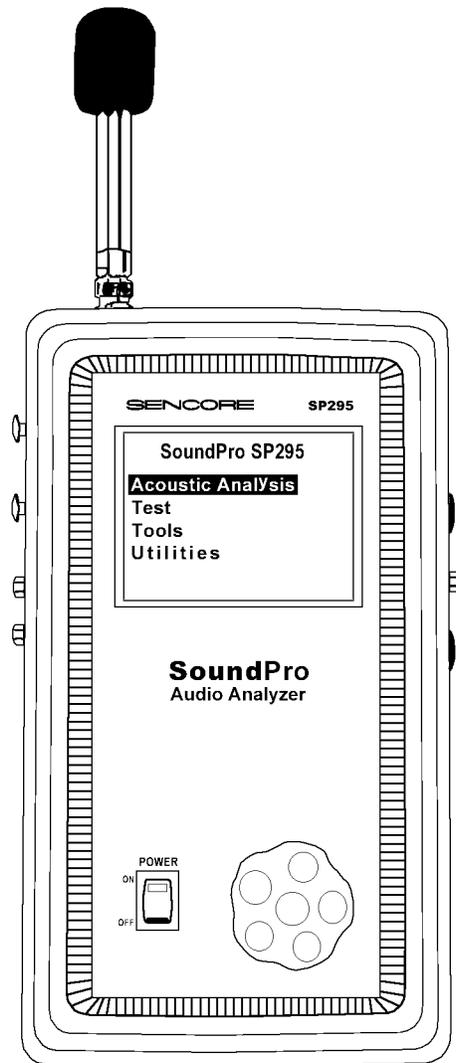


SP295

SoundPro

Audio Analyzer
Operation Manual
(Firmware version 3.05)



SENCORE
3200 Sencore Drive, Sioux Falls, SD 57107

WARNING

PLEASE OBSERVE THESE SAFETY PRECAUTIONS

There is always a danger present when using electronic test equipment. Unexpected voltages can be present at unusual locations in defective equipment and distribution systems. Become familiar with the equipment with which you are working, and observe the following safety precautions.

Every precaution has been taken in the design of the SP295 to insure that it is as safe as possible. However, safe operation depends on you, the operator.

1. **Never exceed the limits of the SP295** as given in the specifications section or other special warnings provided in this manual.
2. **Always be sure that your equipment is in good working order.** Broken or frayed test leads or cables can be extremely dangerous and may expose you to high voltages.
3. **Remove test leads** immediately following measurements to reduce the possibility of shock.
4. **Do not work alone when working under hazardous conditions.** Always have another person available in case of an accident.
5. **Never assume that a cable shield is at earth ground potential.** Both static and electrical voltages can be present on a cable's sheath. Do not connect the SP295 to a cable having a hot shield. Doing so may place lethal voltages on the SP295.
6. **Always follow standard safety procedures.**

When in doubt, be careful.

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SENCORE

3200 Sencore Drive, Sioux Falls, SD 57107

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DESCRIPTION

Introduction

The Sencore SP295 SoundPro is a professional quality audio analyzer that is custom-designed for professional home theater and commercial audio installers. Utilizing the latest DSP technology with powerful FFT analysis, combined with pro-quality analog audio inputs and outputs, the SP295 SoundPro combines the functions of dozens of audio test instruments in one easy-to-use product. It is the only portable audio analyzer that provides all the features needed

to optimize speaker placement, calibrate system settings, adjust speaker phasing, equalize room acoustics, and verify system wiring and component setup. In addition to its audio analyzer tests, the SoundPro features a graphical back-lit LCD display, AC or battery power, built-in microphone, and balanced and unbalanced inputs and outputs, making it a must-have item for every home theater or pro-audio installer's tool kit.

Features

- Acoustic analysis tools help you set up and calibrate both home theater and commercial sound reinforcement systems.
- Balanced and unbalanced inputs and outputs.
- Internal signal generator provides adjustable level pink & white noise.
- 64x128 pixel super-twist backlit graphic LCD is viewable in all lighting conditions from darkness (with the backlight on) to full sunlight. The backlight can be turned off when the unit is under battery power, or turned on as needed.
- Test functions let you measure audio signals and calibrate equipment. The SoundPro's functions are grouped under four menu categories:
 1. **Acoustic Analysis:**
 - Sound Level Meter (A, B, C or flat weighting and Slow or Fast averaging)
 - Real-Time Analyzer (1, 1/3, 1/6 and 1/12 octave)
 - Energy-Time Graph (calibrated in time and distance)
 - Reverb Decay Time (reverb decay and RT60)
 - Noise Criteria (display NC rating and limiting band)
 2. **Test Functions:**
 - Speaker Distortion (speaker comparison to locate defects)
 - Speaker Polarity
 - Cable Test (tests wiring and integrity)
 3. **Tools:**
 - Signal Generator (adjustable level and frequency sine and square waves; adjustable level white noise and pink noise)
 - Level Meters (stereo level and VU/PPM)
 - Sample Scope
 4. **Utilities:**
 - Includes battery status, setup and calibration functions, computer data interface, and software version & tech support information.

Specifications

Sound Pressure Level

Method:	Measures ambient sound energy levels at microphone input.
Frequency Range:	20 Hz to 20 kHz
Accuracy:	± 0.3 dB SPL, steady state
Resolution & Resolution:	0.1 dB; 30 –130 dBA with supplied microphone.
Weighting networks:	ANSI Type 1 A-Weighted, B-Weighted, C-Weighted, Flat
Averaging:	ANSI Type 1 Slow – 1000 ms exponential decay, time-averaged SPL Fast – 125 ms exponential decay, time-averaged SPL

Real-Time Analyzer

Method:	Plots sound energy levels vs. octave band filtered spectrum.
Frequency Range:	Full; 20 Hz to 21 kHz, Low; 10 Hz to 332 Hz
Band Filters:	Full octave, 1/3 octave, 1/6 octave, 1/12 octave
Filter Accuracy:	± 0.20 dBu at band center frequency
Averaging:	1 sec, 3, sec, 6 sec, 10 sec, 30 sec, 60 sec
Display Range:	35 dB or 17 dB window within 25 dB to 170 dB range, adjustable in 5 dB steps and 2 input ranges
Level Accuracy:	± 1.0 dB with supplied microphone

Energy-Time Graph

Method:	Plots impulse sound decay energy vs. time or distance.
Graph y-axis units:	ms (milliseconds), ft (feet), m (meters)
Maximum time:	3840 msec.
Maximum distance:	4339 ft, 1330 m
Display Accuracy:	\pm one pixel.

Reverb Decay Time

Method:	Measures reverberation decay time and RT60 using pink noise.
Weighting:	A-Weighted, B-Weighted, C-Weighted, Flat
Range:	5 msec to 14.5 seconds
Ambient Noise:	Ambient noise level must be at least 26 dB lower than test signal
Accuracy:	$\pm 2\%$ full scale
Resolution:	1 msec.
RT60 Time:	Extrapolated from Decay Time measurement.

Noise Criteria

Method:	Implements ANSI S12.2-1995 for comparison of background noise level in octave bands to standard noise criterion curves.
Displays:	NC curve, Limiting Band, Octave Band levels

Speaker Distortion

Method:	Compares level of speaker output harmonics and noise to fundamental test frequency.
Display Range:	0.02% to 50% THD+N
Accuracy:	$\pm 5\%$
Test Frequencies:	63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz

Speaker Polarity

Method:	Shows polarity of closest speaker's mid-frequency waveform.
Range:	0 to 500 feet, speaker to SoundPro.

Cable Test

Method: Applies digital wiremap test to check for opens, shorts, crosses, and analog transmission test to compare transmission loss at 1 kHz and 20 kHz.

Connector Types Tested: RCA, XLR, ¼" balanced and unbalanced, XLR to ¼"

Signal Generator

Signals: Sine wave, square wave, white noise, pink noise

Distortion: <0.1%

Output Frequency Range: sine wave 1 Hz to 22 kHz, square waves 1 Hz to 1.6 kHz in 1 Hz, 1/3 octave or 1 octave steps

Output Level: sine wave, -78 dBu to +17 dBu, square wave, -78 dBu to +17 dBu
white noise, -78 dBu to +2 dBu, pink noise, -78 dBu to 0 dBu

Level Accuracy: ±0.05dBu @1000 Hz, ±0.10 dBu 16 Hz to 20 kHz.

Resolution: Fine: 0.05 dB from -9.95 to +9.95, 0.1 dB all others
Coarse: 1.5 dB

Level Meters

Display Types: Digital left and right line input levels. Analog bar graph and digital left and right line input VU levels. PPM line input levels

Inputs: Line input connectors

Accuracy: ± 0.5 dB, 20 Hz to 20 kHz, +40 dBu to -85 dBu

Sample Scope

Sample Rate: 48 kHz

Displays: mV vs. time (line in), mPa vs. time (mic in), or X-Y phase display

Display Amplitude: 15.6 – 1000 mV/div (line in), 7.8 – 500 mPa/div (mic in)

Accuracy: ± one pixel of display, 20 Hz to 20 kHz

General

Display: 64x128 pixel super-twist LCD w/LED backlight

Size: 10 3/8" x 6" x 3 3/4" (HWD)

Weight: 3 lbs. 5 oz., 1502 g.

Battery: 6 volt rechargeable lead-acid cell provides 2-4 hours of service

AC Adapter/Charger: 6v @ 800ma

Non-Volatile Memory: 40 graph data storage locations

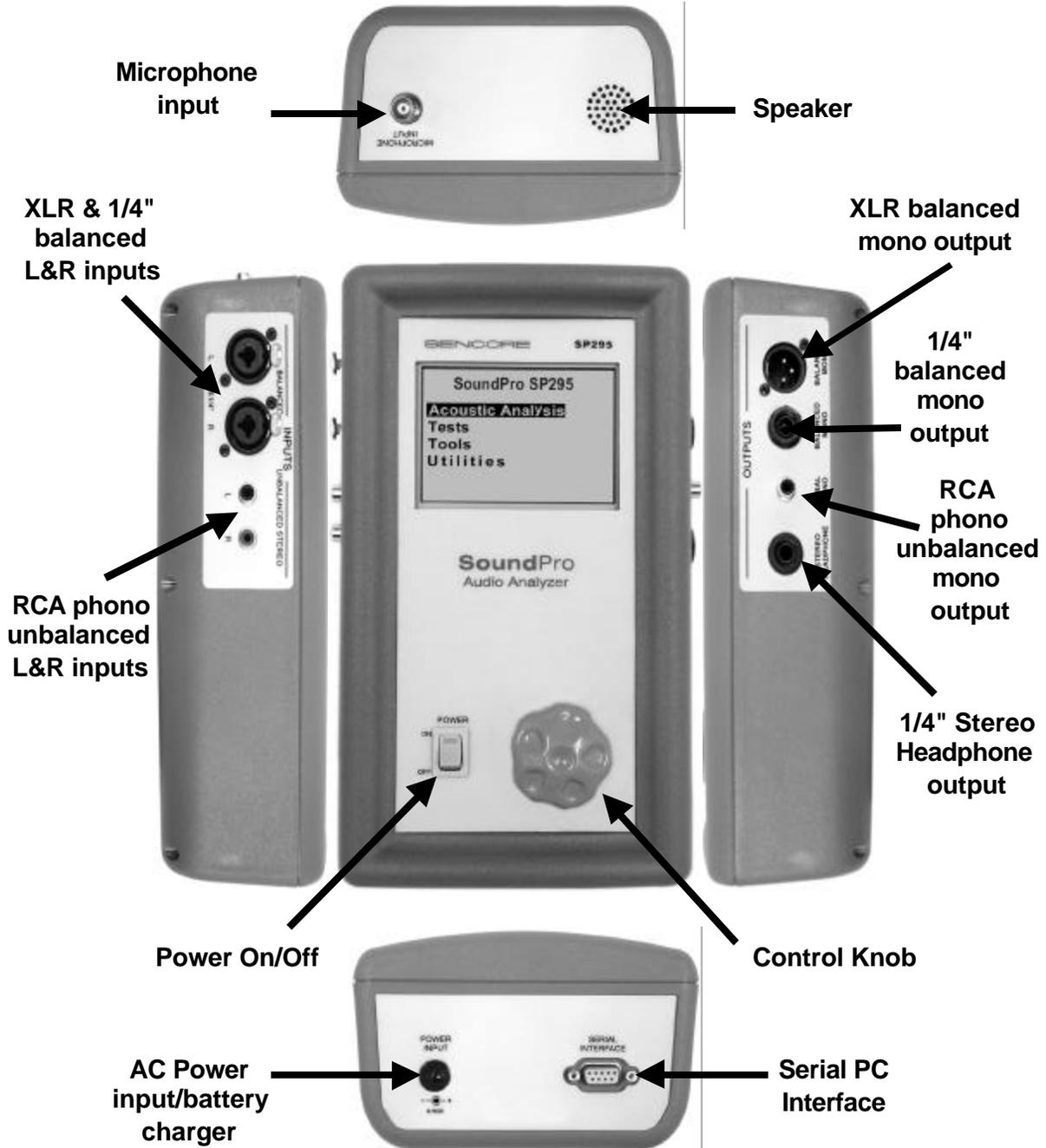
Inputs:

Connector(s)	Impedance	Range	Min. Level	Max. Level
Microphone	N/A			
		MicL	30 dB SPL	95 dB SPL
		MicH	70 dB SPL	130 dB SPL
XLR, ¼"	40k ohms			
RCA Phone	20k ohms			
		ExtL	-95dBu	-35dBu
		Ext	-75dBu	+7dBu
		ExtH	-40dBu	+40dBu

Outputs:

Connector(s)	Impedance	Polarity
XLR balanced mono	300 ohms	+ (hot) on pin 2
¼" balanced mono	300 ohms	+ (hot) on tip
RCA unbalanced mono	150 ohms	+ (hot) on tip
¼" unbalanced stereo	300 ohms	+ (hot) on tip and sleeve

Controls



Accessories

Supplied

Power Adapter/Charger

TC600CD Installer's Guide to Home Theater Audio

Microphone extension cable; 15 ft., BNC male to BNC female

Serial interface adapter cable; 6 ft



Optional:

CC294 Soft Carry Case



Specifications and accessories subject to change without notice.

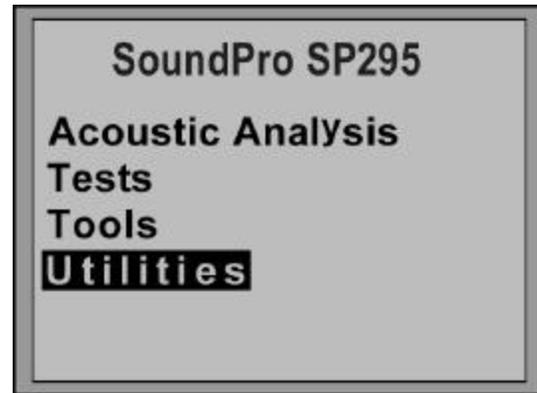
QUICK START

No time for manuals? You can be up and running the SoundPro Real-Time Analyzer (RTA) function in just 5 minutes. Work through this quick start routine to jump-start your SoundPro and learn the basics of SoundPro operation. Here's how:

Turn it on. Plug the AC adapter into an AC outlet and into the SoundPro Power Input jack. Turn on the power switch and the unit identification screen appears with a loading countdown at the bottom of the screen. (Don't turn the Control knob clockwise during this loading countdown or you'll enter the Serial Download mode. If you do, turn off the power switch to exit.)

Navigate the menus. Soon you'll see the main menu with four line items: Acoustic Analysis, Tests, Tools, and Utilities. Turn the Control knob either way and the highlight changes. Highlight on the Utilities menu item and press the knob straight down to click it. The Utilities menu appears along with a number of function choices.

Turn the knob to highlight "About..." and click. You have entered the About function, which displays the unit's software version and tech support info. This function is just an



Rotate the Control Knob to highlight the desired menu and "click" to select it. Highlight and click "<" to return to the previous menu.

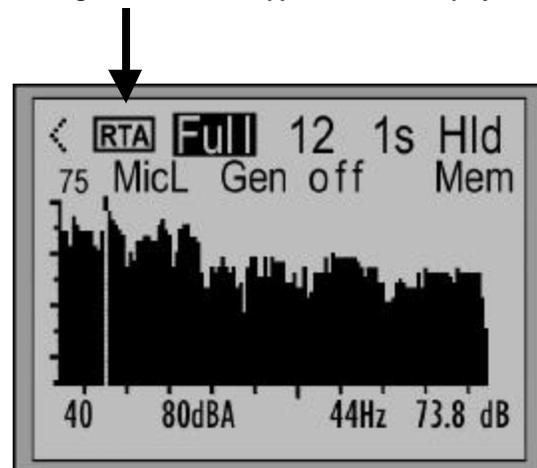
information display function and does not have any user-selectable data fields.

The '<' character means "go back". Click the Control knob and you will return to the Utilities menu. Move the highlight to the '<' and click again, and you're back at the main menu.

