

2. From there adjust the up/down voltage readout to get to the desired frequency. Once desired frequency has been reached select the "Add To Table" button to record the Level/Frequency correlation.

From the Table:
When added to the table the Name cell is filled with a default name. This name can be edited by double clicking the mouse on the Name cell.

The frequency can be output by double clicking on the table row. This will enter the values in the Diagnostics group box and trigger the output.

Highlighting the row and right clicking the mouse will bring up a context menu to edit or delete the row.

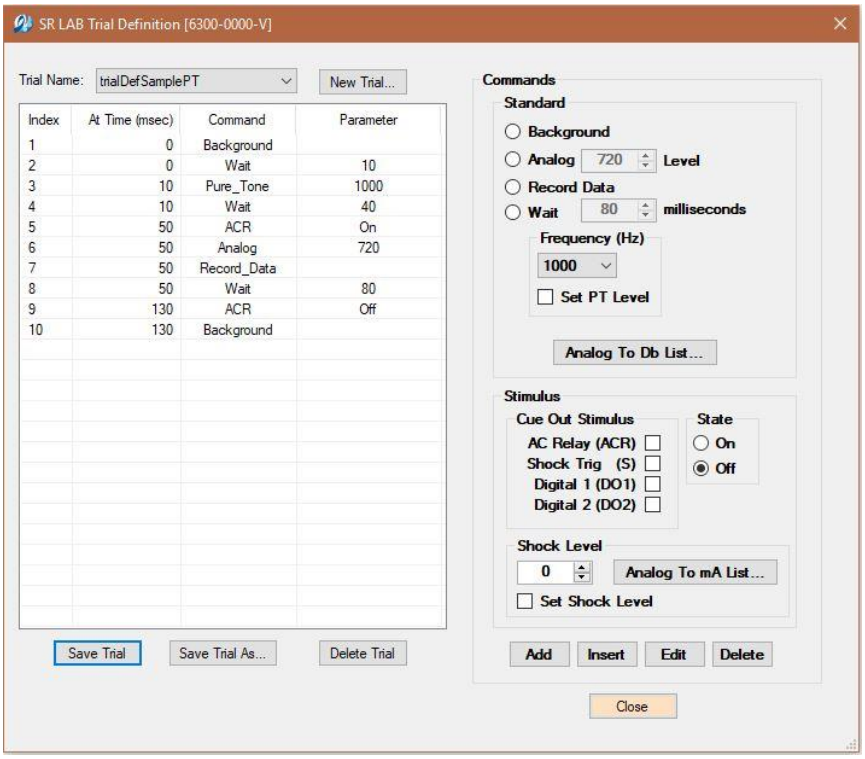
Selecting the Save button will save current table data for use in the Trial/Session definition windows. Only frequencies in this table will be available in the definition windows. The voltage level determined from step 2 from the Calibration group box will set the frequency to 0 Hz, essentially turning off the pure tone. This line is required in the table so it will be automatically generated and saved when the save button is selected.

NOTE:

When using the voltage output from the SR_LAB Controller to the BK Function Generator there is a slight variability of the PT tone output therefore SDI recommends a best practice of running the PT Diagnostics/Calibration before running a test session.

SR_LAB Pure Tone Trial Definition:

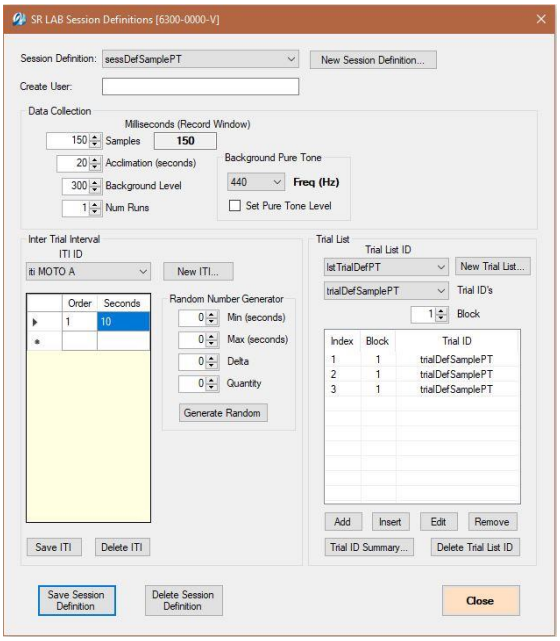
The frequencies defined in the Pure Tone diagnostics window are available to use in the Trial Definition window and is located in the Standard Commands group box. Use the dropdown box to select the frequency to use and check the Set PT Level box. Select the Add, Insert, Edit button to enter the frequency in the trial sequence definition.

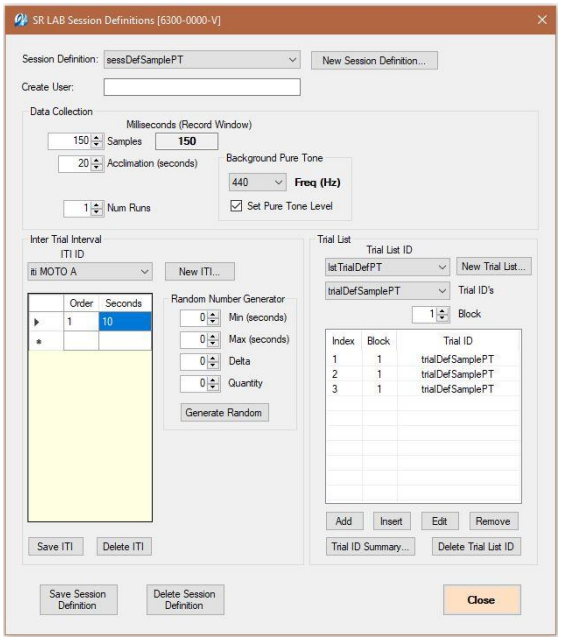


In this particular example the Background is defined in the Session Definition window and can be either a white noise or pure tone level. Also, since the Analog (white noise) and frequency are separate outputs it is not necessary to explicitly turn off one while turning on the other. The runtime algorithm determines that these two entries are mutually exclusive so when one channel is “on” the other channel will be “off”. If the trial designer determines that there should be moments of silence during the trial then the Analog 0 and Frequency 0 can be used to turn off the outputs.

SR_LAB Pure Tone Session Definition:

The frequencies defined in the Pure Tone diagnostics window are available to use in the Session Definition Window. Either a white noise level or a pure tone frequency can be selected but, again, this selection is mutually exclusive.