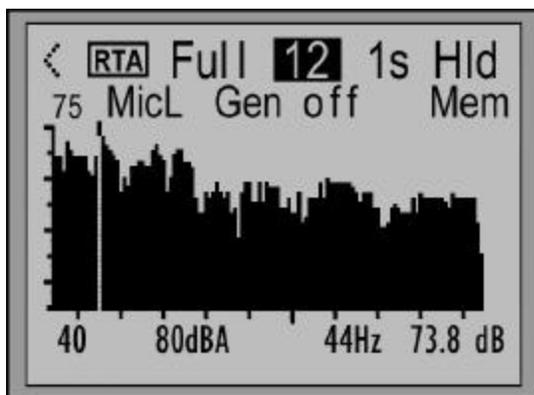
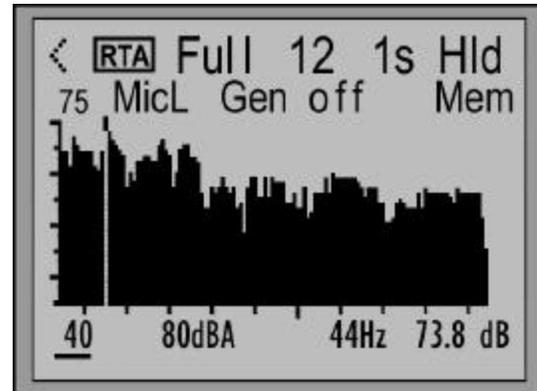
Running a Function. Select Acoustic Analysis in the main menu, then select Real-Time Analyzer. This is a typical SoundPro function, and it has many more fields than the "About" function has. At the top of the screen you will see the letters "RTA" in a small box. This is the function name.

Change the display mode. Just to the right of the RTA name is the word "Full". This field indicates the display mode; Full (20 Hz –20 kHz analysis), and Low (10 Hz to 332 Hz). Turn the Control knob one click clockwise to highlight the display mode field. Click on the field and the screen will re-draw in the "Low" mode.

The name of the function that you are currently using is shown in the upper left of the display

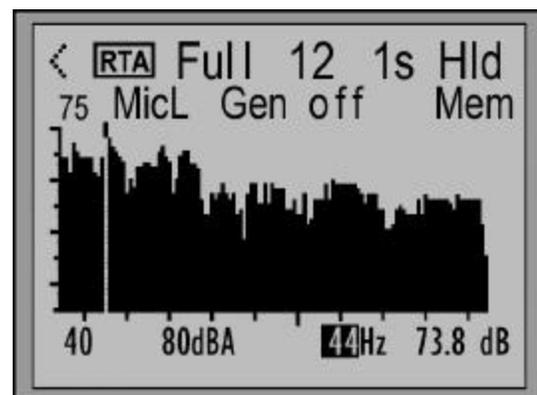


Change a data field. Unless you are in a loud environment, the display will be mostly blank. If you see “MicH” below the RTA function name, turn the Control knob to highlight it and click to select “MicL”. Turn the Control knob until the dB range field in the lower left corner is highlighted. Click it and notice that the highlight changes to an underline. You have entered a “control-lock” field. While you are in a control-lock field the data value changes as you turn the knob. Reduce the value until you get visible bars on the graph, then click to release the control-lock.



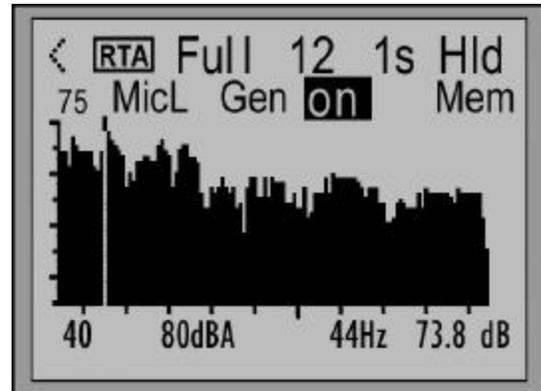
Change another data field. Turn the knob to move the highlight around the screen. Stop when you get to the number field to the right of the display mode (Full) that has a number 1, 3, 6, or 12 in it. This is the octave band field. Click and this field will change – there is no need for control-lock since there are only four choices. Only fields that have a lot of values use control-lock; on/off fields and fields with a few values change with every click. To change the octave band, continue clicking the knob. You'll see the width of the bars change as you change octave bands.

Try the measurement cursor. Each bar on the RTA graph represents the SPL level of a band of frequencies. To see the exact level and center frequency of each band turn the knob until the measurement cursor frequency field (Hz) in the lower right corner is highlighted. Click, and the highlight changes to an underline, indicating that you have activated the cursor field control-lock. Now as you turn the knob, you'll see a vertical line move back and forth on the graph; this is the graph measurement cursor. Notice that the numbers both above and to the right of the underline are also changing. They identify the frequency band the measurement cursor is on and the dB SPL of that band. Click the knob to release the control-lock.

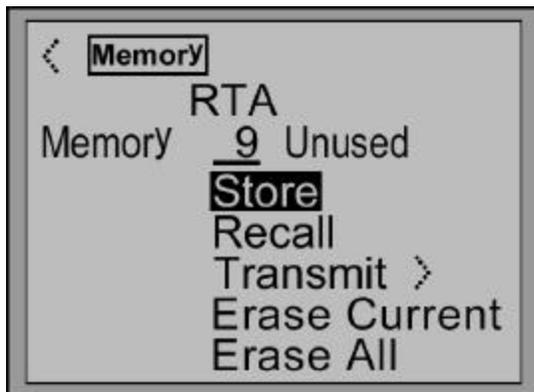


Turn on the generator. Turn the knob to highlight the field just to the right of the word “Gen”. Click to change it to “on.” If you plug any SoundPro output except the headphone output into an amplifier and a speaker, you will hear sound.

NOTE: In all other SoundPro functions “Gen” is a selection field that you can click on to jump directly into the Signal Generator function and make adjustments. Because the RTA function uses only pink noise, the “Gen” field isn’t active.



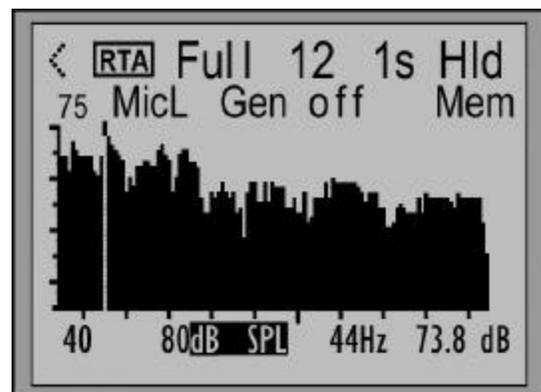
Save to memory. With a sound displayed on the graph, highlight the “Run” field at the upper right and click it to turn the RTA off and freeze the display. The field changes to “Hld”. Highlight and click the “Mem” field. This will take you to the Memory screen, which is available only from the RTA and ETG functions. A memory location will be shown. The word to the right of the number indicates what is currently stored in that memory location (“RTA”, “ETG” or “unused”).



If you want to write the data to that location, simply press the highlighted “Store” field. The data will be stored and the display will return the RTA function. If you want to select another memory location, highlight the memory number field and change it to the desired location. Click Recall on a memory location that has “RTA” data stored in it and the RTA function will appear with the stored graph recalled on the display.

SPL field. The SPL field is at the bottom center of the screen. Move the highlight to that field, click to activate control-lock, then turn the knob to select between unweighted (flat), A-weighted, or C-weighted SPL displays.

Now you’re an expert. At this point you know just about everything you need to operate the SoundPro. You can navigate menus, change data values, use the cursor, and store and recall memories. Most of the other SoundPro functions use the same principles of operation, so you should be able to apply what you have just learned to the other functions.



INPUTS AND OUTPUTS

Audio Inputs

The SoundPro receives input either from the microphone input (located on the top of the unit), or from the line-level input jacks (XLR & 1/4" combo and RCA jacks located on the left side of the unit). Depending on the selected function, the range of these inputs is either auto-ranged or manually selected. You can use either the XLR & 1/4" combo input or the RCA input jacks to match the type of cable you are working with. Always use the left XLR combo or RCA jack for test functions that require only a single input, like the cable test.



XLR and 1/4" Combo Left & Right Inputs -

This connector is a balanced audio input connector that accepts either an XLR connector or a 1/4" stereo or mono phone plug. Pin 2 is "hot" on the XLR input.

*NOTE: Use the **LEFT** input connector for Functions that use only one input or that specify Ext, ExtL or ExtH.*

RCA phono Inputs - These connectors are unbalanced stereo inputs. They are the unbalanced Ext, ExtL, or ExtH inputs.

Microphone Input / Supplied Microphone -

The microphone input BNC connector is located on the top of the unit and is used for the acoustical analysis functions. The supplied microphone connects directly to the microphone input BNC connector or connects remotely through the supplied BNC microphone extension cable. The supplied microphone is designed to accept a standard 1/2" (nominal) Sound Pressure Level calibrator, such as the B&K 4231.



Audio Outputs

All of the output jacks (XLR, ¼" phone plug and RCA jack) provide the same mono signal generator test signal and any of them may be used for the cable test. The ¼" stereo headphone jack powers 32 ohm impedance (or greater) headphones and may also be used as a stereo line output. If the audio output is turned on with no plug inserted in the headphone jack, the audio is routed to the internal speaker. This output can be turned on and off and the level set independently from the mono output jacks in functions that provide a headphone/speaker output.



¼" Stereo Headphone Output / Built-in Speaker - This jack is designed for headphone output, as well as a stereo line level output, if needed. It is the only stereo output on the SoundPro. The built-in speaker is mounted on the front, right side of the unit. It may be turned on in several functions, where it is referred to as the "Sp/Hd" output. The speaker is also used as an audible indicator in the Cable Test function.

RCA phono Unbalanced Mono Audio Output - The mono audio output is also routed to this jack.

XLR Balanced Mono Audio Output - Use this connector when a balanced XLR audio output is needed. Pin 2 is "hot".

¼" Balanced Mono Audio Output - This connector is wired in parallel with the XLR output jack above. It provides a phone plug balanced audio output (tip & ring hot, sleeve ground).

Power Input

The SoundPro power input takes 6-8 VDC unregulated at a minimum of 500mA. The



input connector is a 2.1mm coaxial power connector, positive on the center pin.

Serial Interface

The serial interface jack is used with the supplied Serial Interface Adapter cable for serial computer communications to download stored memory graph data to a computer for use with the SoundPro Audio Report software.

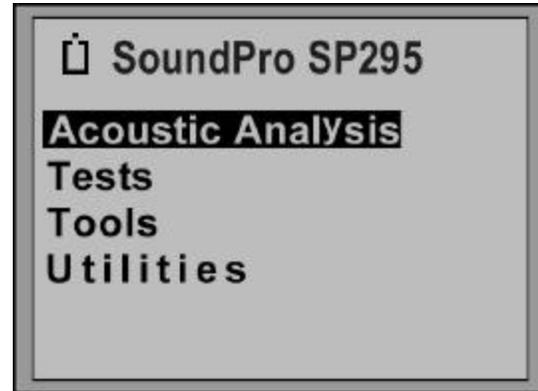
OPERATING THE SoundPro

Power On & Off

When you turn on the power switch, a unit identification screen appears momentarily before the main menu appears. This unit identification screen includes the unit's software serial number and a loading countdown. While the unit identification screen is visible, the SoundPro is running its monitor program, which loads the main SoundPro software and controls software upgrades. The monitor program is stored in protected memory and cannot be erased or altered.

To enter the software firmware upgrade mode, turn the Control knob to the right during the loading countdown – you will enter the Serial Download mode. Turn off the power switch to exit this mode. The SoundPro can be powered off at any time - there is no required shutdown procedure.

A low battery indicator is located at the upper left of the display. Power the SP295 with the AC Adapter when this indicator is on. Allow the SP295 to charge for 8 hours with the power off to completely recharge the battery.

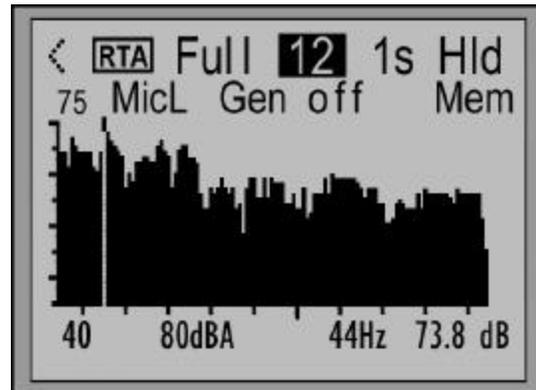


Power the SP295 with the AC Power adapter to charge the internal battery when the low battery indicator is visible.

User Interface

The SoundPro is controlled by either turning or pressing (clicking) the Control knob. Turning the Control knob moves a display highlight (inverted text) from between selected fields on the screen. Clicking a highlighted menu choice selects it. To exit from a function and return to the menu from which it was selected highlight and click on the '<' symbol. Do the same to exit from any sub-menu back to the main menu - move the focus to the '<' symbol and click on it.

To change the value of a selected field, click the Control knob. The highlighted field will either change to a new value (fields with only a few possible values) or will change to an underlined "control-lock" (data fields with many possible values).



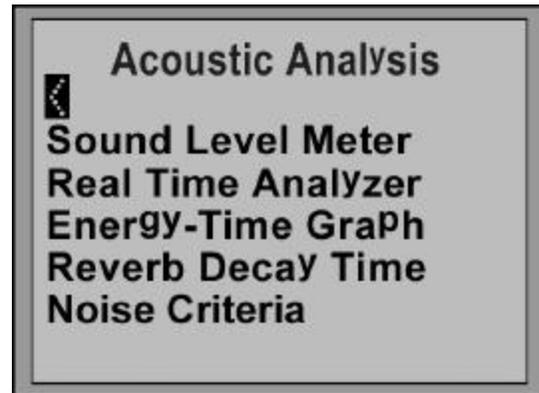
Turn the Control knob to highlight a field. Click to select it. Select "<" to return to the previous display screen.

On data fields that use the "control-lock" feature, click the Control knob to "lock" the control highlight, then turn the knob to change the value. Click again to unlock the control highlight and move to the next field.

Menus & Navigation

When the SoundPro is turned on, the main menu appears on the screen with four function categories. Turning the Control knob changes the highlight from one menu item to the next. Select the highlighted function category by clicking the Control knob. This will display another menu that lists the functions for that category. To select a function, turn the Control knob to highlight the desired function and click the knob. The selected function will be displayed.

knob. To return to the main menu from any function menu, highlight '<' and click the Control knob.



To exit from a function back to the function menu, highlight '<' and click the Control

Using the “Gen” and “Mem” Jump Fields

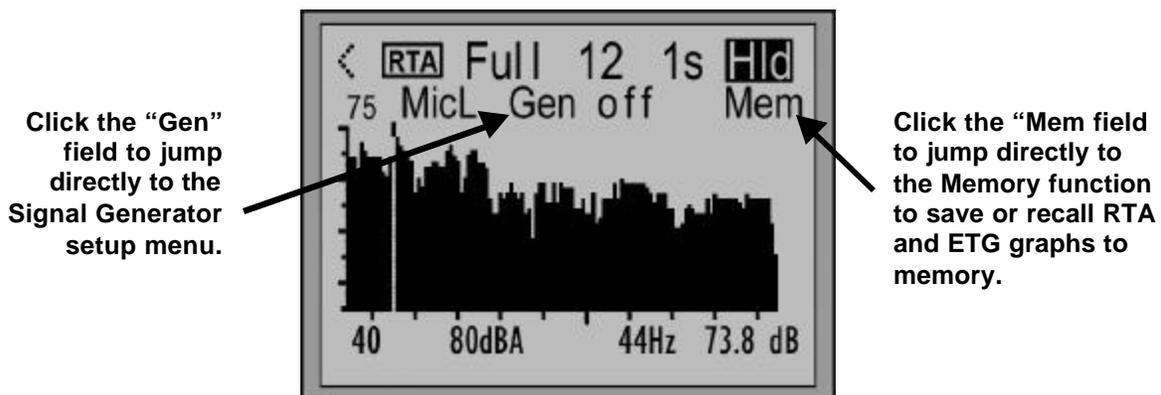
Several functions have “Gen” and “Mem” jump fields that let you jump directly into the Generator or Memory display functions, perform a task, and return to the first function without navigating through the menus.

The RTA and ETG graphing functions provide a “Mem” field. Click this field to jump directly to the Memory function. From this function you can save your current graph to a memory location or recall a stored graph. Recalling a stored graph or clicking '<' returns you to the function from which the Memory function was called.

Functions that have a “Gen” field (SLM, Level Meters and Sample Scope) allow you to jump directly to the Signal Generator screen. From there you can adjust the settings of the internal signal generator, such as frequency, level, and signal type. Clicking the '<' field returns you to the previous function. The Signal Generator remembers the field that you last modified and that field is highlighted the next time you jump into the Generator.