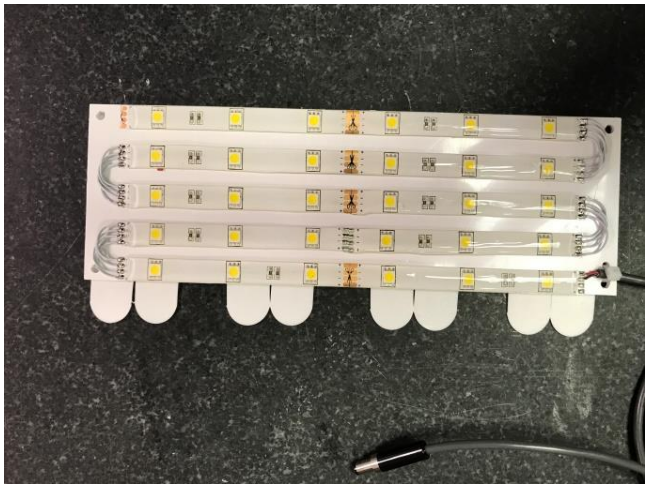




To select a pure tone background, select a frequency from the dropdown box and check the Set Pure Tone level. This will hide the white noise background and set its value to 0 volts.

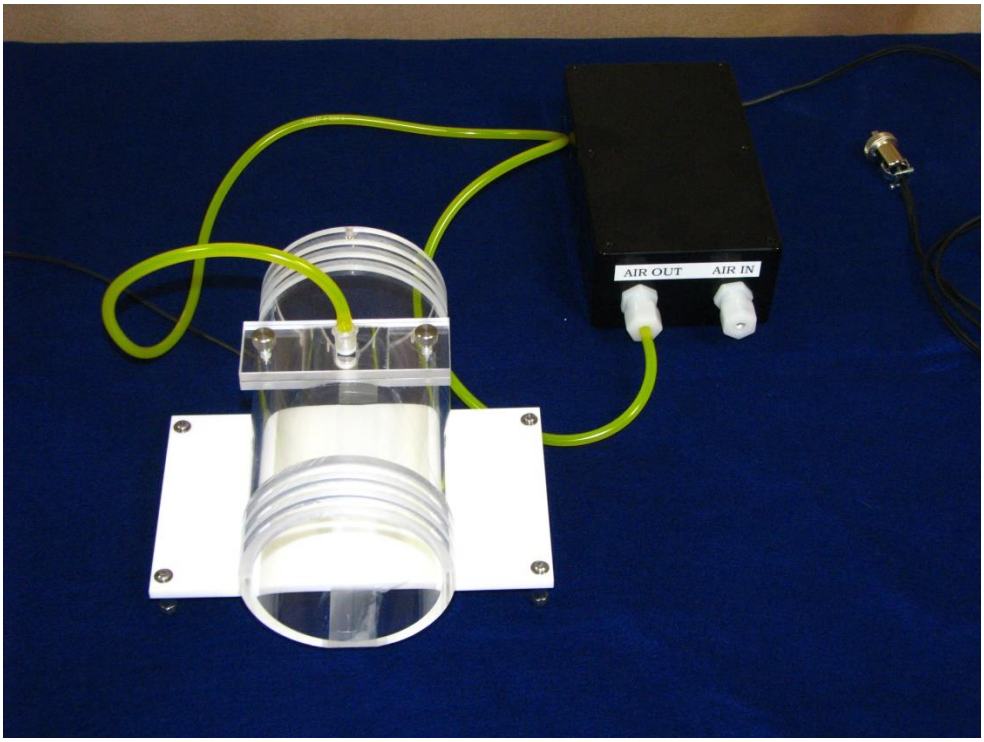
Appendix D: Anxiety Potentiated Startle

Anxiety Potentiated Startle tests the animal in an anxious state and a relaxed state and compares the results. The anxious state is induced via the High Intensity Light Bar, which is affixed to the side wall of the chamber via 3M strips. You can select either a red or white light bar for your assay. The wire is passed through the rubber stopper at the rear and connected to the Cue Out connector on the back of the chamber. The Cue command controls the on/off state of the High Intensity Light Bar.



Note: On the white light the tabs of 3M Command® strips which are pulled down to remove the light bar.

Appendix E: Tactile Stimulus Kit



The Tactile kit allows for a more humane stimulus then the fear potentiated startle kit.

1. First connect the plug attached to the black solenoid box to the Cue Out connector to the back of each Startle test station.
2. Second, attach the yellow tubing to the animal enclosure with the included thumb screws
3. Third, thread the yellow tubing out the back stopper of the Startle test station.
4. Connect the yellow tubing to the AIR OUT side of the manifold. Turn the white nut to tighten the grip on the yellow tubing. Be sure to not over tighten as it can pinch the yellow tubing cutting off the air.
5. Do the same with the additional yellow tubing to the AIR IN and connect the other end to your air source.
6. The CUE command controls the on/off of the air puff for each trial.

Your air source can be any compressed air tank or centralized laboratory air (non-flammable). Best option is to obtain a tank of nitrogen as it is both dry and non-flammable. When selecting your air source please consider the volume of air you will need, specifically, the desired psi, duration of air-puff, number of presentations, etc.

****the maximum operating air pressure input of the Tactile Unit is 60psi. The air source must be REGULATED****

Appendix F: FDA Part 11 Compliance

This appendix applies to users that are submitting their research to any regulatory agencies. If the user has not purchased the SR-LAB FDA Part 11 Compliance software package this appendix is not applicable.

Unique User ID

The program administrator assigns each user a unique User ID. The User ID can be any combination of letters and numbers and is case sensitive. It is the responsibility of the administration to determine the appropriateness of a User ID. No limits are set by the program for length of User ID or number of users on the user list.

Secret Password

The program administrator assigns a password when a new User ID is added to the user list. There are no limits set by the program for the password assigned by the administrator. The user should change the password the first time they log on to the program. The password is case sensitive. After the user has changed the password, it is their secret. Not even the administrator can learn the secret password.

Multiple Levels of Access

The levels available are Administrator, Supervisor, Auditor and User.

Administrator

- ✓ Assigns initial User ID
- ✓ Inputs SR-Lab Release Code
- ✓ Assigns or changes privilege level
- ✓ View/Creates activity reports
- ✓ Creates user list

Supervisor

- ✓ Reviews and export data
- ✓ Create/Edit a study DB file
- ✓ View/Creates activity reports
- ✓ Defines a Trials, Sessions
- ✓ Creates Subjects, Sessions
- ✓ Run Options, Diagnostics

Auditor

- ✓ Reviews data edits
- ✓ Reviews summary reports
- ✓ View/Creates activity reports

User

- ✓ Run a session
- ✓ Run Diagnostics

Automatic Password Expiration
Passwords expire automatically in 30, 60, 90, 365 days. The Administrator password does not expire. If a password expires, the administrator must assign a new User ID to reactivate the user. A selection can be made so the password will not expire.

Failed Log on Attempts
The user may make three attempts to enter a valid ID password combination. If the password ID combination attempt fails the predetermined number of times, the program becomes unusable (until a valid login is entered).

Encrypted User List
The user list is authenticated, encrypted and stored as an encrypted file. The file cannot be edited using normal methods. An ASCII text file of the user list can be generated by the Administrator on demand. The administrator may also view a list of users on the monitor screen. The password information is omitted from both of these lists.

Encrypted Activity Log
All significant actions are logged to an encrypted activity log file. The activity log contains:

- ✓ Time, date User timestamp
- ✓ Activity (Login, Logout, add user, change password, modify data)
- ✓ User name associated with activity
- ✓ User authority level (administrator, supervisor, auditor, user)
- ✓ Current database connection

The purpose of the special features incorporated in this version of the SR-LAB Software is to limit and control access to the SR-LAB data and definition files.

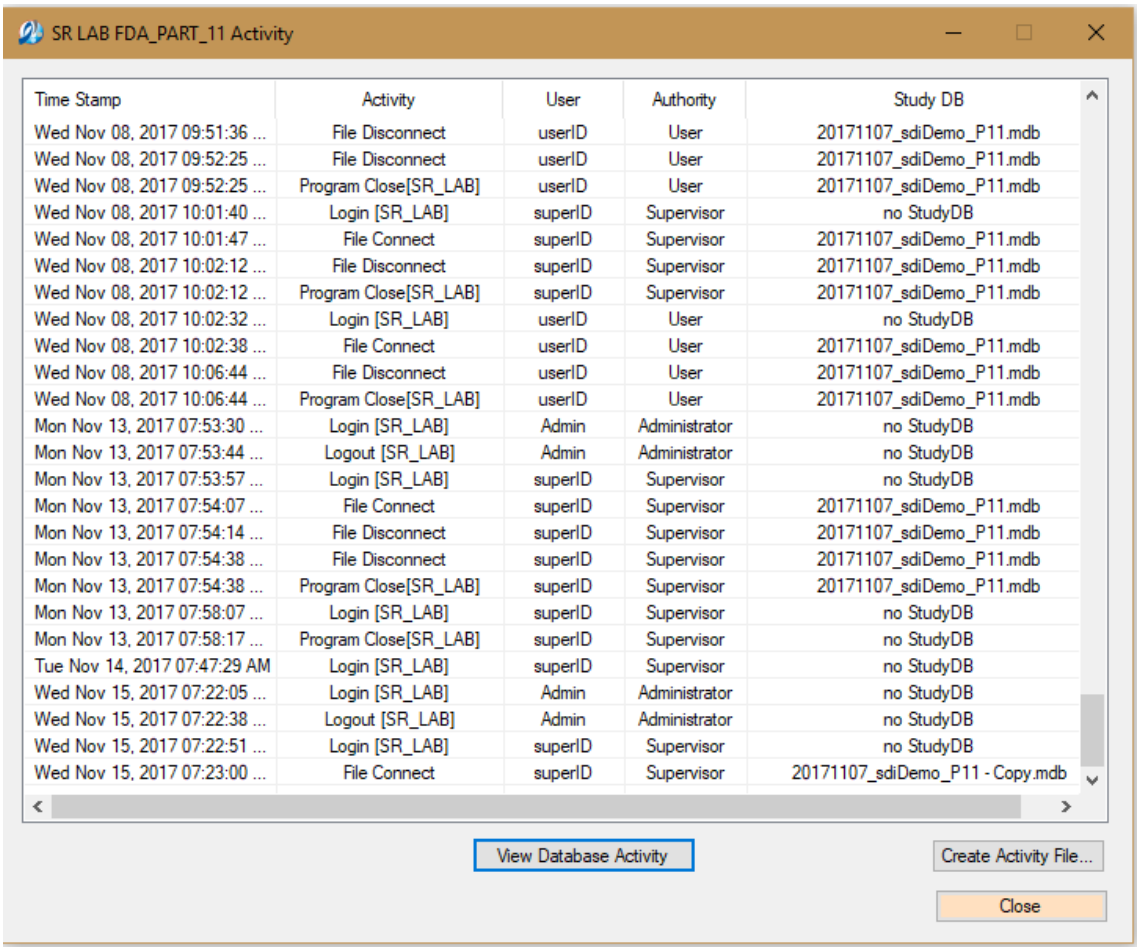
A valid User ID and password are required to begin the program. After starting the program, the user should go to the main menu and select Run➔Login… then enter an ID and password. The program verifies the existence of an authority file. If the user fails to log in, the program displays an error message and does not continue.

If the log attempt is successful the program compares the ID and password to the User List. If there is a match, the program then checks that the password has not expired. An expired password terminates the program. An error message is displayed to contact the administrator. If the date is valid, the program begins with authorities allowed the particular user. The user may make three attempts to enter a valid ID password combination. The program denies access if the password ID combination is attempted and fails three times.

Files
Activity Log

- Login/Logoff Success / Failure
- Adding/Removing a USER ID
- Expiring a USER ID
- Changing a password
- Creating a study Database file
- File Connect/Disconnect
- Modifying a study Database file

The activity log file is encrypted and is not viewable or editable using normal methods. The administrator may make a tab delimited text copy of the file as needed. Activity is also logged to an open database during the time that database is open. Both the encrypted and database activity log can be viewed in the SR_LAB Activity window, if the database is open. There is a button available that will toggle between the two views. This database activity log can also be viewed directly in the database however, it cannot be modified.



User List (authority file)

- USER ID (assigned by the administrator)
- User password (chosen by the user)
- User authority level
- Active days remaining for USER