Saving favorite user settings

The SoundPro has the ability to store a set of favorite unit setting values. Set up the SoundPro the way you like it, then select the Utilities menu and go to the Setup & Calibration function. Click on the upper-right selection field until "Save Defaults" appears, then highlight and click "save". Your settings will be stored in non-volatile memory, and will be restored each time you re-power the SoundPro.



ACOUSTIC ANALYSIS

Sound Level Meter (SPL)

Description

A sound pressure level meter measures the change in air pressure created by a sound wave and displays this pressure relative to the threshold of hearing sound pressure.

Weighting curves are added to SPL measurements to make SPL readings correspond to perceived loudness. The SP295's Sound Pressure Level function measures the loudness of the ambient sound level in standard dB SPL measurement units, autoranged from 30 to 130 dB (A-weighted). Use the SPL function when you need to know objective sound volume, such as when balancing speaker output levels and adjusting room sound levels.

The SP295 SPL level is a true-RMS measurement, using ANSI Type 1 standard display time averages, ANSI Type 1 standard A, B, and C weighting networks, and ANSI Slow and Fast averaging. SPL measurements are made using the supplied microphone connected to the Microphone Input. The large, digital display shows the ambient sound level in standard units of dB SPL and the level is also shown on an analog bar graph meter (one pixel equals one dB). Output signal from the internal signal generator is available in the SPL meter function.

SPL Display & Controls

The following fields and parameters are displayed in the SPL function:

Averaging

Two ANSI-standard averaging modes are available. These modes use exponential decay averaging, in which the more recent sounds have more bearing in the average.

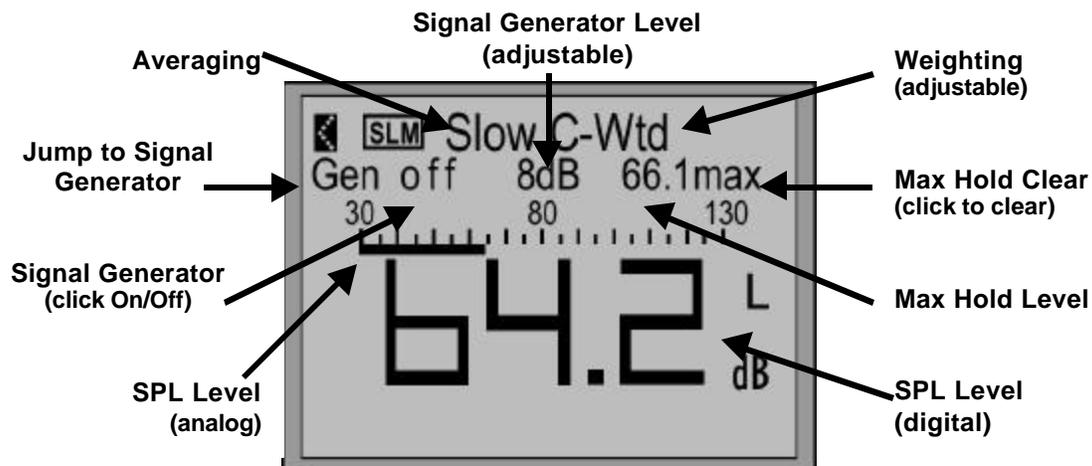
Slow – 1000ms exponential decay, time-averaged SPL.

Fast – 125ms exponential decay, time-averaged SPL.

Highlight the Averaging field and press the Control knob to toggle between these two modes.

Weighting

Standard unweighted (flat), A-weighted, B-weighted, and C-weighted filters are available. These weighting networks make SPL readings correspond more closely to what our ears hear. ANSI guidelines suggest using A-weighting for SPLs below 55dB and C-weighting for SPLs above 85dB. Highlight the field and press the Control knob. Rotate the knob to the desired filter and click.



Signal Generator Control fields

Full control of the signal generator is available directly from the Sound Level Meter display:

Jump To Signal Generator - Click this field to jump to the Signal Generator display, select the waveform type and frequency, and then return to the SPL function.

Signal Generator On/Off - Click this field to turn the generator on and off.

Signal Generator Level - This field

allows you to make coarse adjustments of the generator level without jumping into the generator setup screen. Highlight the field and click to select it (underlined). Turn the Control knob to the desired level, then click to select this level. (This is an approximate level - the exact level is shown in the Signal Generator display).

Max Hold Clear

The maximum SPL reading is constantly updated and displayed. To reset the displayed value, highlight and click on the "Max" field.

SPL Operation

1. **Connect a constant-level signal to the audio system.** SPL tests require a constant-level signal, such as a single-frequency test tone or wide-band pink noise. To use the SP295 as the signal source, connect a cable from an output connector to the desired audio system input.
Caution: *Preset the amplifier gain to minimum to prevent speaker damage when the SPL test is turned on.* There will not be an output until the SP295's signal generator is turned on.
2. **Position the microphone.** For Home Theater SPL tests, such as setting speaker level balance, the microphone should be positioned in the center of the listening area.
3. **Select either slow or fast averaging mode.**
 - Use slow (1000 mS time-averaged) for most SPL measurements. This averages transients and provides the best indication of the sound level that our ears hear.
 - Use fast (125 mS time-averaged) to see noise spikes or to follow fast audio changes.
4. **Select the weighting filter.**
 - Use A-weighting for low SPL levels below 55dB.
 - Use B-weighting for SPL levels between 55-75dB.
 - Use C-weighting for louder SPL levels above 75 dB, including most system measurements.
5. **If you are using the SP295 as the signal source for the audio system:**
 - Jump to the Signal Generator function and set up the generator as desired;
 - Turn the generator on by clicking the "on/off" field.
 - Adjust the generator output level.
6. **Read the SPL level.** The SPL reading in the upper right is the peak SPL reading. Highlight the "Max" field and click the Control knob to reset this reading.

Real-Time Analyzer

Description

A Real-Time Analyzer provides a graphic display of an audio system's frequency response. While there are 10 octave bands in the 20Hz to 20kHz audible frequency range, a 1 octave band is too wide for making acoustic adjustments and seeing frequency response peaks and dips. The SP295 RTA function uses FFT analysis to separate the audio spectrum into narrower 1/3, 1/6 or 1/12 octave bands. Further resolution is achieved by displaying the spectrum in two frequency ranges: Full (22 Hz to 21 kHz), and Low (10 Hz to 332 Hz).

Each band is graphed as a vertical bar, with the height representing the SPL level of the individual octave or sub-octave bands within the audio spectrum. The graph displays either

a 17 dB or 35 dB range, and measures SPL levels from 25 to 170 dB. The display is updated approximately twice per second, with selectable averaging times from 1 to 60 seconds. The internal signal generator can be used to provide pink noise while using the RTA function. RTA graphs can be stored and recalled for viewing and analyzing at a later time, and the data can also be sent to a computer for the SoundPro Audio Report.

Use the SP295's RTA function to analyze the frequency response of audio systems and listening rooms, and to monitor the results as you re-position subwoofers, adjust room treatments, and change equalizer settings for the most acceptable response.

RTA Display and Controls

The following fields and parameters are displayed in the RTA function:

Frequency Range

Use to select the frequency range displayed along the horizontal axis.

Full - 22 Hz to 21 kHz

Low - 10 Hz to 332 Hz

Highlight the field and press the Control knob to toggle between these two modes.

Band Filters

This field controls the width of the bands into which the frequency spectrum is "sliced".

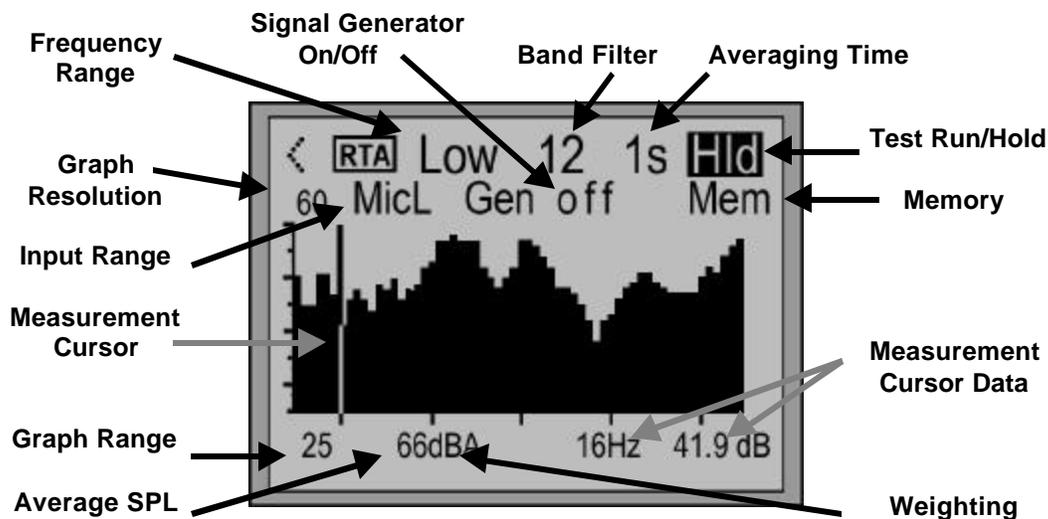
1 = full octave

3 = 1/3 octave

6 = 1/6 octave

12 = 1/12 octave

Highlight the field and press the Control knob to toggle between the octave band widths.



Averaging Time

This function uses exponential decay averaging, meaning that more recent sounds have more bearing in the displayed average. A longer time constant produces a more stable display, but a slower response to changing sounds. Highlight the field and click the Control knob to select the field (underlined). Select time constants of **1, 3, 6, 10, 30** and **60** seconds. Turn the Control knob until the desired value is displayed, then click to select the new value.

Test Run/Hold

Click on this field to run the RTA function, or to stop the measurement and hold the display. Run the test to collect ambient sound energy data. Hold the test to "freeze" the displayed RTA graph so that you can easier make cursor measurements or store the graph to memory.

Input Range

The Real-Time Analyzer is calibrated for use with the supplied microphone. It has an SPL range of 30 dBA to 130 dBA using two user-selectable ranges:

MicL covers 25 dB to 90 dB

MicH covers 70 dB to 135 dB

Highlight the Input Range field and click the Control knob to toggle between MicL and MicH.

Graph Range

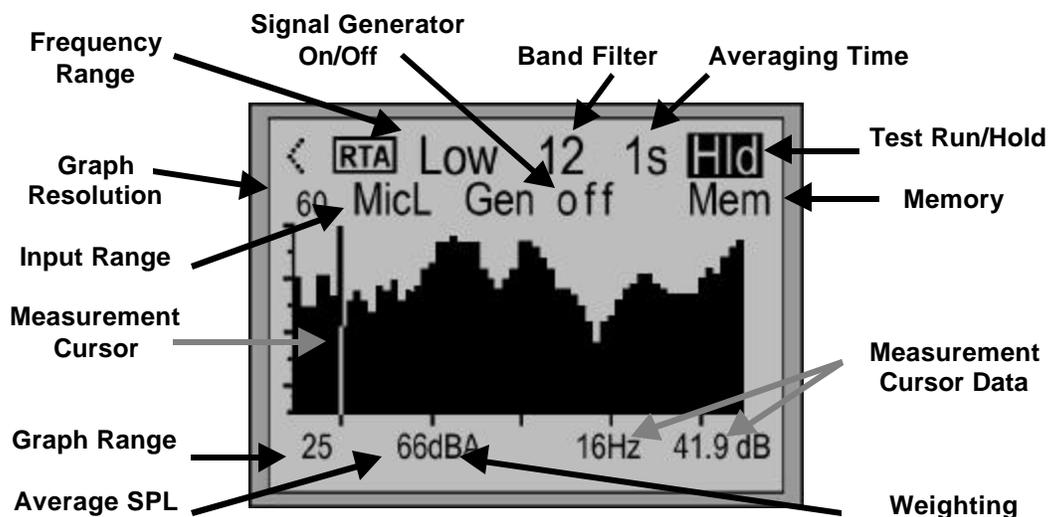
This field displays the bottom value of the graph amplitude range. The range is adjustable in 5dB steps from either 25-135 dB (MicL range) or 70-170 dB (MicH range). Highlight the field and click the Control knob to select the field (underlined). Turn the Control knob until the desired value is displayed and click to select the new value.

Graph Resolution

Click the dB number at the top of the left graph axis to change the vertical graph resolution between 1 dB/pixel (35-dB range) and 0.5 dB/pixel (17-dB range). The top dB number will change to be either 17 or 35 dB higher than the number at the bottom of the axis.

Signal Generator

The RTA function provides a pink noise signal for system testing. Only pink noise is provided because an RTA octave band analysis requires pink noise for proper amplitude vs. frequency display. Click the Generator "On/Off" field to toggle the pink noise generator on or off as desired. The output level will default to the level set in the Signal Generator display.



Memory

Real-Time Analyzer graphs can be stored in one of 40 non-volatile memories (0-39). Each memory location can store either a Full frequency or Low frequency graph. To access the memories, click the "Mem" field. This takes you to the Memory function, where you can save the current RTA graph or recall a previously stored graph. The memories are maintained through power off and are not lost when the Sound Pro software is upgraded. These memories can be transferred to a computer using the Transmit Data function and the serial port.

When recalling a stored graph, the active RTA display must be set to the same frequency mode (Full or Low) as the graph being retrieved. A "type mismatch" indication occurs if you attempt to recall a graph using the frequency mode different than what the data is stored as. A recalled graph can be analyzed exactly the same as a live graph - by changing the octave band filter size, graph amplitude range, and using the cursor to read individual band frequencies and dB levels.

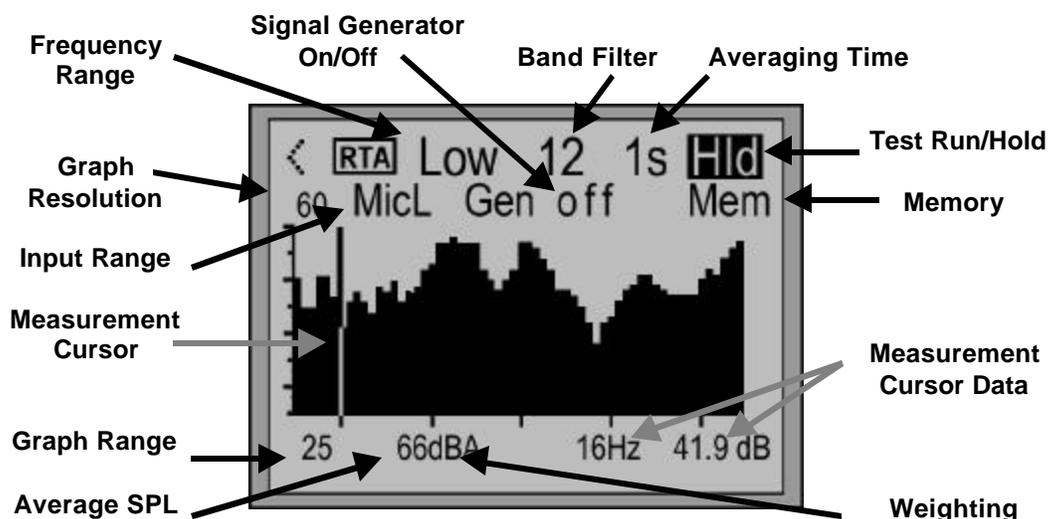
Average SPL & Weighting

The digital SPL measurement that is displayed along the bottom of the graph is calculated from the RTA bands and is therefore slightly less accurate than the standard SPL function. It is provided here for convenience while using the RTA display. You can select **SPL** - unweighted, **A SPL** - A-weighted and **C SPL** - C-weighted. Highlight the **Weighting** field and click the Control knob to select it (underlined). Turn the Control knob until the desired weighting value is displayed, then click to select the new value.

Measurement Cursor

The Measurement Cursor allows you to analyze the RTA graph display in detail. It is an inverse-highlighted vertical bar that you can position horizontally along the graph. The center frequency of the selected band and the band's dB SPL level are displayed in the lower right portion of the graph. Cursor measurements can be made in the Run or Hold mode, or on recalled RTA graphs.

To position the Measurement cursor along the graph, highlight the frequency "Measurement Cursor" field and click on it (underlined). Rotate the Control knob to move the cursor.