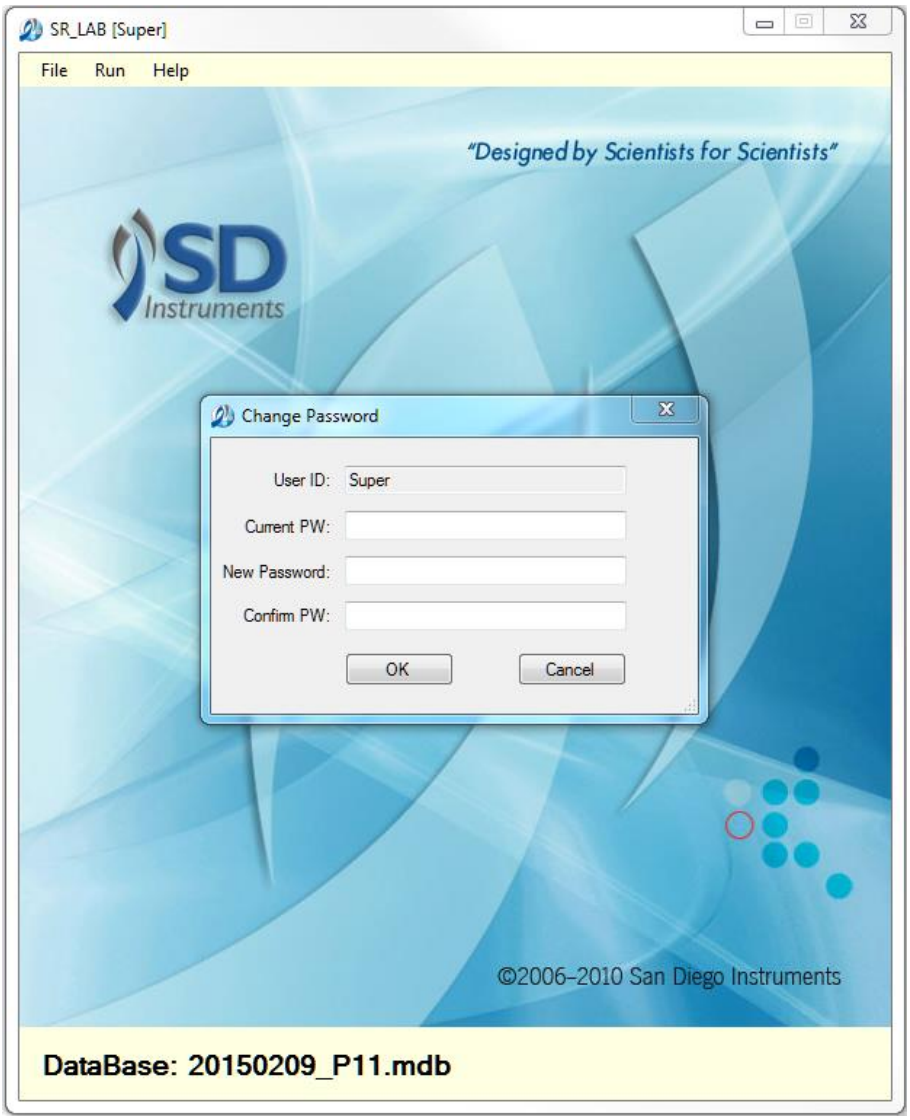
The user list file is encrypted and is not viewable or editable using normal methods. The administrator may make a copy of the user list that does not contain passwords.

Using the FDA Part 11 Software

After a successful software installation the default login UserID is “Admin” and password is “admin”. The administrator, once logged in, should go to the Run➔Administrator screen and add a new administrator with a unique UserID and password for the administrator level. The USER ID Admin should not be deactivated (Removed) until the administrator has logged on with the new ID and password. To change the password, the user must “Change Password…” from the Run menu. This will bring a “Change Password” dialog where the new password will be entered. The procedures for assigning USER ID and PASSWORD are explained in the next section.

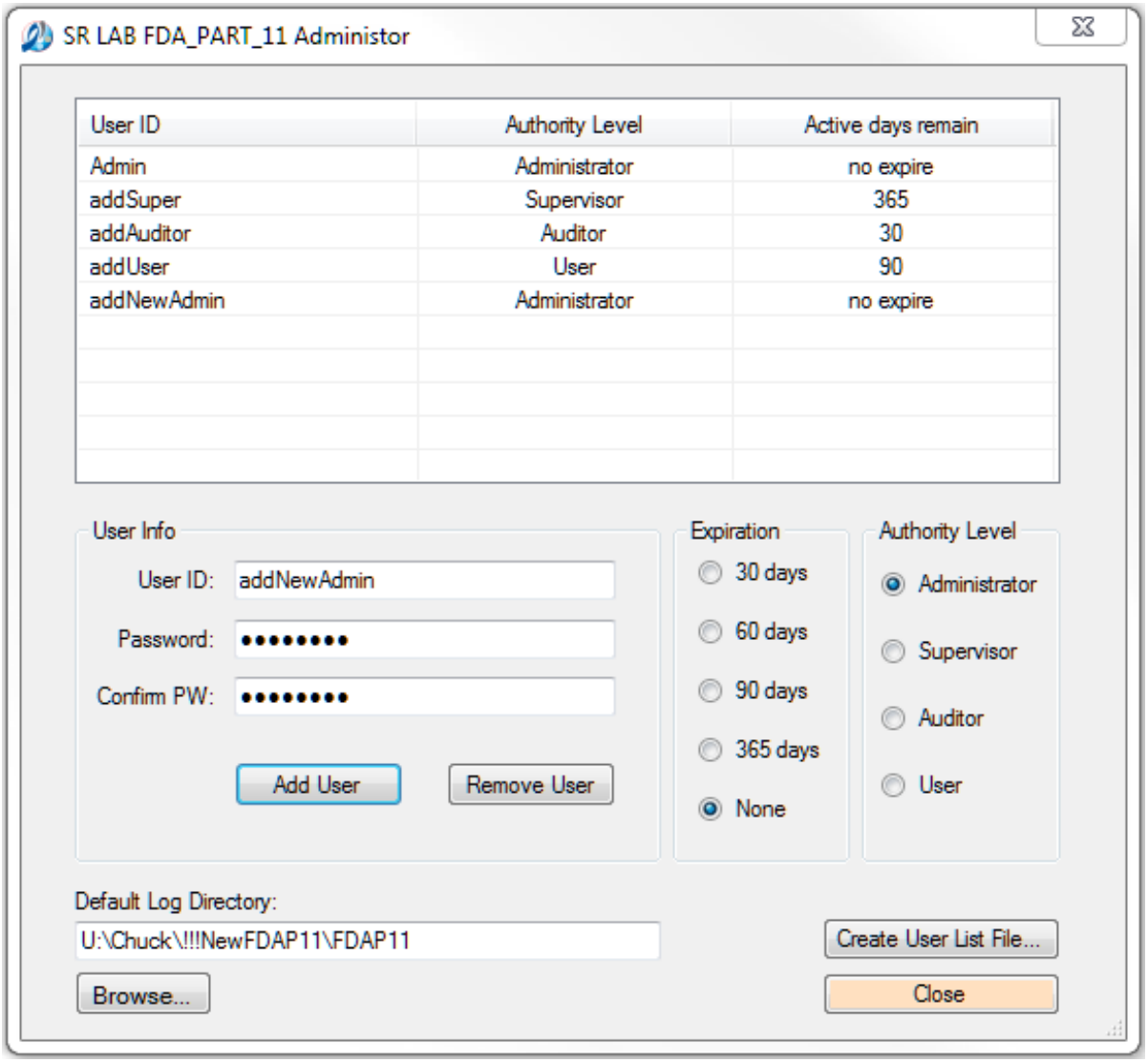
Change Password Utility

Once a password has been assigned to a new user this new user should log in with that password and change it to a unique password that only the new user will know. A record of this password should be kept in a safe place since this password, if lost or forgotten, is not retrievable, even by the administrator.



Administrator Utility

The administrator can add and removed users from the Run➔Administrator screen. The administrator also assigns authority level and life span of the user. A list of the current users is also available in this screen. This list includes the User ID, authority level and remaining until user/password expires. The User ID must be unique in respect to the current user list. The Default Log Directory is identified in this window. This is the directory location of all files relating to FDA_P11 such as Authority.enc Activity.enc and all report files.



Data Editing

Only a user with the authority level of Supervisor may edit the original subject data. The Supervisor selects from the current list of subjects in the current session and, after selecting the Edit… button a dialog will appear with fields that can be edited. If multiple selections of the list are made, the subject ID must be the same for all lines selected. Once the subject data has been edited the current list will show the new current subject data and the edit data history list will record the changes with a timestamp and the activity will be updated (with timestamp) identifying a "Subject Edit" activity.

The subject edit data history can be exported to a tab separated file which can be viewed in Excel.

Reports

All report files are tab separated text files that can be view and printed with Excel or any notepad type program. Report files are stored in the directory identified in the Administrator… screen.
Files created are:

Authority_UserList.txt	
Activity_List.txt	
Xxx_SSS_EditSubject.txt	NOTE: xxx indicates the name of the study database and SSS is the session ID.

Creating SR-LAB Working Directories on Shared Network

With the standard installation of SR-LAB software there are three default data directories created:

Data Directory: Directory where study databases are located.
Located at C:\Users\Public\San Diego Instruments\SR_LAB\Data

Definition Directory: Dir where the definition database (SRDB_Definition.mdb) is located.
Located at: C:\ProgramData\San Diego Instruments\SRLAB\Definition

FDAP11 Directory: Dir where the FDAP11 files are located.
Located at: C:\ProgramData\San Diego Instruments\SRLAB\FDAP11

The SR-LAB software can be installed on multiple computers to aid with research where one computer can define the trials and sessions (at office) and a second computer can run the actual sessions in the lab. The two computers must be connected to a LAN and commonly shared directories should be used as the default SR-LAB directories.
Steps to creating SR-LAB default working directories on a shared network directory:

1) Install SR-LAB software on two or more computers.

2) Run SR-LAB from computer 1.

3) From Main menu: Run➔Login to Log in to the software using default Admin/admin ID/password.

4) From Main menu: Run➔Administrator… The Default Log Directory is "C:\ProgramData\San Diego Instruments\SRLAB\FDAP11". Select the Browse… to navigate to the new shared directory location. NOTE: If a new folder is made the folder should be renamed and hit the Enter key before selecting the OK button.

5) To Define the Default Data Directory:
    a. NOTE: user will have to be logged in with Supervisor authority.
    b. From Menu run: File➔Define Default Data Directory…
    c. In the dialog browse to the new default data directory. NOTE: If a new folder is made the folder should be renamed and hit the Enter key before selecting the OK button.

6) To define the Default Definition Directory:
    a. NOTE: user will have to be logged in with Supervisor authority.
    b. From Menu run: File➔Definitions…➔Define Default Definition Directory…
    c. In the dialog browse to the new default definition directory. . NOTE: If a new folder is made the folder should be renamed and hit the Enter key before selecting the OK button.
    d. If there is not a file in the new directory the current definition file will be copied to the new default definition directory. Otherwise the user will be asked if they wish to overwrite the default definition file.
    e. A backup subdirectory will also be created.
7) Run SR-LAB from computer 2 and repeat steps 3 thru 6. NOTE: The first time this procedure is run the necessary files are copied to the new directory. Running this procedure on following computers will ask the user if they wish to overwrite the current files.

NOTE: When using SR-Lab with this configuration it's important that SR-Lab is running exclusively on only one computer. SR-Lab software cannot determine if the same database file is being used by another instance of the program and this can cause database issues.

Appendix G: Extended Record Time

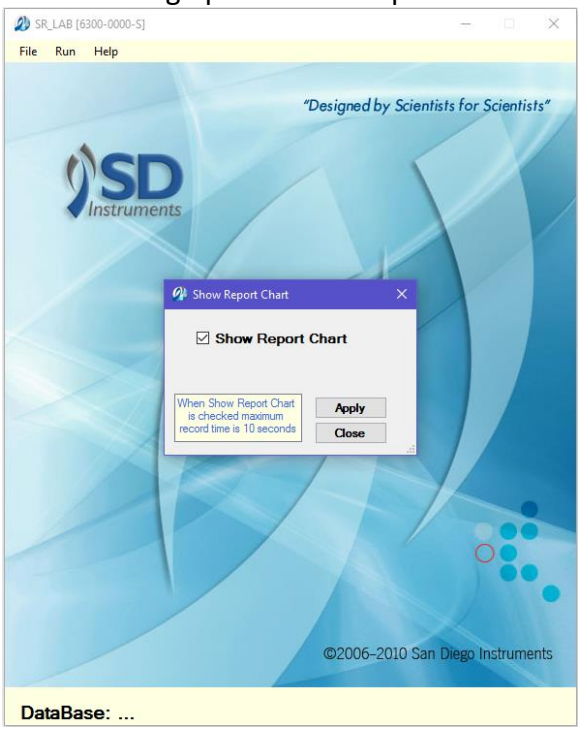
The normal Maximum Record Time for SRLAB is 10 seconds (10,000 msec). SDI provides a feature to extend the Maximum Record Time to 30 minutes (1,800,000 msec). This feature can allow for delayed reactions to stimulus to still be recorded.
There are some considerations when using this option:

1) When the Maximum Record Time is set beyond 10 seconds the response waveform will not be displayed in the Report Dialog. To visualize a response plot the data must be exported to Excel or some other statistical or data software.