RTA Operation

1. **Connect a constant-level pink noise signal to the audio system.** Accurate and meaningful RTA tests require a pink noise sound source. To use the SP295 as the pink noise signal source, connect a cable from an output connector to the desired input on the audio system. There will not be an output from the system until the RTA and Signal generator are turned on from the RTA display. The output level of the RTA pink noise is adjustable in the Signal Generator setup menu. **Caution: *Preset the amplifier gain to minimum to prevent speaker damage when the RTA test is turned on.***
2. **Position the microphone.** For home theater calibration, a RTA reading should be taken at each seat in the listening area with the microphone placed at ear level. Adjust the system for the best overall RTA response at all seating locations.
3. **Select the frequency range:**
 - Use low (10Hz to 332Hz) to analyze and perform low frequency equalization.
 - Use full (20Hz to 20kHz) to analyze and equalize the entire audio spectrum.
4. **Select the octave band filter resolution.** Use 1/12 octave (12) for most RTA analysis, as this provides the best spectrum resolution.
5. **Select the averaging time constant.** Longer times provide a more stable display, while slower times respond more quickly to changing sounds and noise. Use 6 second (or longer) averaging when performing low frequency equalization.
6. **Select the desired weighting.** Use C-weighting for most applications.
7. **Set the input range.** Use MicL for most applications. If an input overload occurs, "Overload" appears on the display.
8. **Turn on the pink noise.** If you are using the SP295 as the signal source, turn on both the RTA function and the generator. ("Gen on" field).
9. **Adjust the Graph Range and Graph Resolution.** Adjust the range and resolution so that the entire graph display fits on the vertical axis. Depending on the SPL difference between the highest and lowest levels, you may need to use 35-dB resolution to see the entire graph.

If the vertical bars are too short or not visible:
 - set the Input Range to MicL.
 - set the Graph Amplitude Range to a lower dB value.If the vertical bars are too tall or appear clipped:
 - select 35 dB Graph Resolution.
 - set the Graph Range to a higher dB value.
10. **Use the measurement cursor to read the exact dB level and frequency of any frequency band on the graph.** Turn the RTA to "Hld" if desired to freeze the display.

Energy-Time Graph

Description

Because sound travels only about 1130 feet/second, time delays caused by even relatively short distances can cause audible effects. An energy-time graph shows time relations between sounds.

The SoundPro's ETG function applies an exciting pulse through an external amplifier and speaker, and displays the energy decay of the sound reaching the microphone. The graph represents the instantaneous SPL levels at specific times after the exciting pulse occurs, and is calibrated vertically in dB (SPL) and horizontally in time and distance.

Use the ETG function to identify room reflections, measure Initial Time Delay Gap (ITDG) to characterize room acoustics, accurately set A/V processor time delay and to calibrate speaker phasing (delay time of reinforced sound vs. direct sound) to reduce echoes) in multi-zone sound reinforcement systems, such as PA systems.

The energy-time graph is typically viewed at a short time/distance to identify early speaker reflections and check PA speaker phasing, and at a long time/distance to view the room energy decay rate and determine ITDG.

Energy-Time Display/Controls

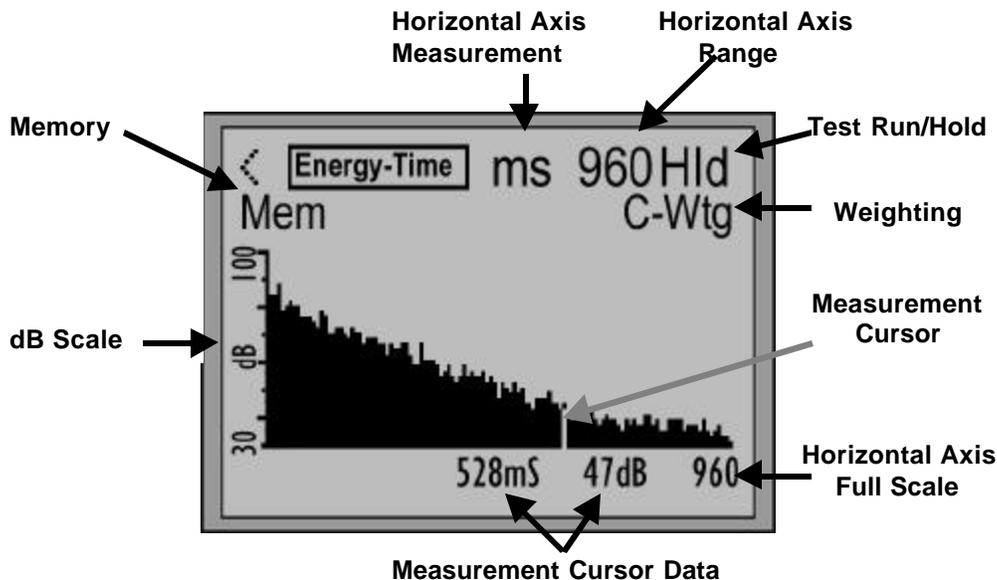
The following fields and parameters are displayed in the ETG function:

Test Run/Hold

Click on this field to turn the ETG function on to run the test and off to Hold the current display. When Run is selected the test pulses the room with sound energy and collects the resulting energy decay data. Select Hld to stop the test and "freeze" the currently displayed graph. This allows you to make cursor measurements and ITDG calculations, and to save the graph to memory.

Memory

Energy-Time graphs can be stored in one of 40 non-volatile memories. To access the memories, click on the "Mem" field. You will jump directly to the Memory Control screen, where you can save the current graph, or recall a previously stored graph. After recalling a graph, you can use the cursor to measure individual data values.



Weighting

This field selects the ANSI weighting that is applied to the measurement. The following selections are available:

- Flat** - unweighted
- AWtd** - A-weighted (use when measuring SPL levels from 25-55 dB)
- BWtd** - B-weighted (use when measuring SPL levels from 55-85 dB)
- CWtd** - C-weighted (use when measuring SPL levels from 85-140 dB)

To change the weighting, highlight the field and click the Control knob to select the desired weighting.

dB Level Scale

This scale shows the dB SPL energy level with 10 dB reference marks. It has a fixed range, and is provided only for quick reference. Use the Measurement Cursor to determine the exact dB SPL levels.

Horizontal Axis Measurement

This field controls what measurement is displayed along the horizontal (X) axis of the display. The axis can display time (in milliseconds), or the equivalent sound travel distance (in feet or meters). The following options are available:

- ms** - displays time with a full scale range from 15 to 3840 milliseconds.
- ft** - displays equivalent distance with a full scale range from 16 to 3840 feet.
- m** - displays equivalent distance with a full scale range from 5 to 1320 meters.

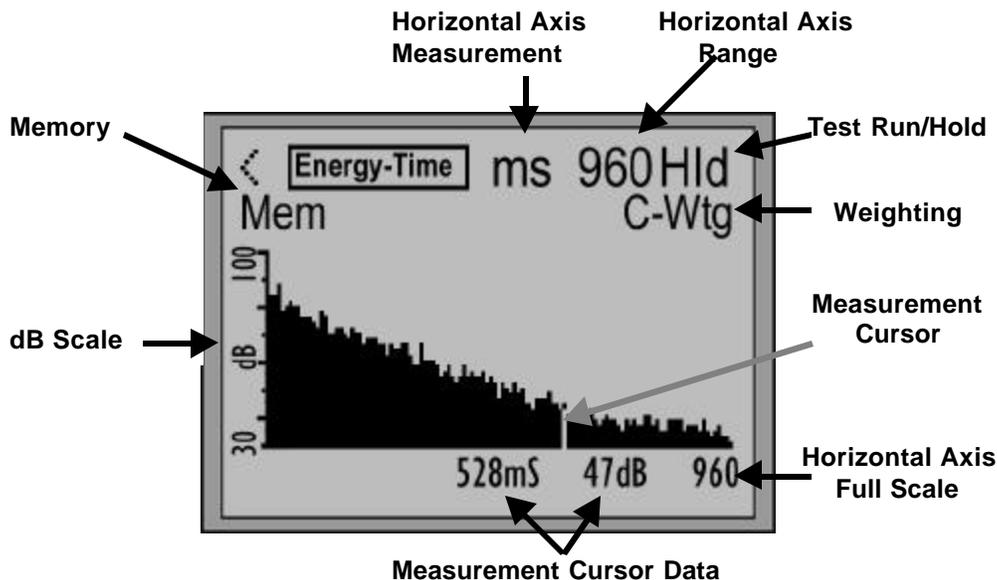
To change the measurement, turn the Control knob until the field is highlighted and click to toggle between measurements.

Horizontal Axis Range

This field controls the full-scale resolution of the measurement that is displayed by the horizontal (X) axis. The selected full scale range is also displayed in the **Horizontal Axis Full Scale** field. The following full scale range selections are available:

- Millisecond ranges - 15, 30, 60, 120, 240, 480, 960, 1920, 3840
- Feet ranges - 16, 33, 67, 135, 271, 542, 1084, 2169, 4339
- Meter ranges - 5, 10, 20, 41, 82, 165, 330, 660, 1320

To change the range, highlight the field. Click the Control knob to select it (underlined), then turn the Control knob to select the desired range. Click to select the new value.



Measurement Cursor

The measurement cursor allows you to analyze the ETG graph in detail. It is an inverse-highlighted vertical bar that you can move horizontally along the graph. As you move the cursor, the time (or sound travel distance) from the source pulse and the dB level relative to the maximum value received

are displayed in the Measurement Cursor data field.

To move the Measurement Cursor, highlight the "Measurement Cursor " field and click on it (underline). Rotate the Control knob to move the Measurement Cursor and read the corresponding time/distance and dB level.

ETG Operation

Obtaining an Energy-Time Graph (follow these preliminary steps for all ETG applications.)

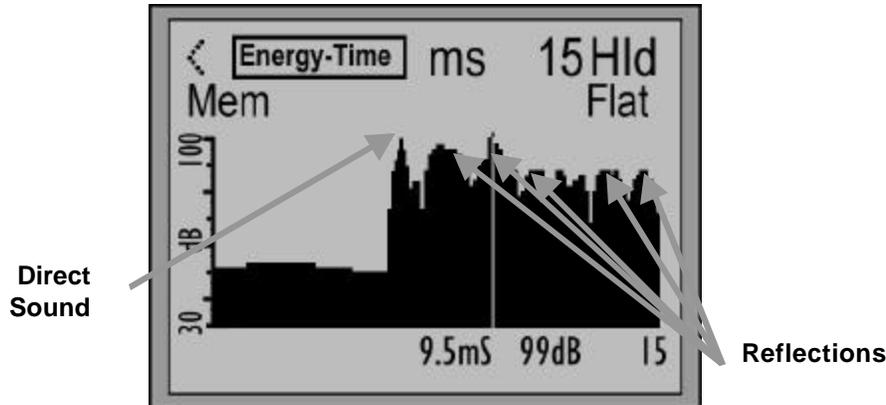
1. **Connect the SP295 Output to the amplifier input.** Connect a cable from an SP295 output connector to the input of the audio amplifier. Apply the signal to each speaker individually. *Caution: Preset the amplifier gain to minimum to prevent speaker damage when the ETG test is turned on.* You will not hear an output from the speakers until the test is turned on.
2. **Select the Horizontal Axis Measurement.** Use a distance display (ft, m) for locating reflections and the ms time display for ITDG measurements.
3. **Select the Horizontal Axis Range.** To locate reflections, select a distance that is just longer than the total distance from the speaker, to the rear wall, to the center of the listening area (microphone location). Use 60 ms for measuring ITDG in a typical size home theater room, and use longer times for large rooms.
4. **Turn on the test.** *Be sure the amplifier volume is set to minimum before turning on the ETG test.*
5. **Adjust the amplifier volume for a good display.** Increase the amplifier volume to obtain the highest possible signal reading on the ETG graph without signal clipping or excessive speaker distortion. If the signal level picked up by the microphone is too loud, the display will indicate "Overload".
6. **Select the desired weighting.** A-weighting often provides better results because it rolls off most of the low frequency resonances created by room modes.

Identifying Speaker Reflections

1. **Follow steps 1 -6 to obtain an Energy-Time graph.** Enable only one speaker at a time to display early reflections from that speaker.
2. **Set the Horizontal measurement to either feet or distance.**
3. When you have a representative graph, **select "Hld" to freeze the graph.**

4. Analyze the data from the graph:

- **Direct sound** -The first peak is the direct sound and is the distance (or time) that the sound traveled in a straight line from the speaker to the microphone.
- **Reflections** -The next peak(s) are reflections. Each peak is the distance that a reflection traveled from the speaker to the microphone. The peaks that occur within 5-10 milliseconds after the direct sound (a reflection path 5-10 foot longer than the direct sound path) are called early reflections. They should be at least 10-12 dB lower than the direct sound level to prevent stereo imaging degradation.



Determining Initial Time Delay Gap (ITDG)

ITDG is the time between the direct sound and the first sound reflection that is within 10 dB of the direct sound. This time clues the brain as to the room size - longer ITDG equate to larger spaces and “cold” sounding room, while too short ITDG causes early reflection problems. For good home theater acoustics, the ITDG for all speakers should be about 25-30 msec. ITDG time can be lengthened by adding sound absorbing material to the speaker mirror points to reduce early reflections.

1. Follow the steps outlined above for "Identify Speaker Reflections".
2. Set the Horizontal measurement to time (ms).
3. After you obtain a good display, select "HLD" to freeze the graph.
4. Set the cursor to the direct sound (first peak). Note the dB level and the time.
5. Move the cursor towards the right until you encounter a next peak that has an SPL level that is within 10 dB of the direct sound level. Measure this time.
6. Subtract the time of the reflection (time step #5) that is within 10 dB of the direct sound level from the time of the direct sound (time in step #4).

Reverb Decay Time

Description

When a steady sound is applied to a room, the sound energy builds until it reaches a constant level. When the sound source is removed, the sound energy doesn't immediately cease, but decays over a short period of time. How long the sound energy reflects off multiple surfaces inside a room before it is absorbed by the room's contents is called decay time. The time needed for the sound level to decay by 60 dB after the sound source is removed is called reverberation time, or RT60.

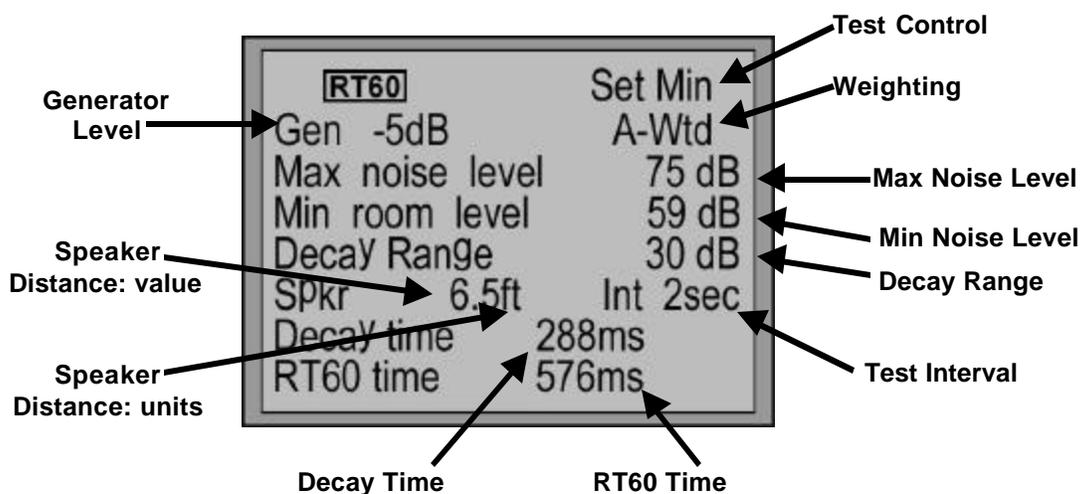
Optimum decay time depends largely on the room's size, whether you are listening to speech or music, and listener preferences. Decay time, or reverberation, creates room ambiance - the sense that the performance is taking place in either a large or small space. Too long decay time causes echoes, while too short decay time makes the room sound "cold" and unnatural. Music requires longer RT60 times for best sound, while speech requires shorter RT60 time to be intelligible. An average-sized home theater should have an RT60 between 0.3 and 0.6 seconds.

A room's volume (physical dimensions) and the amount of sound absorption inside the room (i.e.: carpet, drapery, wall treatment, people etc.) determine its decay time. Make RT60 decay time measurements with all of the furnishings in place and, if possible, with someone seated in each listening position. If the final acoustical panels aren't available, place temporary panels at the speaker mirror points to eliminate early reflections.

The SoundPro Reverb Decay Time test works by first measuring the room's ambient noise level, then the sound level with the test pink noise applied. The difference in levels is the decay range (at least 26 dB is required for the test to continue). After the decay range dB is determined, the test outputs an interval of pink noise, followed by silence. As soon as the pink noise is halted, the test measures the time needed for the sound level to drop by the decay range dB amount. This time is displayed as the Decay time reading. The RT60 time is determined by extrapolating the decay time to 60 dB.

Display/Controls

The following fields and parameters are displayed in Reverb Decay Time function:



Test Control

The Reverb Decay function requires setting the ambient noise and the maximum sound (pink noise on) levels to determine the Decay range dB. The Test Control field allows the operator to set these levels and to control the test. Highlight and click this field until it displays **'Set Min'**. Then click the Control knob to store the ambient noise level. The field then changes to **"Set Max"** and the pink noise test signal turns on. Click to store the maximum noise level. The field now changes to **'Run RT60'** and the test begins. Click again to stop the test. When the field displays **'Off'**, clicking again repeats the setup sequence. Turning the test "Off" holds the currently displayed readings.