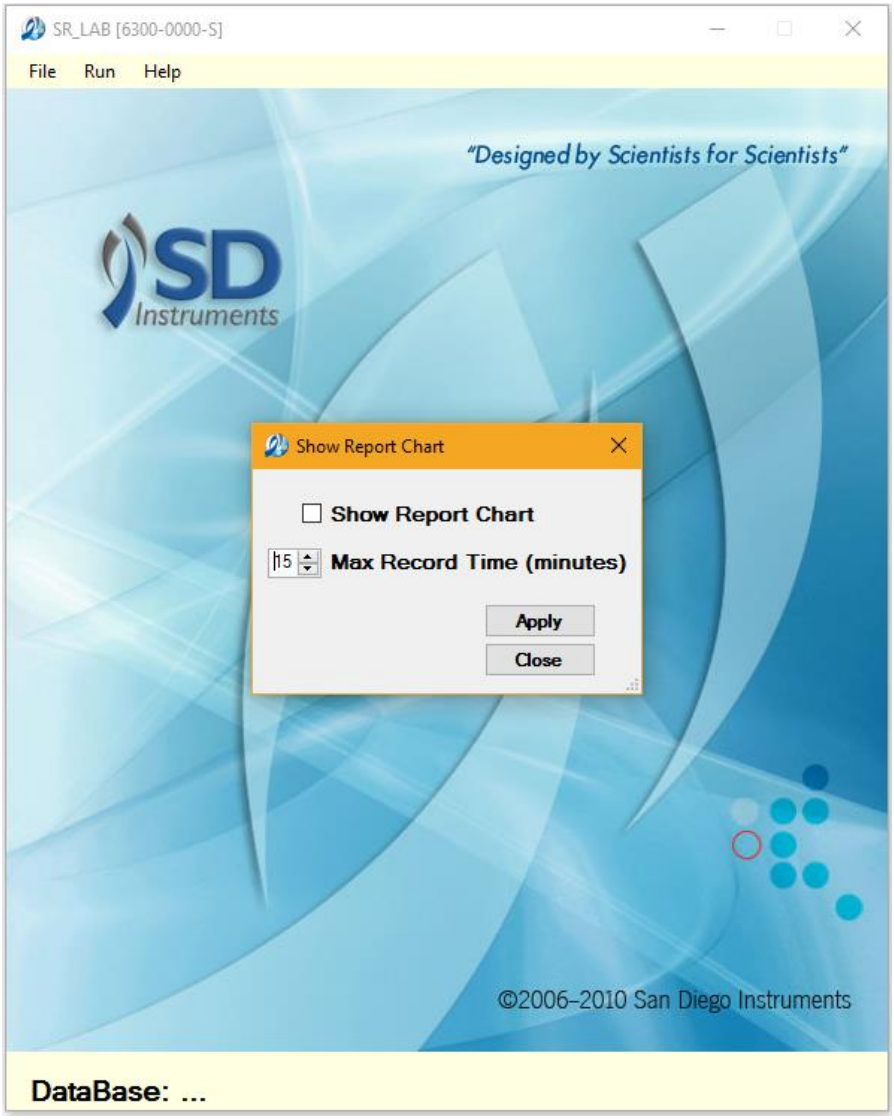
2) If Max Record Time is greater than 17 minutes the waveform data cannot be exported to Excel because of Excel's maximum row limitation. The waveform data will be exported as a tab separated (".txt") file. From that point the data can be divided into smaller excel files or exported to other statistical programs.

3) Though the extended record time is set for 30 minutes all timing parameters are in milliseconds. The sample rate for SRLAB is 1 kHz so, for example, one minute is equal to 60 seconds * 1000 ➔ 60,000 milliseconds.

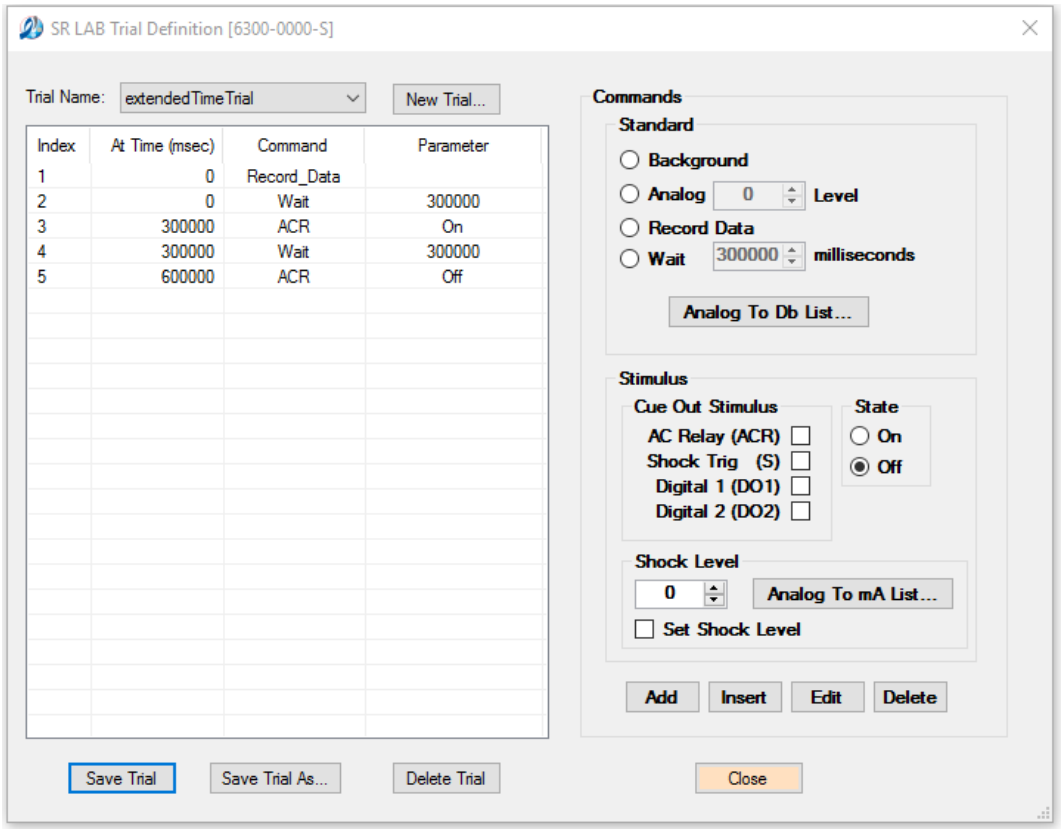
To Increase Maximum Record Time from the main dialog main menu select Run➔Options➔Extend Record Time…. Selecting the Ctrl key plus the F1 key simultaneously will also bring up the Show Report Chart dialog.



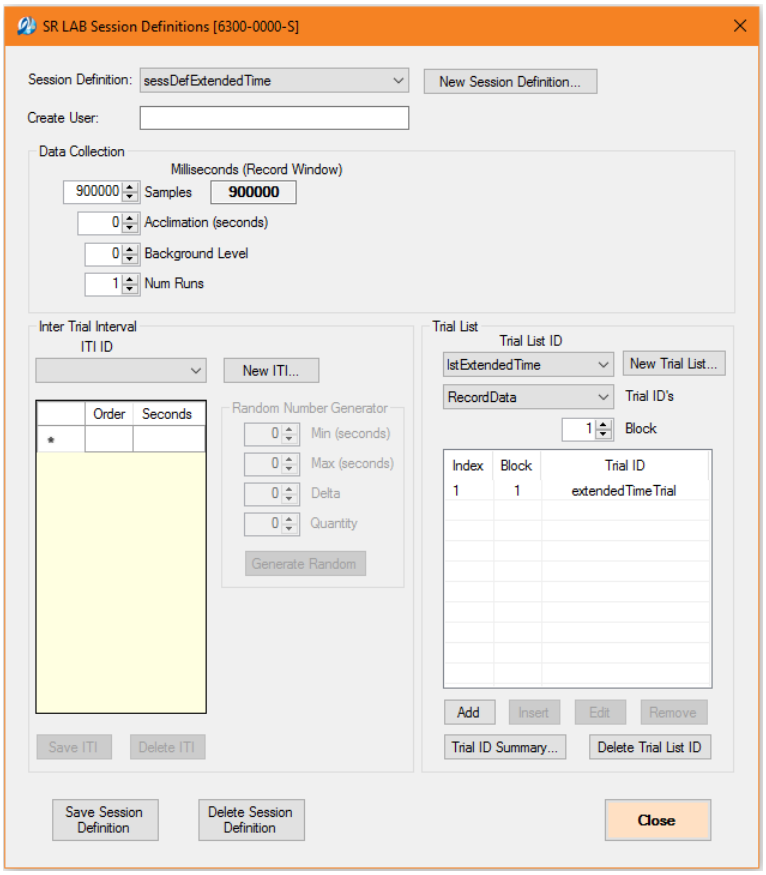
When the Show Report Chart checkbox is checked the maximum record data time is 10 seconds (10,000 msec). When this checkbox is unchecked there is an additional parameter that allows the user to extend to the time from 1 minute to 30 minutes with a one minute resolution.



This is an example of a trial definition using extended record time. This trial example starts recording data at time 0 and then the ACR is turned on at time five minutes. Then, five minutes later (time at 10 minutes) turned off. All Stimuli can be incorporated in an extended time trial definition including Background, Analog and all Cue Out Stimuli.

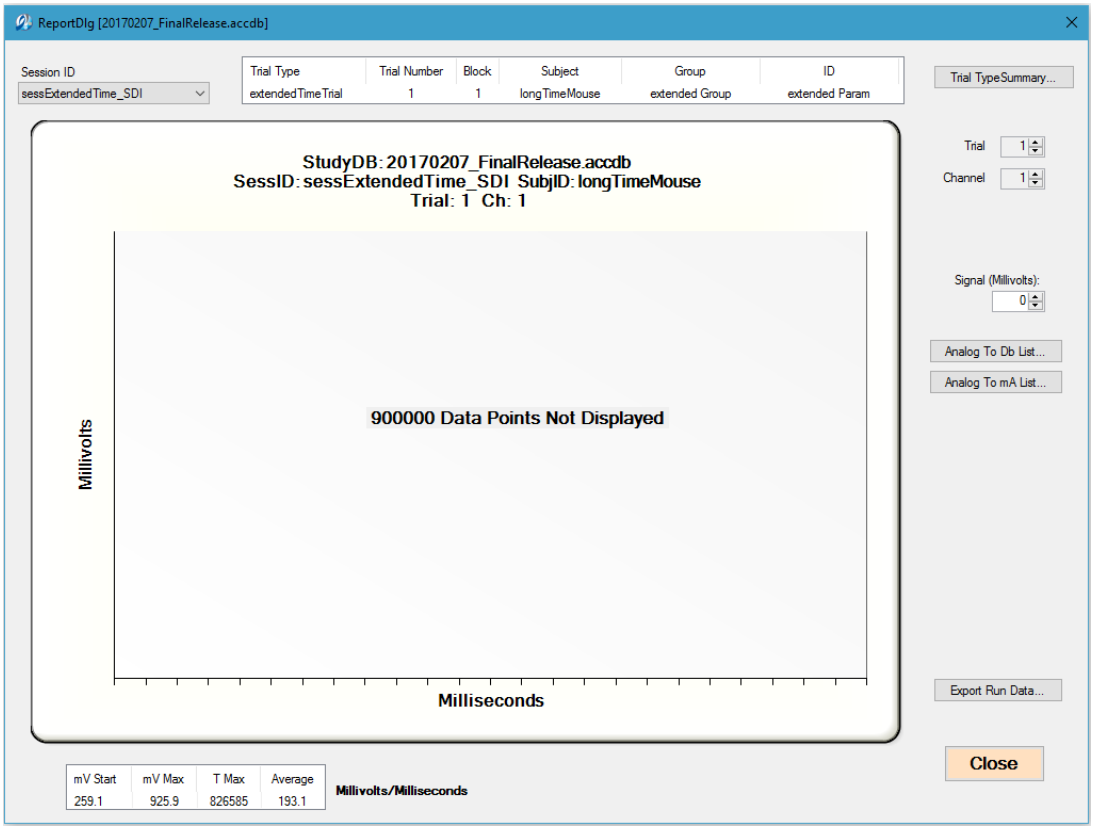


This session definition describes a record time of 15 minutes using the previously defined extendedTimeTrial Trial Definition:



When a session is created using this definition the session trial will run, recording data for a period of 15 minutes. At the five minute mark the ACR will be turned on and at ten minutes the ACR will be turned off. Recording of the response data will continue until the 15 minute (900000 msec) has been reached.

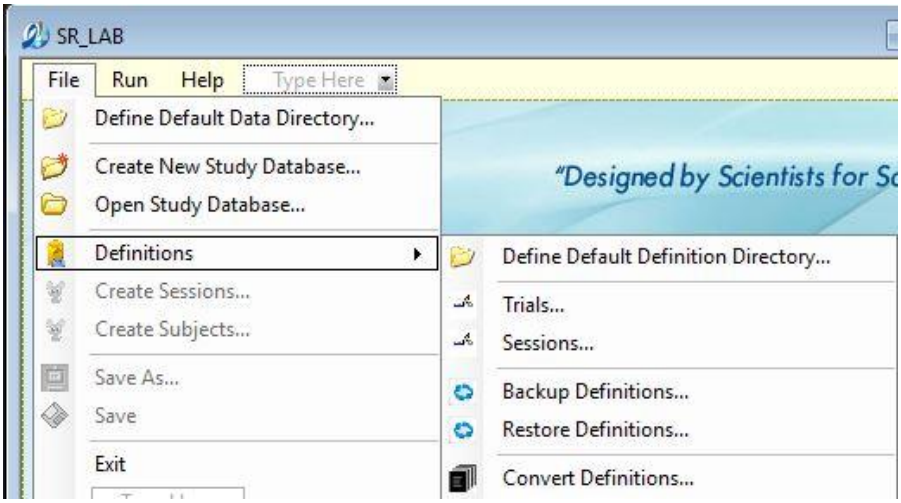
In the Report Dialog an extended time session will not display the response data. To get the response data select the Export Run Data… button.