Weighting

This field selects the ANSI weighting that is applied to the measurement:

Flat - unweighted

A-Wtd - A-weighted (use when measuring SPL levels from 25-55 dB)

B-Wtd - B-weighted (use when measuring SPL levels from 55-85 dB)

C-Wtd - C-weighted (use when measuring SPL levels from 85-140 dB)

To change the weighting, highlight the field and click to select the desired weighting.

Max Noise Level

This is the maximum sound energy in the room with the pink noise test signal applied. Adjust the amplifier's volume and/or SP295 generator output to increase the sound level to approximately 75-85 dB. At this level the Max Noise reading should be at least 26 dB higher than the Min Room level reading (number in the Decay Range field). To store the Max Noise level, set the Test Control field to **'Set Max'** and click the Test Control field.

Min Room Level

This is the level of the ambient room noise. The minimum room noise level must be at least 26 dB lower (indicated by a number display in the Decay Range field) than the

Max Noise Level reading. If the Min Room level is greater than 50 dB, you need to lower the ambient noise for best test results. To store the Min Room level, set the Test Control field to **'Set Min,'** then click the Test Control field.

Decay Range

This field shows the dB difference between the Max Noise and Min Room levels, minus 6 dB to allow for a 6 dB test headroom. The Reverb Decay test measures the time taken for the sound energy to decrease by this amount. The display automatically updates when the Min Room level has been set, and displays "--" if the difference between the max and min levels is less than 20 dB. Adjust the sound system's amplifier volume and/or the SP295 test generator output, or reduce the ambient background noise to obtain a decay range greater than 20 dB. Larger dB decay ranges produce better test results. If possible, try to attain a decay range of 35-45 dB.

Test Interval

This field sets the noise on-time duration (the off and on time are equal) from 2 to 15 seconds in 1-second steps. Setting the test time too long will not affect the test accuracy, but a too-short test time will not allow the sound to fully build up and decay. Larger rooms require longer test intervals to allow the sound to build to maximum and the sound to decay. Use the following approximate guidelines for selecting the proper test time:

Room Volume (cubic feet)	Test Time
< 1000 ft ³	2 sec
2000 - 5500 ft ³	3 sec
5500 - 13,000 ft ³	4 sec
13,000 - 25,000 ft ³	5 sec
25,000 - 43,000 ft ³	6 sec
43,000 - 66,000 ft ³	7 sec
66,000 - 100,000 ft ³	8 sec
100,000 - 145,000 ft ³	9 sec
145,000 - 200,000 ft ³	10 sec
200,000 - 265,000 ft ³	11 sec
265,000 - 340,000 ft ³	12 sec
340,000 - 440,000 ft ³	13 sec
440,000 - 550,000 ft ³	14 sec

RT60 Time

This field shows the calculated RT60 reverberation time. The number is extrapolated from the measured decay time by linearly extending the decay time and dB decay range to a 60 dB drop in SPL.

Decay Time

This is the actual time needed for the maximum sound level to drop by the amount shown in the decay range field.

Speaker Distance (Units & Value)

Use these fields to enter the approximate distance that the SP295 microphone is from the nearest speaker. The reverb decay test uses this information to ignore any possible early sounds that are not part of the normal test, allowing the test to provide more accurate measurements with transient noise

spikes. To set the speaker distance, turn the Control knob to highlight the Speaker Distance: Units field, and click to select between **m** (meters) or **ft** (feet). Then turn the Control knob to highlight the Speaker Distance: Value field. Click on the field and turn the Control knob to set the distance in 0.1 increments from 4 ft/m to 999.9 ft/m. Click to select the desired value.

Generator Level

This field allows you to make coarse adjustments of the pink noise level without jumping into the generator setup screen. You may need to adjust the generator level to set Max Noise level for an acceptable decay range. Highlight the field and click to select it (underlined). Turn the Control knob to the desired level then click to select the level setting.

Reverb Decay Time Operation

1. **Position the SP295 microphone in the center of the listening area.**
2. **Connect the SP295 line output to the A/V receiver's left and right auxiliary inputs** using a Y-adaptor. Select the 5-channel stereo mode or other DSP mode on the A/V receiver that drives all of the speakers simultaneously, without adding reverberation.
3. **Select the Reverb Decay Time function and select A-weighting.** A-weighting rolls off most of the effects of low frequency room modes and provides a better indication of delay time.
4. **Adjust the Speaker distance to the distance between the microphone and the closest speaker.**
5. **Set the Time interval.** Use short test times for small rooms, and longer test times for larger rooms and rooms with minimal sound absorption.
6. **Highlight the Test Control field and select "Set Min". Click to set the Minimum Room (ambient noise) level.** If this level is greater than 50 dB, you should attempt to decrease the ambient noise for best test results and better room acoustics.
7. When you click "Set Min," the display changes to "Set Max" and pink noise is applied to the amplifier input. **Adjust the amplifier's volume and/or the SP295 output level for a Max Noise level of approximately 75-85 dB.** This should produce a Decay range of greater than 26 dB.
8. **Click the Test Control field to display "Run RT60"** and read the decay time and RT60 reverberation times on the display.

Noise Criteria

Description

All rooms have noise - sound that is present without any energy applied by the audio system. Noise affects the dynamic range of the reproduced audio. Noise levels that are too high interfere with our ability to hear sounds, especially softer sounds, and may require extra volume from the amplifier.

How our ears respond to noise depends on its frequency and loudness. Noise measurements follow ANSI standard S12.2-1995 Noise Criteria (NC) weighting curves (see Appendix C) that are weighted for the frequencies and sound pressure levels where our ears are most sensitive. NC curves specify equal-loudness levels of noise over the audio spectrum. They are numbered for easy reference, with lower numbers corresponding to less noise. The NC

rating of a room is the number of the lowest curve that is not exceeded by any of the background noise.

The SP295 Noise Criteria Test automatically measures the SPL noise levels at the standard octave band frequencies and compares them to ANSI standard NC curves (Appendix C). The display shows the NC rating, the weighted noise energy level in the individual octave bands, and the band that is limiting the NC rating. Reducing the noise in this band may allow you to achieve a lower NC rating. You should perform NC measurements under typical and worst case conditions, including having the room's ventilation system running and outside noises such as street traffic corresponding to the typical listening times.

Display/Controls

The following fields and parameters are displayed in the Noise Criteria function:

NC Curve

This is the room's background noise rating. The number is the lowest-level ANSI noise criteria curve that is not exceeded by the room's background noise level. The Noise Criteria Curve is determined by measuring the noise in the 31 Hz – 8 kHz octave bands.

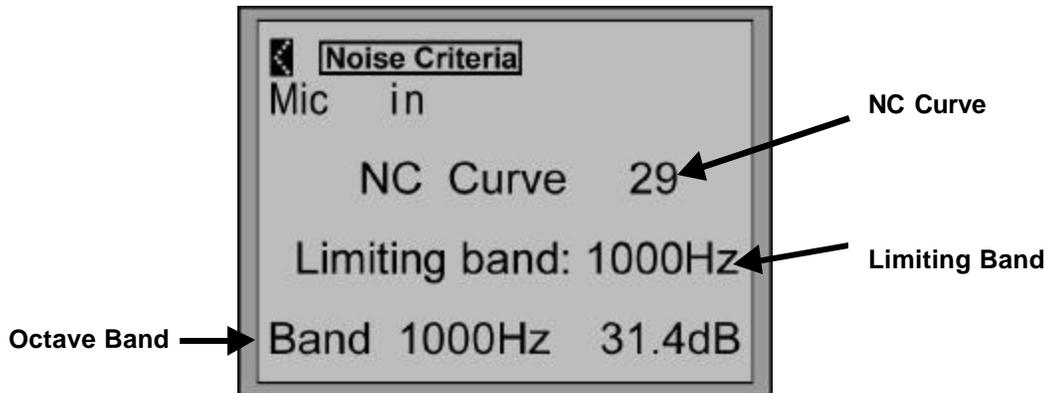
Limiting Band

Indicates which octave band contains the noise level that, if reduced, would allow the NC rating to drop to a lower level.

Octave band

You can measure the level contained within each of the individual nine ANSI-standard octave bands: **31, 63, 125, 250, 500, 1000, 2000, 4000** and **8000** Hz. The noise within the selected band is indicated in dB. The Noise Criteria rating is not affected by measuring a selected octave band.

To read the noise level within a band, highlight the field and click the Control knob to select it (underlined). Turn the knob until the desired octave band is displayed and click to select the band. The noise level of the selected band is displayed.



Noise Criteria Test Operation

1. **Connect the microphone to the SP295** and position it in the center of the listening position. The microphone is the only input that can be used for the noise criteria test.
2. **Select the Noise Criteria function.**
3. **Read the NC background noise rating.** The value in the NC Curve field is the room's background noise rating.
4. **Read the octave band that is limiting the NC rating.** The number in the Limiting Band field indicates the octave band that contains the noise level that is limiting the NC rating. If you can lower the noise level in this band, the NC rating will drop to a lower level.
5. **View the noise SPL level for any octave band.** The number in the Octave Band field indicates the noise level in that particular band. Use this function to view the noise level in the limiting band as you track down possible sources of that noise. Also use this function to plot the noise levels against the NC curve chart in Appendix C, to check whether there are equivalent levels of noise in multiple octave bands or primarily in one band.

TEST FUNCTIONS

Speaker Distortion

Description

Excessive speaker distortion can cause audible problems and may be a sign of speaker damage or impending speaker failure. The SoundPro speaker distortion test uses FFT analysis to compare the level of the fundamental test frequency with its harmonics and noise. It generates a sine wave and sums the energy in the upper harmonics (and residual noise) to calculate the total harmonic distortion plus noise (THD+N). The range is 0.02% to 50%. The display shows the value numerically, and also has a bar graph using a log-scale from 100% to 0.01% THD.

Speaker distortion typically runs in the 1-5% range (with low levels of room noise). Use the SP295 Distortion Meter function to check all speakers, looking for differences between left and right speakers and differences between speakers in matched sets. If one speaker has appreciably higher distortion than the others, it is probably defective or damaged and may fail soon. Several test frequencies are provided to properly test woofers, midrange and tweeter speaker types.

Display/Controls

The following fields and parameters are displayed in the Speaker Distortion test:

Input Range This field allows you to select the input range of the signal that is picked up by the microphone:

MicL - 30 dB to 95 dB

MicH - 70 dB to 130 dB

Highlight the Input Range field and click the Control knob to toggle between MicL and MicH.

Test Frequency

Seven frequencies are available for testing distortion in different types of speakers: **63, 125, 250, 500, 1000, 2000** and **4000** Hz. Test distortion of full-range speakers over this full frequency range; test sub-woofers at 63 and 125 Hz; test satellite, bookshelf, and PA speakers at 125 Hz and above.

To set the test frequency, highlight the Test Frequency field and click the Control knob to select it (underlined). Turn the Control knob

until the desired value is displayed and click to select the test frequency.

Input Level Bar Graph

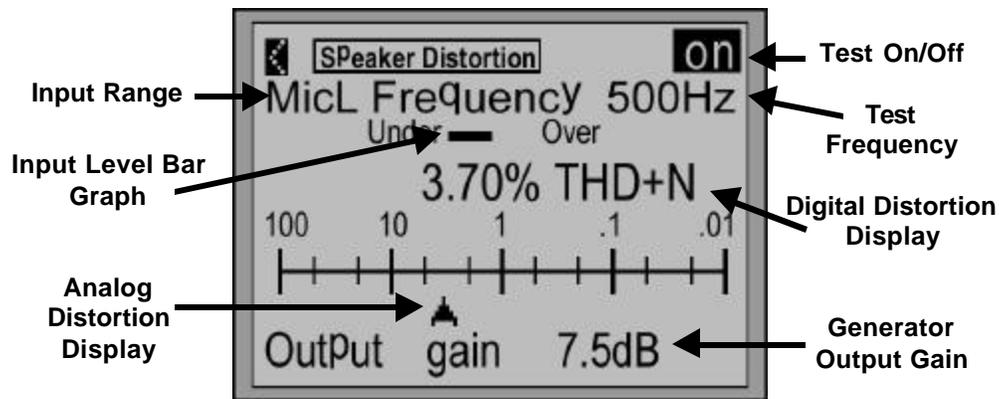
This bar graph indicates when the signal picked up by the microphone is within the useable level range. Adjust the SP295 generator output gain or amplifier volume for a reading approximately centered between the Under and Over points.

Analog Distortion Display

This graph displays the speaker distortion percentage displayed on an analog bar graph, ranging from 100% (left) to 0.01% (right).

Digital Distortion Display

This number is the speaker distortion percentage displayed as a digital numeric reading.



Generator Output Gain

This field allows you to adjust the output level of the SP295's internal signal generator. Set the gain for a useable sound level as indicated on the Input Level bar graph. The gain is adjustable in 1.5 dB steps from -64.5 dBu to 15.0 dBu. To change output level turn the Control knob to highlight the Generator Output Gain field and click to select it

(underlined). Turn the Control knob until the desired value is displayed and then click to select the new output level.

Test On/Off

Click on this field to turn the Speaker Distortion test on and off. Turning the test on and off automatically turns the internal signal generator on and off.

Speaker Distortion Test Operation

1. **Connect the SP295 Output to the amplifier input.** The SP295 must be the signal source for the distortion test. Connect one of the SP295 outputs to the amplifier that is driving the speaker to be tested. Set the amplifier to gain at 1/3 to 1/2 volume. (You will not hear an output from the speaker until the test is turned on).
2. **Select the Input Range.** Perform the test at an SPL level below 70 dB using MicL.
3. **Select the desired test Frequency.** Test full-range speakers at each frequency; sub-woofers at 63 and 125 Hz; satellite, bookshelf and PA speakers at 125 Hz and above.
4. **Set the SP295 Output Gain to minimum.** The speaker volume depends on the SP295 generator level and the amplifier volume. *Caution: Start with SP295 Output gain at minimum (-64.5 dB) to prevent speaker damage when the distortion test is turned on.*
5. **Turn on the Distortion Test.**
6. **Adjust the output gain for a mid-range reading on the level meter.** If you hear the test tone at the maximum output gain setting, but the Input Level Bar Graph is not above the minimum level, increase the amplifier volume control. *Caution: If you do not begin to hear an output from the speaker with the gain set at 0 dB, set the Output gain to minimum and check the connections between the SP295 and amplifier, the amplifier input and speaker selection switches, and the amplifier volume setting.*
7. **Read the speaker distortion.** The percent of speaker distortion is shown on the digital display and on the analog bar graph.
8. **Test the speaker at all appropriate test frequencies.**
 - full-range speakers at each test frequency.
 - sub-woofers at 63 and 125 Hz.
 - satellite, bookshelf, and PA speakers at 125 Hz and above.*Caution: Reduce the SP295 output level before changing the test frequency.*
9. **Test the remaining speakers in the audio system.**
Caution: Reduce the SP295 output level before switching speakers or amplifier inputs.

Cable Test

Description

The SP295 Cable Tester verifies the wiring and integrity of all audio cables. Connect one end of the cable being tested to the appropriate input connector on the left side of the SP295 (use "L" input) and the other end to the corresponding output connector on the right side of the SP295. Two tests are preformed - a digital wiremap test and an analog audio transmission test. The Cable tester can also be used as a continuity tester.

The wiremap test checks all connections for opens, shorts, or crossed wires and displays

the results graphically. If the cable is wired correctly, straight lines are shown. If the cable is open or wired wrong, the display shows the wiring. The internal speaker beeps for good wiring and buzzes for incorrect wiring. After the digital test completes, an analog transmission test is performed. This test passes a 1 kHz and a 20 kHz signal through the cable and displays the dB loss at each frequency. Good cables should have less than 0.5 dB loss at both frequencies. Poor cables have a higher loss at 20 kHz.

Display/Controls

The following fields and parameters are displayed in the Cable tester function:

Cable Type

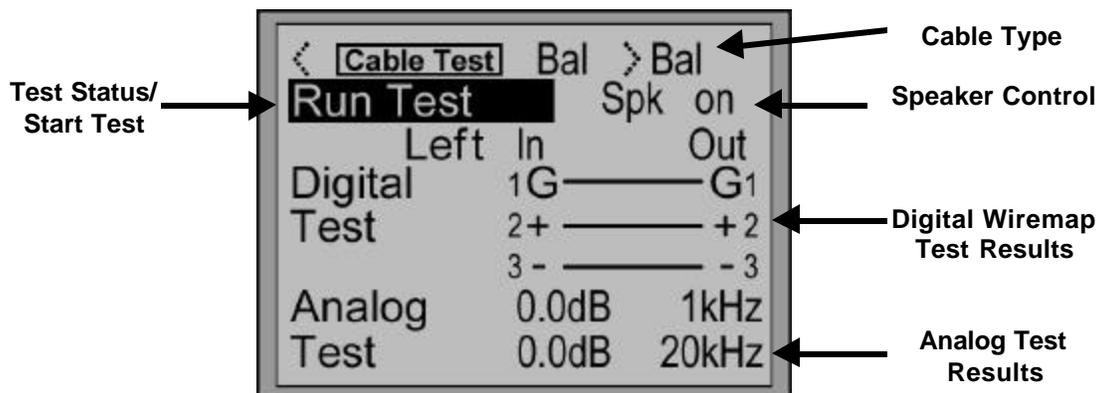
Use this field to select the type of audio cable that you are testing. Select one of the following types:

- Unbal > Unbal** - unbalanced-to-unbalanced cables
- Bal > Bal** - balanced-to-balanced
- Bal > Unbal** - balanced-to-unbalanced
- Unbal > Bal** - unbalanced-to-balanced
- Continuity** - allows the SP295 to function as a continuity tester (requires a test cable)
- Calibrate** - (use to calibrate the analog test after new software has been installed).

Test Status / Start Test - Click this field to start the Cable test. The field changes to indicate "Run Test" or "Test Running."

Speaker Control

The internal speaker can be turned on for an audible indication of the digital wiremap test results. The speaker beeps if a cable is wired properly, and buzzes if the wiring is incorrect. No audio indication is provided for the analog test, as different cable types have different characteristics. Highlight and click this field to turn the speaker on or off.



Wiremap Test Results

This display shows a graphical wiremap of the cable's wiring. It indicates normal through connections, shorts, opens, or crossed connections. Good cables show a straight line from the input pins to the output pins.

dB attenuation loss through the cable. Better cables show readings closer to 0, indicating no signal attenuation. For most audio cables, the 1 and 20 kHz levels should be less than 0.5 dB. Unequal response indicates a bad cable or a faulty solder connection.

Analog Test Results

This shows the results of the 1 kHz and 20 kHz transmission test. The numbers are the

Cable Test Operation

Testing Cables

1. **Select the Cable Test function.**
2. **Connect the cable to be tested to the SP295 input and output connectors.** Connect one end of the cable to the "L" input on the left side of the SP295 and the other end to the output connector on the right side of the SP295.
3. **Select the Cable Type.** The left designator corresponds to the input connector and the right designator corresponds to the output connector.
4. **Turn the speaker On or Off as desired** for an audible indication of the wiremap test.
5. **Start the test.** Highlight and click the Test Status field and click to begin the test. The field displays "Test Running" while the test is in progress and "Run Test" when completed.
6. **Read the results of the cable tests.**
 - **Wiremap Test** - Properly wired cable show straight lines from input to output. A missing line indicates an open connection, and lines that cross indicate incorrect wiring.
 - **Signal Transmission Test** - Good cables have little loss (0 - 0.5 dB) at 1 kHz and 20 kHz.

Note: The SoundPro uses XLR pin 2 hot. If your system is wired pin 3 hot, you will get wrong results. A simple way around this is to use an unbalanced output, either the RCA output or the 1/4" output with an unbalanced 1/4" plug.

Continuity Tester

1. **Wire a pair of continuity test cable adapters.** Connect one end of the test cable to the tip of a 1/4" plug and the other end of the test cable to a probe, such as a test probe or alligator clip.
2. **Connect one test cable to the SP295's "L" input and the other to the SP295's output.**
3. **Select "Continuity" test mode and turn the speaker "On".**
4. **Each time the test probes are connected together, a short beep will be heard.**

Speaker Polarity

Description

Correct speaker polarity is critical for achieving good stereo imaging, wide sound stage, and proper frequency response. The sound waveform reproduced by the speakers should follow the polarity of the sound wave that energized the recording microphone. For example, the beat of a drum should move the speaker cone outward on playback. A single out of phase speaker can degrade the performance of the entire audio system.

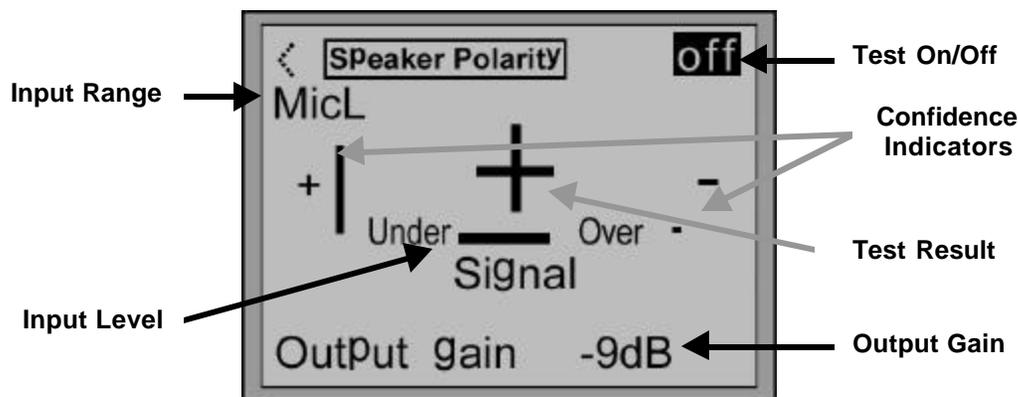
Determining proper polarity by listening to the speaker output is very difficult and

inaccurate, and observing cable polarity does not guarantee correct speaker polarity.

The SP295 Speaker Polarity test provides a simple, reliable way of determining absolute speaker polarity. It applies pulses to the amplifier and speakers and compares the polarity of the reproduced pulses picked up by the microphone to the polarity of the applied pulses. The polarity of all the speakers in an audio system can be quickly checked by driving all speakers simultaneously and positioning the microphone closer to one speaker at a time.

Display/Controls

The following fields and parameters are displayed in the Polarity test function:



Input Range

This field matches the sound level picked up by the microphone to the speaker sound level:

MicL - 30 dB - 95 dB (typical level)

MicH - 70 dB to 130 dB

Highlight the field and click the Control knob to toggle between MicL and MicH.

Input Level Bar Graph

This bar graph indicates when the signal picked up by the microphone is within a useable range. Select the Input Range that

produces a display closest to mid range, then adjust the Output Gain or amplifier volume to produce a near mid-scale reading.

Output Gain

This field adjusts the output level of the test pulse. Adjust the gain to produce a mid-scale reading on the Input Level bar graph. To adjust the gain, highlight the Output Gain field and click the Control knob to select it (underlined).

Confidence Indicators

The two confidence bars indicate if the SoundPro is picking up good sound from the speaker to insure an accurate test. Only one bar should be tall at a time (it does not matter which one, or if they alternate). If both bars are either tall or low, the test is picking up

background noise or multiple speaker sounds. Reduce room noise and/or move the mic closer to the speaker.

Test On/Off

Click the Control knob to toggle the Speaker Polarity test on and off.

Operation ---

1. **Connect the microphone to the Microphone Input connector.**
2. **Connect the SP295 Output to the amplifier input.** Set the amplifier to drive all speakers simultaneously. Adjust the amplifier volume to about 1/3 gain. *Note: Use an unbalanced output (either the RCA output or the 1/4" output) instead of the XLR output.*
3. **Set the Input Range to MicL.**
4. **Set the SP295 Output Gain to minimum.** *Caution: Start with SP295 Output Gain at minimum, to prevent speaker damage when the Polarity test is turned on.*
5. **Turn on the Speaker Polarity test function.**
6. If you are driving all speakers simultaneously, make sure that the microphone is closer to one speaker than to the others, and that there is a direct audio path from the speaker to the microphone.
7. **Adjust the SP295 Output Gain for a mid-range reading on the Input Level Bar Graph.**
8. **Observe the confidence indicators to see that the SoundPro is getting good information.** Only one bar should be tall. If both bars are tall or if both bars are low, there may be excessive background noise in the room, or the signal from another speaker(s) may be interfering. Reduce room noise and/or move the microphone closer the speaker you are testing.
9. **Observe the display for speaker phase.** A plus sign indicates that the speaker output is the same polarity as the signal that is being applied to the system input. *Note: Some loudspeakers are intentionally wired with one driver out of phase in the enclosure. This is done to provide a smoother phase response at the crossover point of the crossover network.*

TOOLS

Signal Generator

Description

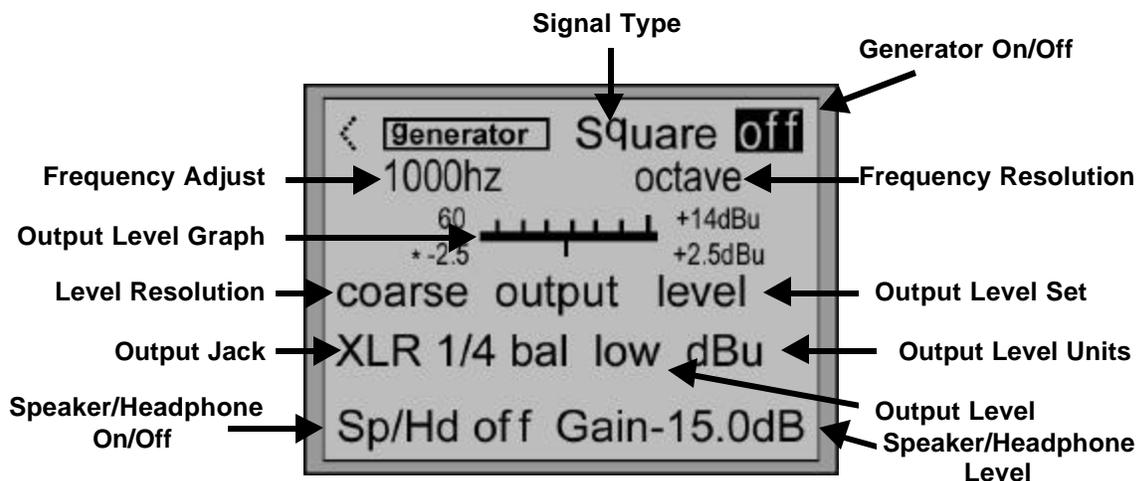
The SoundPro's internal signal generator is a general-purpose, crystal-controlled function that generates sine waves, square waves, white noise, and pink noise that you can use for testing, audio analysis, or recording. All signals are available at all of the output jacks and through the internal speaker. The internal speaker is active only when the signal generator display is active.

The sine and square wave signals are available at any audio frequency from 1 Hz to

22,000 Hz in 1 Hz increments using the fine tuning mode, and at ISO standard center frequencies using octave or 1/3 octave tuning. These signals are adjustable in level from -78 dBu to $+17$ dBu. The maximum white noise level is $+2$ dBu and the maximum pink noise level is 0 dBu. You can store your own default values for waveform type, frequency, and level, by using the Save Defaults function in the Setup & Calibration function.

Display/Controls

The following fields and parameters are displayed in the Signal Generator function:



Signal Type

This field selects the output signal type:

Sine - sine wave

Square - square wave

White - white noise

Pink - pink noise

To change the signal type, highlight the field and click to toggle between signal types.

Generator On/Off

Highlight this field and click to toggle the generator output **on** and **off**.

Output Level Bar Graph

The Level Bar graph provides a visual indication of the approximate generator output level, whether the output is on or off, so that you can set the approximate output

level before turning the generator on. Clicking the Output Level field makes the graph active. The level is adjustable from -60 to +14dBu (numbers above graph) in 1.5 dBu steps. Each tick mark represents 10 dBu, with the taller tick mark approximately equal to 0 dBu.

When the sine wave or square wave signal types are selected, the graph also provides a fine level adjustment range of ± 2.5 dBu in 0.05 dBu steps (numbers below graph).

Output Level Resolution

This field works with the Output Level Bar Graph and displays which adjustment mode the generator is in. It only displays "fine" or "coarse" when a sine wave or square wave signal type is selected. (Pink and white noise levels are only adjustable in "coarse" steps). In the "course" adjustment mode, the entire Level Bar Graph moves as the Control knob is turned, indicating the approximate output level between -60 and +14 dB (1.5 dBu steps). In the fine adjustment mode, a single tick mark is displayed below the Level Bar Graph. This shows the level being fine tuned ± 2.5 dBu above and below the coarse level indicated on the main bar graph (0.05 dBu steps).

Switching between the coarse and fine adjustment modes is automatic as you turn the Control knob. Turning the Control knob to the end of the ± 2.5 step fine scale automatically switches to the "coarse" adjustment mode and continues adjusting the level in the direction the knob is being turned. Reversing the direction of the Control knob in the "coarse" mode automatically switches to the "fine" adjustment mode.

Output Jack

Use this field with the Output Level field to display the actual output signal level. Select either **XLR ¼ bal** (signal level at the balanced output connectors) or **RCA unbal** (level at the unbalanced output, which is normally about 6dB lower than the balanced output). The Output Level field shows the actual signal level at the output connector,

including the effect of any loading caused by the connected device. To select the output connector, highlight the field and click to toggle between outputs.

Output Level Set

Click this field to enter the output signal level adjustment mode, then turn the Control knob to set the level. A visual indication of the approximate signal level is shown on the Output Level Bar Graph with the generator turned either "On" or "Off". When the generator is turned on the actual output level at the output jack is also displayed in the Output Level field.

Output Level

The Output Level field shows the actual calibrated signal level at the output connector that is selected by the Output Jack field (including loading). Use the Output Level Units field to select the measurement units. The Output Level field displays "low" when the generator is turned "Off". The output level changes in fine or coarse steps, as selected by the Output Level Resolution.

Output Level Units

This field determines what units are used to measure the output level that is displayed in the Output Level field. Measurement units include **dBu**, **dBv**, **Vave** (average RMS), **Vrms** (true RMS), and **Vp-p** (volts peak-to-peak). To change the measurement units, highlight the field and click until the desired value is displayed.

Frequency Resolution

The sine waves are variable from 1 Hz to 20 kHz, and square waves from 1 Hz to 1,600 Hz. The frequency can be set in three resolution steps; octave, 1/3 octave, and fine. Octave and 1/3 octave modes step between ISO-standard center frequencies, while fine steps the frequency in 1 Hz increments. Use the Frequency Adjust field to select the desired frequency. To change the frequency resolution, highlight the field and click to toggle between resolutions.

Frequency Adjust

Highlight and click this field to change the frequency of the sine and square wave signals. Depending on the setting of the Frequency Resolution, the frequency may be varied in 1 octave, 1/3 octave, or fine (1 Hz) steps.

Speaker & Headphone On/Off

Set this field to "On" if you want hear the generator output from the internal speaker and

headphone output. The speaker and headphone turns on and off simultaneously when the generator is turned on and off.

Speaker & Headphone Gain

The speaker and headphone gain may be adjusted from -81.0 dB to 0.0 dB, independently of the line output level.

Signal Generator Operation

1. **Connect the SP295 Output to the audio amplifier or component input.**
2. **Set the Output Jack field to correspond to the connector that you are using.** You need to select the Output jack only if you are setting the output level to a specified amount.
3. **Select the desired signal type.**
4. **Set the desired Frequency (sine and square wave only).** To tune to a frequency other than a standard octave or 1/3 octave center frequency, use the octave or 1/3-octave steps to tune to the closest frequency, then use the fine-tuning to select an exact frequency.
5. **Select the desired measurement unit.** You need to change the measurement units only if you need to set the output level to a specified amount.
6. **Adjust the approximate output signal level.** View the Output Level Bar Graph for a visual indication of the signal generator output level before turning the generator on. The second and taller tick mark from the right is approximately 0dBu and each smaller tick mark represents approximately 10 dB. When an exact output level is desired, use the coarse mode first to set the output close to the desired level, then switch to the fine mode.
Note: White and pink noise levels are adjustable only in coarse steps.
7. **Turn the generator on and set the exact output level, if needed.** View the digital Output Level field (displayed only when the signal generator is "on") when setting the exact level.

The generator settings are automatically saved when you exit the function and when the power is turned off. Entering the generator function recalls the last generator settings.

Level Meters

Description

The Level Meter function includes two meters: a stereo audio level meter and a DIN-standard stereo VU/PPM bar graph meter. Highlight and click the meter field at the top of the display to switch between the VU/PPM and the Signal Level display modes. The signal generator output is available in either level meter function.

The Level Meter measures the Left and Right input levels simultaneously, using either pair of SP295 stereo inputs. The level resolution changes with input level. In the range of -9.95 to +8.50, the output level changes in steps of 0.05 dB. Outside this range, the step size is 0.1 dB. Three line-input ranges of ExtL, Ext, and ExtH may be

manually selected to accept levels from -95 dBu to +40 dBu, or use autorange. All measurements are performed in averaging mode, which is the same method used by the meters on most tape recorders, consoles, and outboard equipment, so the SoundPro readings conform to the readings of most recording studio signal level meters.

The VU/PPM meter provides a standard left and right VU display. The absolute signal level to which the meter's 0 VU point is referenced may be adjusted from -30 to +20 dBu. The PPM (Peak Program Meter) indicator is shown as a single bar that bounces above the main bar. The PPM meter uses the same reference level as the VU meter.

Level Meter Display and Controls

Input Range (left and right input)

Select from three manual input ranges; **ExtL**, **Ext**, and **ExtH**, or **Auto** (autorange) to accept levels from -95 dBu to +40 dBu. The input range for the left and right inputs is selected independently.