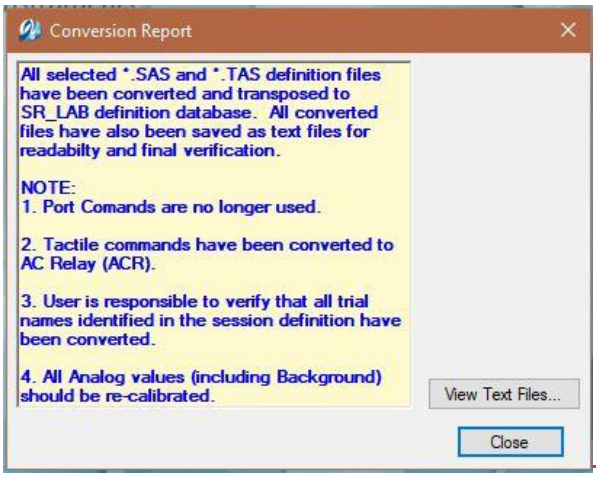
Because of a maximum time of 30 minutes and the default data sampling rate of 1 kHz the export file is fixed as a tab separated file (*.txt extension). The purpose for this is that Excel has a maximum row specification of 1,048,576 (2^{20}) rows. For an extended time of 17 minutes or less a single Excel file can be used. For any time exceeding 17 minutes it will be necessary to take the tab separated file and partially parse it to separate excel files. Check for any row or data limitations with other third party data files.

Appendix H: Convert Definitions

Before USB version of SRLAB trial and session definitions were encoded to *.TAS ans *.SAS files. Beginning with SRLAB software # 6300-0000-U these files can be converted to the newer trial and session definition formats. To do this select File➔Definitions…➔Convert Definitions… This will bring up an Open File Dialog Box. Navigate to the location of the *.TAS and *.SAS files. Multiple files can be selected to convert.

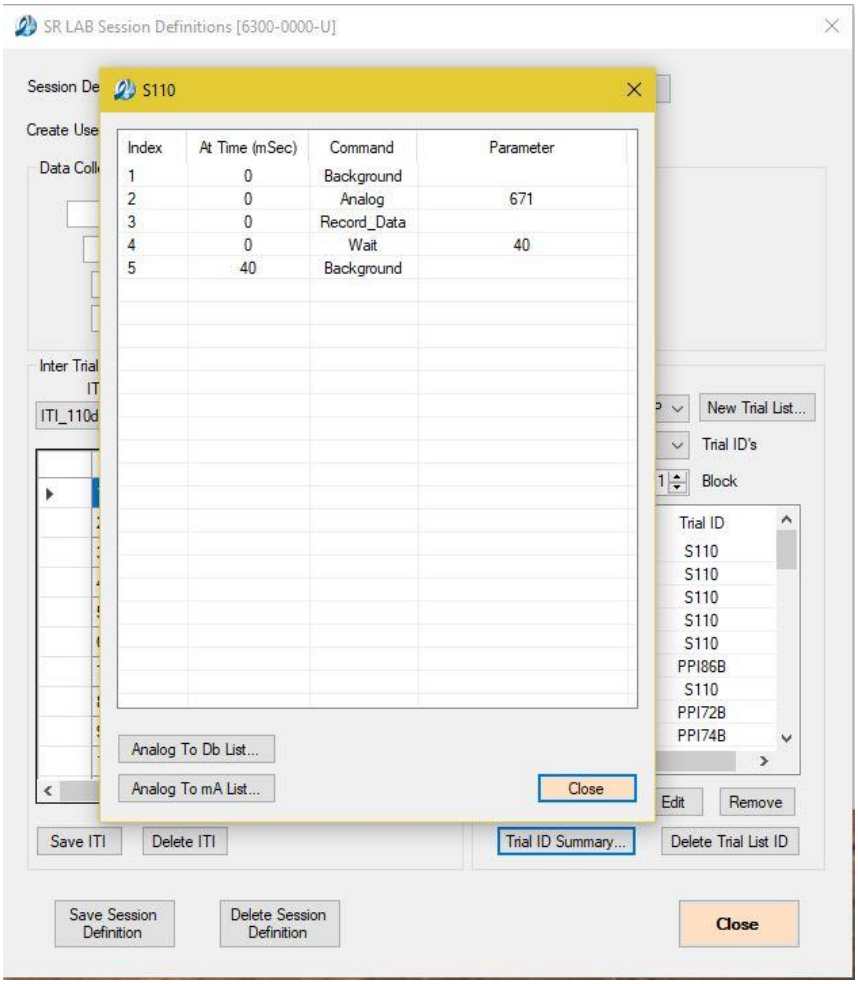


The conversion algorithm first decrypts the files to a *.txt file then parses that file to create new trial and session definitions which is then loaded into the definition database. NOTE: “PCI Port” commands are now obsolete and will not be converted as well as the “End of Trial” command which is no longer necessary. The “Tactile” command will be converted to “AC Relay” (ACR) in the converted Trial definition.



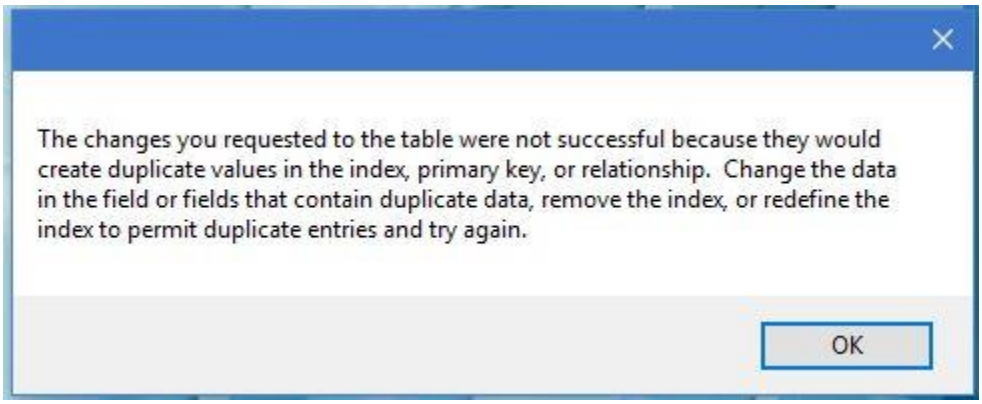
Text files can be viewed and printed by selecting the View Text Files… button.

It is the user's responsibility to validate that all trial definitions have been converted. For example in the Sessions definition window it is important that all defined trials in the Trial List have actually been converted. To do these highlight the trial in the list and select the Trial ID Summary… button. If the trial summary comes up then the trial has been converted. If not (blank screen) the trial has not been converted and should either be converted or removed from the list.



It is also the user's responsibility to verify that analog levels are producing the required Decibel level required.

If the following error occurs:



The file has already been converted and should be in the Trial or Session definitions screens.