Units

The same measurement units are selected for both channels. Select one of the following signal level units:

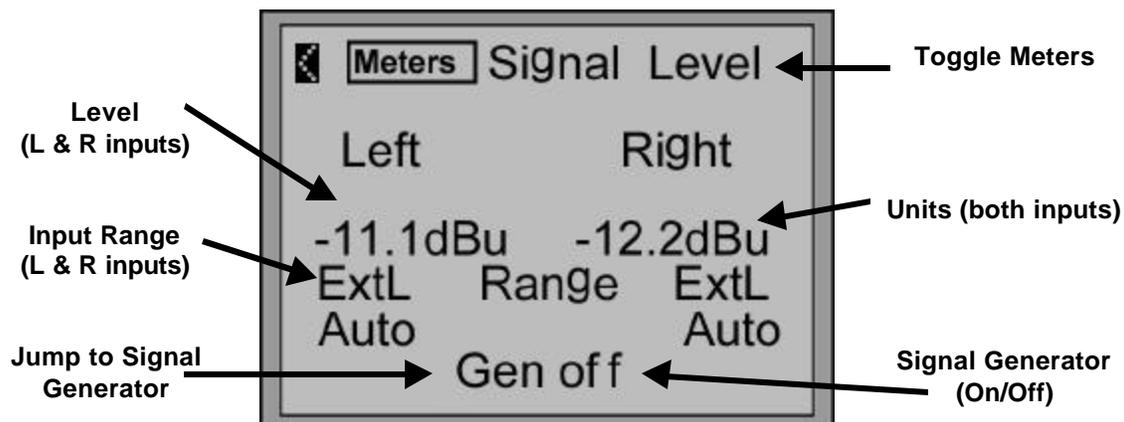
dBu - dB scale with 0 dB referenced to 0.775 Vrms (voltage equivalent of 0 dBm)

dBv - dB scale with 0 dB referenced to 1.00 Vrms

Vave - average voltage level of waveform

Vrms - true RMS voltage calculation of waveform

Vp-p - true peak-to-peak, using an algorithm that is accurate for all waveform types



Level

These fields display the signal level that is present at the left and right input connectors.

Jump To Signal Generator

Click to jump to the Signal Generator display to set up the generator as desired. Clicking '<' returns to the Meter display.

Signal Generator On/Off

The signal generator can be turned on to provide the selected signal to the output

connectors. Click to toggle the generator on or off.

Toggle Meters

Click on this field to toggle between the "Signal Level" display and the stereo "VU/PPM Meter" bar graph meter display explained in the next section.

Level Meter Operation

1. **Plug one or two audio sources into any of the audio input connectors.** Do not plug two sources into the different jacks for the same channel or the readings will not be accurate.
2. **Select the Level Meter Test function.** The Signal Level meter function is the default selection when the Meter display is opened. If the VU/PPM Meter function is displayed, highlight the Toggle Meters field and click to toggle functions.
3. **Select the desired display units.** The same units are selected for both inputs.
4. **Select the measuring range.** As the SoundPro changes ranges, the display may momentarily say "OVER" or "UNDER" and you may hear the signal bleed through the internal speaker.
5. **Use the signal generator as needed.**

VU/PPM meter Display/Controls

Input Range

Highlight and click to toggle input ranges:

Ext (-75dBu to +7dBu)

ExtH (-40dBu to +40dBu).

Jump to Signal Generator

Click to jump to the Signal Generator display to set up the generator as desired. Clicking '<' returns to the Meter display.

Signal Generator On/Off

The signal generator can be turned on to provide the selected signal to the output

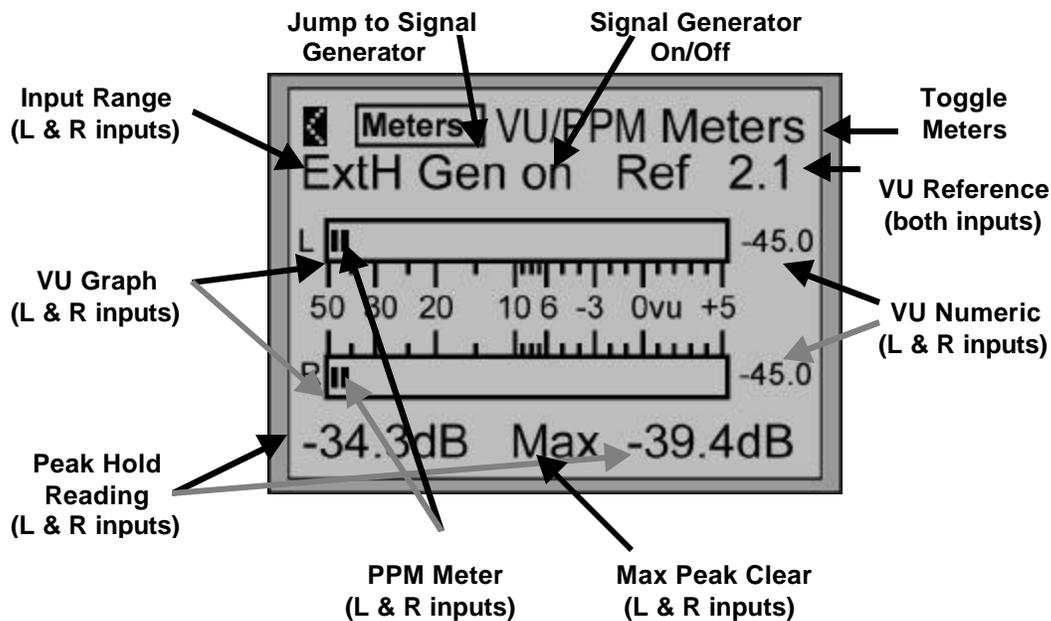
connectors. Click to turn the generator on or off.

Toggle Meters

Click on this field to toggle between the "Signal Level" display and the stereo "VU/PPM Meter" bar graph meter display explained in the previous section.

VU Reference Level

This field sets the absolute signal level to which the meter's 0 VU point is referenced. It can be adjusted from -30 to +20 dBu.



VU Numeric

Graphic VU display of the Left and Right levels, relative to the reference level set.

VU Graphic

Numeric VU display of the Left and Right levels, relative to the reference level set.

PPM Meter

The PPM (Peak Program Meter) indicator is a single bar that bounces above the main bar. It

uses the same reference level as the VU meter.

Peak Hold & M Peak Clear

The maximum peak level is shown at the bottom of the display for both the Left and Right inputs. Highlight and click the Max Peak Hold field to reset the peak readings.

VU/PPM Meter Operation

1. **Plug one or two audio sources into any of the audio input connectors.** Do not plug two sources into the different jacks for the same channel or the readings will not be accurate.
2. **Select the VU/PPM Test function.** The Signal Level meter function is the default selection when the Meters display is opened. If the VU/PPM Meters function is displayed, highlight the Toggle Meters field and click to toggle functions.
3. **Select the measuring range.**
4. **Set the 0 VU reference level.**
5. **Read the VU and/or PPM meter levels.**

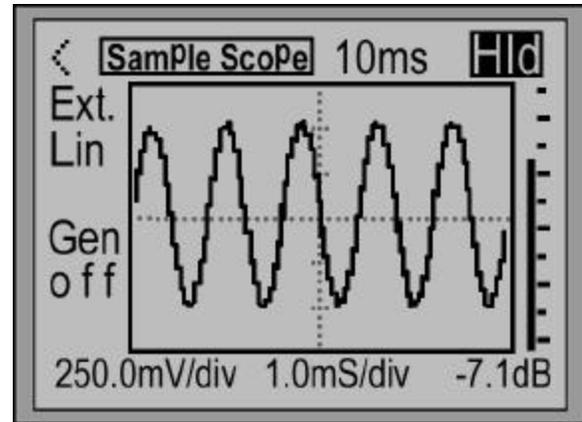
Sample Scope

Description

The Sample Scope is an audio-bandwidth digital oscilloscope. It has a sample rate of 48 kHz, meaning that it is useful for viewing signals below 10 kHz. It provides AC-only input coupling (down to approx. 3 Hz) for viewing the AC component of waveforms. Use the Sample Scope to look for gross waveform distortion, obvious clipping, input over-ranges, for identifying repetitive waveforms, or to verify the presence of an input signal. The X-Y mode can be used as a graphical phase meter to view accurate phase relationships for signals up to approximately 22 kHz.

The Sample scope auto-triggers on repeating waveforms with a trigger level automatically set to 1/256th of the maximum vertical scale.

The display is refreshed approximately every 1/2 second. Input signals may be applied using the left or right external line inputs, or the microphone input. A bar graph and digital readout show the level of the applied signal. The following table lists the input modes and the corresponding scope, bar graph and level meter displays.

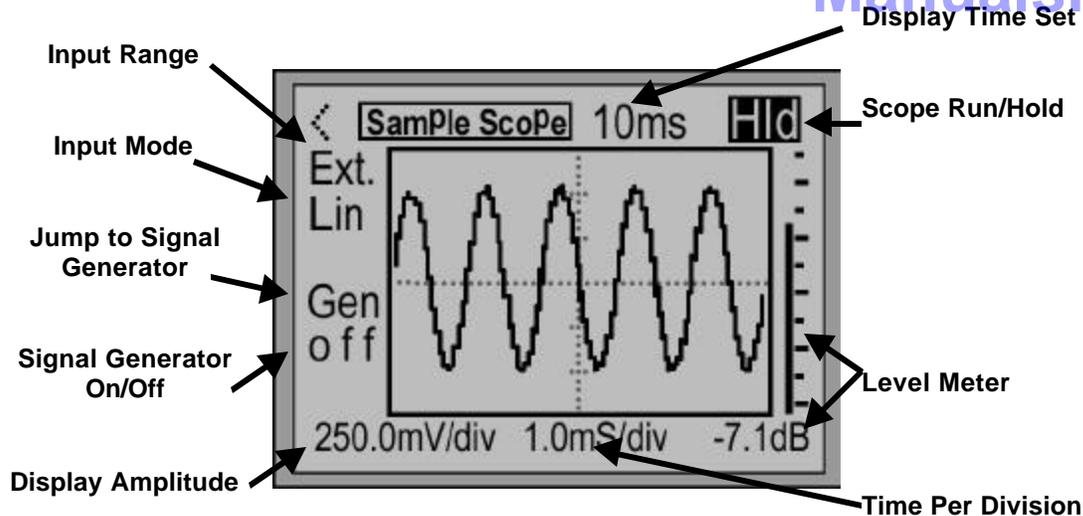


Display/Controls

Input Mode

The sample scope works with either the left or right Line in, or the microphone input. The table below lists the input modes and shows the resultant display on the scope screen and the bar graph level meter.

Input Mode	Scope Signal Displayed	Bar Graph Level Meter
L	Left Line Input	Left input signal, dBu
R	Right Line Input	Right input signal, dBu
L&R	Both inputs, overlaid, triggered on the left input	Sum of left and right signals, dBu
L+R	Both inputs, summed	Sum of left and right signals, dBu
L-R	Both inputs, difference	Left signal minus right signal, dBu
Mic	Microphone Input	MicL in level, dB SPL, unweighted



Input Range

The vertical display corresponds to the amplitude of the input signal. When any of the line input modes are selected, the vertical display is calibrated in volts/div (or mV/div.) The microphone input is calibrated in SPL level units of mPa/div and has only one range, 7.8 mPa/div to 500 mPa/div. The ranges for the line inputs are:

ExL (0.156 - 10 mV/div.)

Ext (15.6 - 1000 mV/div)

ExH (1 - 4 volts/div.)

Display Time & Display Time Set

The horizontal axis has 10 divisions marked along the center horizontal line. The time that corresponds to each division is indicated by the time/div displayed at the bottom center of the display. The time selected in the Display Time field corresponds to the time across the full graph. Full screen display times are 1, 2, 4, 10, 20, 40, or 80 mS or X/Y mode. In the X-Y mode, accurate phase relationships can be seen up to approximately 22 kHz. Highlight the Display Time Set field and click to cycle through the available times.

Scope Run/Hold

Click this field to turn the Sample Scope on and off. Turning the scope off freezes the waveform that is currently displayed. (Changing the time/div or amplitude/div while the display is in "Hld" will not change the display).

Display Amplitude

The vertical scale has 6 divisions. This field selects the amplitude that corresponds to each division. Values are **15.6, 31.2, 62.5, 125, 250, 500, or 1000**. When the Mic input mode is selected the vertical scale units are in Pa/division, where 1 Pa (Pascal) = 94 dB SPL. The vertical scale is in mV/div for all other inputs. To set the vertical scale highlight the field (underlined), then turn the Control knob to select the desired setting.

Level Meter

The vertical bar graph displays the relative level of the incoming signal. The numeric value below the graph indicates the level in dBu for line inputs or dB SPL for the Mic input.

Jump To Signal Generator

Click to jump to the Signal Generator function, set up the generator as desired, then return.

Signal Generator Run/Hold

The signal generator can be turned on to provide the selected signal to the output connectors. Click to turn the generator on or off.

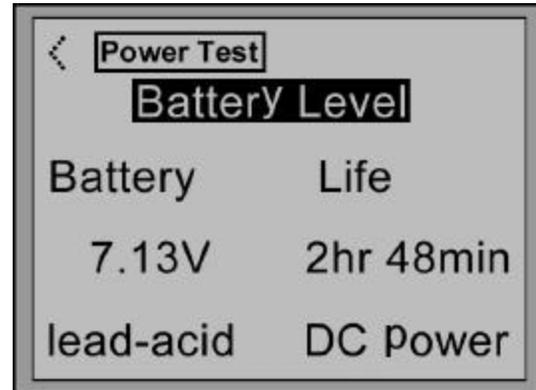
Sample Scope Operation

1. **Connect the input signal.** Plug the audio source(s) into the L or R line inputs on the left side of the SP295, or use the microphone input.
2. **Turn the sample scope function on.**
3. **Select the input mode.** Toggle the Input Mode to match the input.
4. **Select the input range.**
5. **Adjust the display amplitude for a display that has sufficient height, but is not clipped.** Selecting a V/div setting that is too low will cause the waveform display to be clipped.
6. **Select the Display Time or X-Y mode.**
7. **View the input signal.**
8. **Turn the scope "Off" to freeze the display.**

UTILITIES

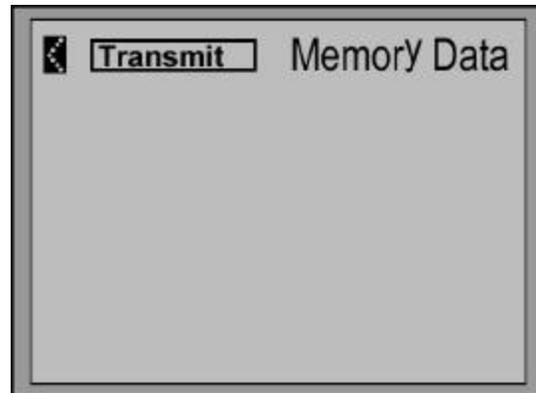
Power Test

The Power Test display shows the voltage and remaining "Life" of the internal lead-acid battery. The Life reading is the approximate time before under-voltage shutdown. Use the remaining battery life as an approximation only, as different SoundPro functions require more battery power, and older batteries discharge faster than new, fresh batteries. There are no user-selectable fields in the Power Test display screen.



Transmit Data

This function allows you to transfer RTA and ETG graph data to a computer for storage, analysis or printing. The data is in a comma delimited, ASCII format and includes headers that identify the data. To transfer data, connect the supplied serial adapter cable between the Serial Interface port on the SoundPro and an open serial port on the host computer. You will need to run an application program such as the *SoundPro Audio Report* software to transfer the data.



Setup and Calibration

The Setup and Calibration utility has several options: Save Defaults, Input calibration, Output calibration, SPL calibration, and General. Each SoundPro is fully tested and calibrated before it leaves the factory. All calibration constants are stored in non-

volatile memory. Accurate operation of the SoundPro depends on this calibration. For this reason, only the General Setup and Save Defaults menus are covered here. Contact the Sencore Service Department if you feel your unit needs re-calibration.

General Setup Screen:

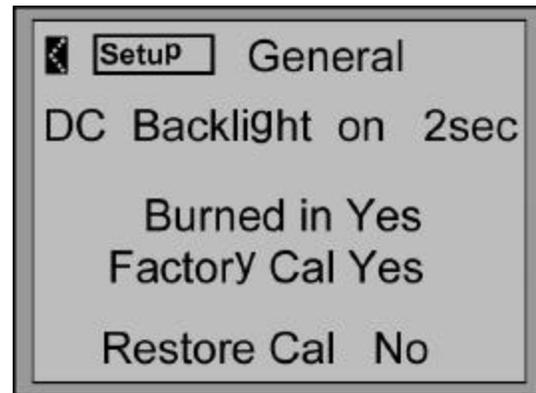
This menu has fields for miscellaneous data values that are stored in the SoundPro. Each is described below. Since you can alter the contents of the calibration values stored in the SoundPro, be careful with these data fields! *If you are unsure of what to do, contact Sencore technical support before altering any setting.*

DC Backlight On - This field controls how many seconds the display backlight stays on after the Control knob is last turned or clicked. Enter any number of seconds from 0 to 999. Keeping the backlight off conserves battery power. The backlight stays on continuously under AC power.

Burn-in - This field indicates whether or not the SoundPro has been through the burn-in process. When a SoundPro is first powered up in manufacture, it enters a burn-in and self-calibrate state. Several constants are stored at this time. The unit may be forced through the burn-in process again by setting the burn-in data field on the General Setup menu to No, exiting the menu, and powering the unit off and back on. The burn-in procedure takes one hour to complete. Note that this may affect the main calibration.

Factory Calibration - This field indicates whether or not the SoundPro has been through the factory calibration process. The factory calibration process requires a special calibration fixture. *Contact Sencore technical support before changing this field.*

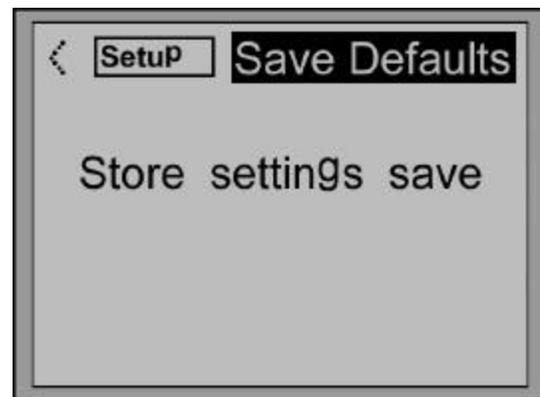
Restore Factory Calibration - The factory calibration constants are stored in non-volatile memory. A second copy of the constants is also stored so that, if the first set is altered, the original factory calibration can be restored. To do this, set the Restore Cal data field on the General Setup menu to Yes and exit the menu. The original factory calibration will be restored.



Save Defaults Screen:

This screen allows you to store the following default instrument setup values:

- all of the last selected sub-menus.
- last selected signal generator waveform type, frequency, and level.
- last selected RTA graph settings.
- last selected sample scope settings.
- last selected level settings for most functions.
- last selected input selections for most functions.



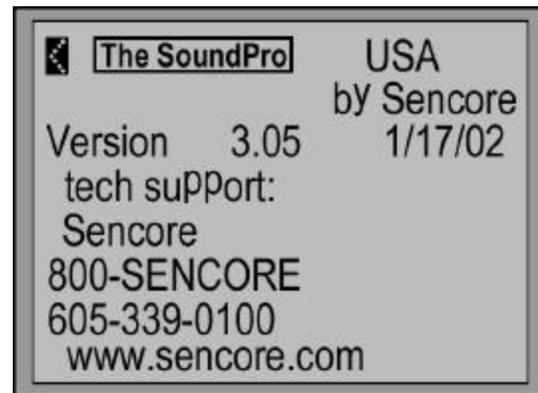
The default setup values are stored in non-volatile memory and are retrieved whenever the SoundPro is turned on. All stored settings are updated with the current settings each time you restore the values.

To store a set of user defaults:

1. Go to the Setup & Calibration functions, on the Utilities menu.
2. If it is not already showing, change the sub-menu until you reach “Save Defaults”.
3. Move the cursor to the “Save” field and click.
4. Click on the ‘<’ field to exit the function. All current settings are now stored, and will be recalled each time the SoundPro is turned on.

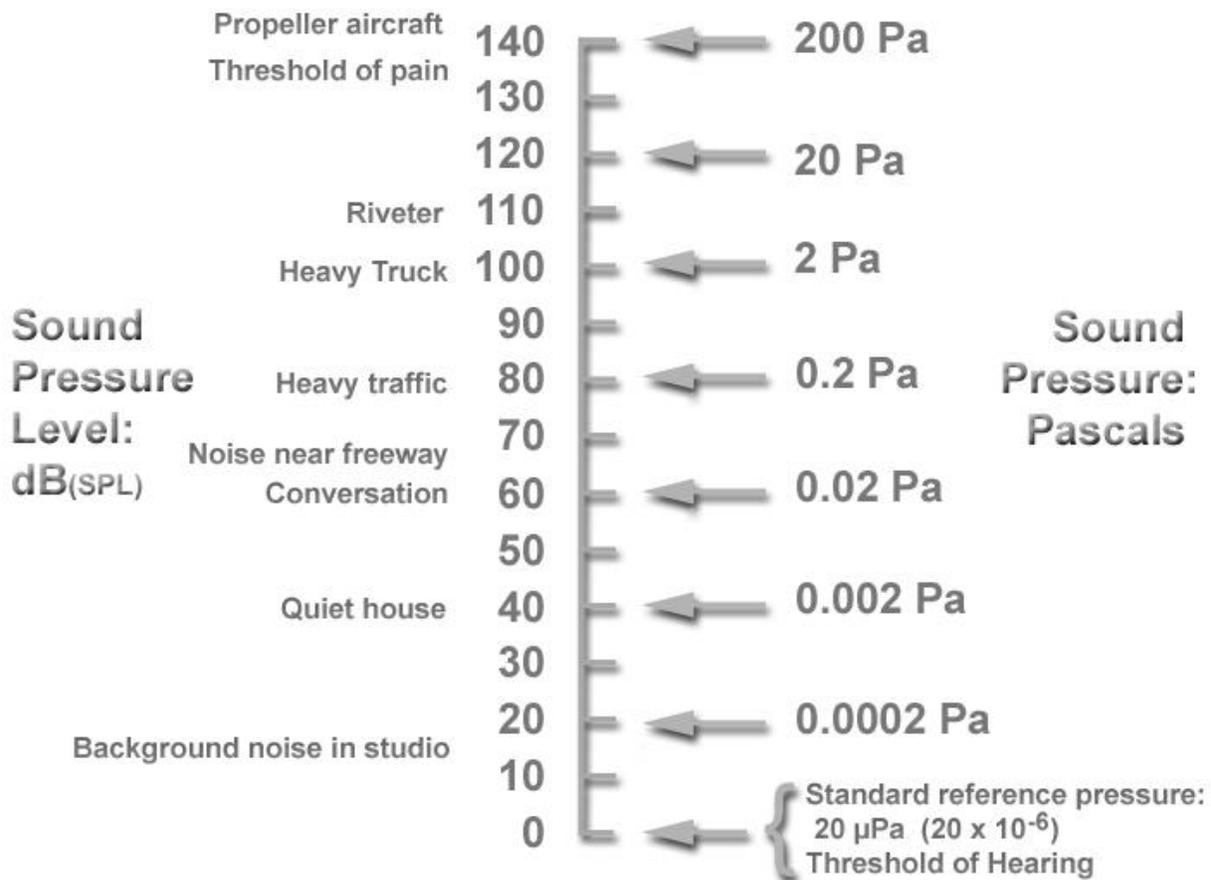
About Screen:

This screen provides unit information and technical support contact information about your SoundPro. It displays the version number and date of the installed firmware.



APPENDIX A - dB SPL Scale

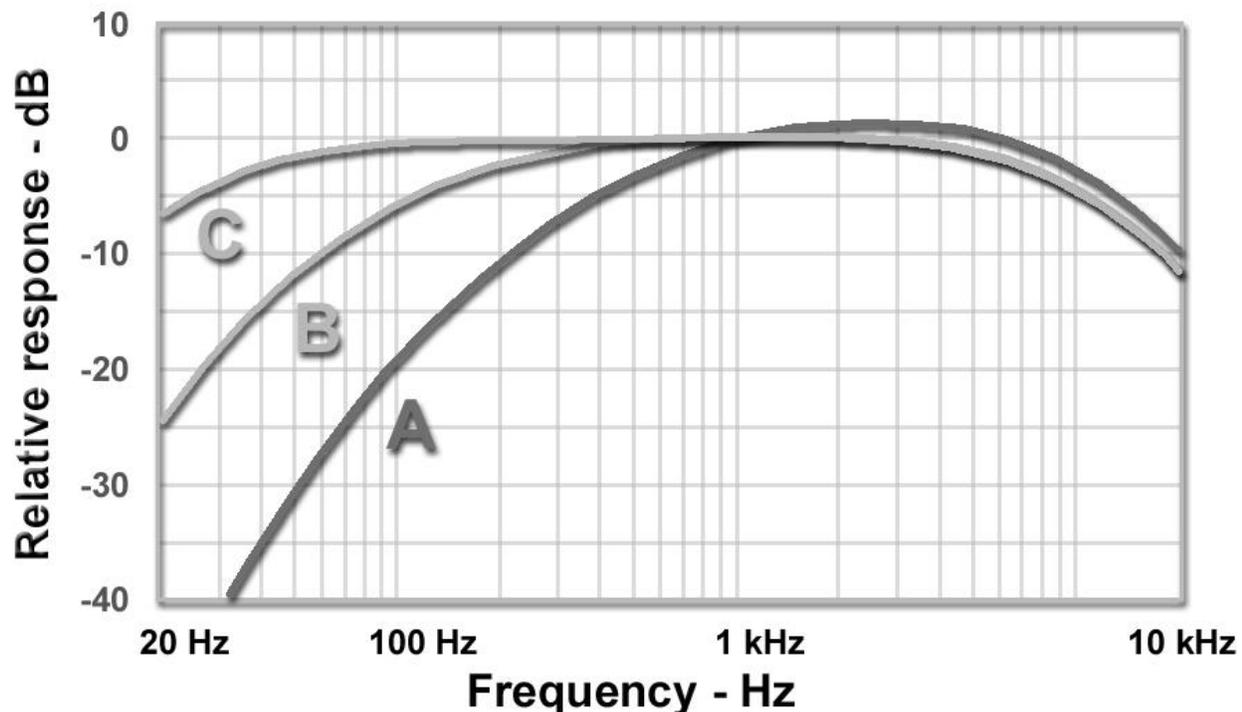
The 0 dB SPL reference level is set at 20 μ Pa (pressure equal to the threshold of hearing at 1kHz). This places the upper threshold of pain near 135 dB SPL. Unless otherwise noted, SPL readings use this reference and omit the "SPL" notation. For example, a sound level expressed as 60 dB is actually 60 dB SPL, referenced to 20 μ Pa.



APPENDIX B – ANSI Weighting Curves

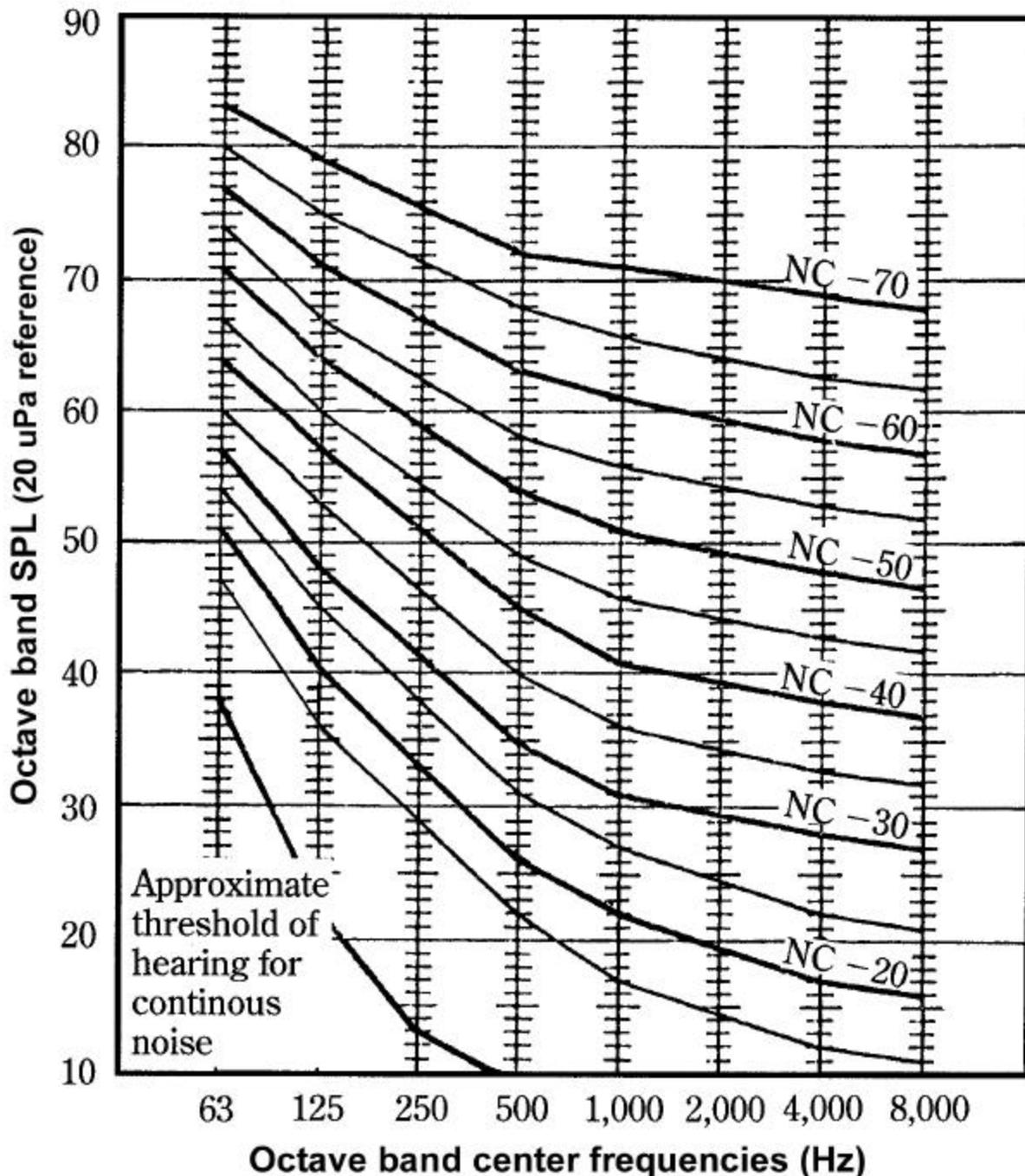
SPL meters convert sound pressure variations into an electrical signal that changes in amplitude, according to the sound pressure. The display shows the sound pressure level with a flat or linear response to all audio frequencies. Our ears however, do not have the same sensitivity for all frequencies. Instead, the sensitivity of our ears changes with sound level and frequency. In order for SPL readings to more closely correspond with what we hear, electronic filters are added to the SPL measurement circuitry. These filters, or weighting networks as they are commonly called, filter the measurements to correspond to the various sensitivities of our ears.

Three standard ANSI (American National Standards Institute) weighting curves are used in SPL meters. They are simply called A, B, and C weighting. The A-weighted curve approximates the 40 phons equal loudness curve, and is used when measuring SPLs of 20-55 dB. The B curve closely follows the 70 phons curve, and is used when measuring SPL levels of about 55-85 dB. The C curve, which closely follows the 100 phons curve, is used when measuring SPLs from about 85-140 dB. Weighted SPL readings are often referenced by the corresponding weighting curve; dB(A), dB(B) or dB(C).



APPENDIX C – ANSI Balanced Noise-Criterion Curves

Simple SPL measurements do not represent the background noise our ears hear. Because our ears are less sensitive to low frequency noise than to high frequency noise, noise levels at higher frequencies must be given more weight than levels at lower frequencies. This results in a set of curves called Noise Criterion or NC curves. The curves are arbitrarily numbered for easy reference. The Noise Criteria (NC) rating of a room is the number of the lowest curve that is not exceeded by any of the noise in the room. To determine an NC rating, the noise levels at 8 different octave band frequencies are measured and compared to the Noise Criteria curves.



WARRANTY AND SERVICE INFORMATION

WARRANTY

Your SP295 SoundPro has been built to the highest quality standards in the industry. Each unit has been tested, aged under power for at least 24 hours and the every function and range was retested to insure it met all published specifications. Your instrument is fully protected with a 1-year warranty.

SERVICE

Save the original shipping carton and packing material for reuse should you ever need to ship your SP295, or return it to the Sencore factory for repair.

1. If you are returning the unit to Sencore for service, call the service department at the number below and enclose the following information: owner's address, billing information, purchase order (if applicable), name and phone number of contact person, description of problem and reason for return. No return authorization is required.
2. Completely enclose the unit inside a plastic bag to protect its finish and prevent foreign material from getting inside.
3. Cushion the unit equally on all sides with a minimum of 3 inches of padding material. Pack the padding tightly enough to prevent the unit from shifting during shipment.
4. Seal all seams on the container with strapping tape.
5. Send the packed unit to the following address (we recommend shipping via United Parcel Service):

SENCORE FACTORY SERVICE
3200 Sencore Drive
Sioux Falls, SD 57107

Most service repairs are completed within 72 hours. If you need to ask about your unit, the Sencore Service Department phone number is:
 1-800-SENCORE (736-2673) or FAX (605) 339-7032

Fill in for your records:

Purchase date: _____

Serial Number (on opening power-on display) _____

Software version (in Utilities ABOUT menu) _____

SENCORE

3200 Sencore Drive
Sioux Falls, SD 57107
Call 1-800-SENCORE (736-2673)
www.sencore.com

*Innovatively designed
with your time in mind.*