

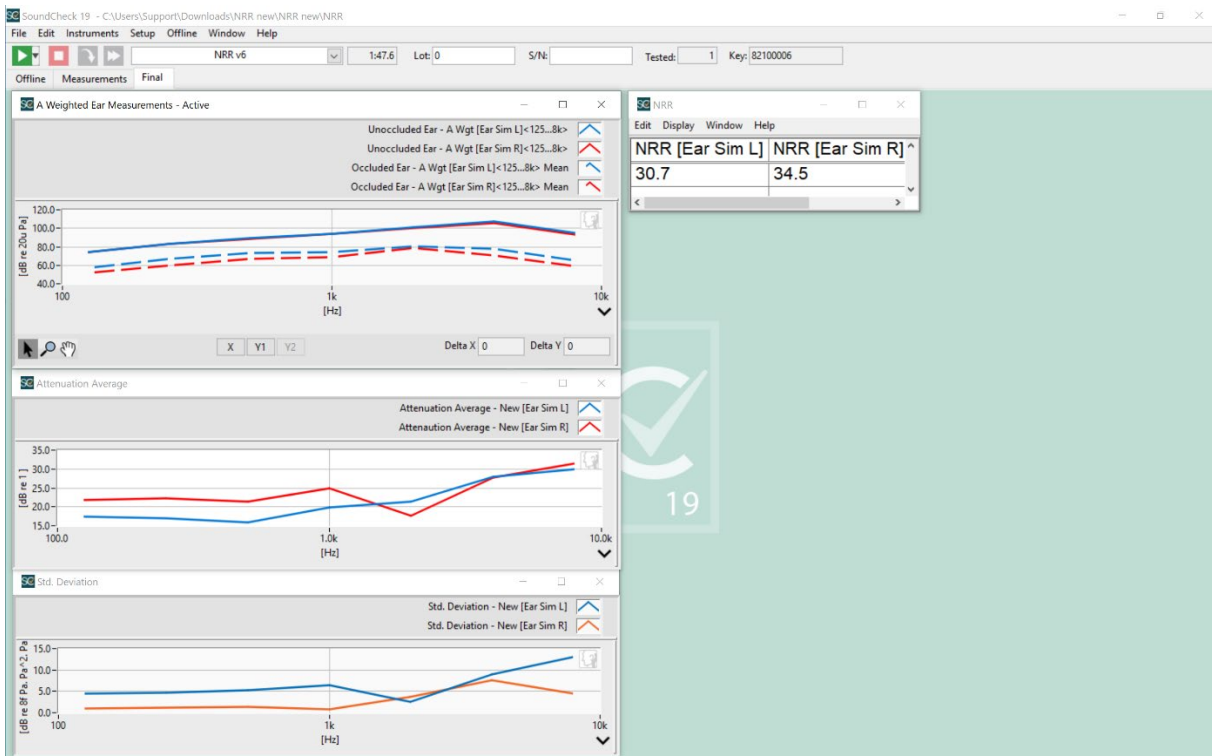
# Sequence Note

## Measuring Hearing Protection Devices to ANSI S3.19-1974 Standard

### Introduction

This sequence is used to measure the NRR, or Noise Reduction Rating, of a hearing protection device to the ANSI S3.19-1974 standard. NRR is a numerical representation of the sound attenuation of a device. The sequence first measures the response spectrum of the unoccluded hearing protector test fixture, then makes a second measurement with the hearing protection DUT affixed. A signal generator virtual instrument generates the pink noise stimulus while an RTA virtual instrument simultaneously records the A and C weighted noise spectrums. The unoccluded and occluded measurements are analyzed with a series of post-processing steps according to the ANSI S3.19-1974 standard. The final display shows the NRR numerical value, RTA spectra of the left and right side of the unoccluded and occluded hearing test fixture, average attenuation level of the DUT, and the standard deviation of the DUT on the test fixture.

The sequence will prompt the user to recall previously saved unoccluded measurements and standard deviation values, saving time if the test fixture and DUT have been measured previously. When a new unoccluded measurement is taken, the user has the option to save these measurements for a future data recall.



Final Display for ANSI S3.19-1974 standard measurement on a hearing protection device

## Hardware Requirements

- Hearing Protection Test Fixture or equivalent Head Simulator
- Source Speaker with minimum frequency range of 100hz - 10kHz
- Listen SCM-4 Reference Microphone (Listen p/n 4012) or equivalent (only for calibration)
- Listen AmpConnect ISC (Listen p/n 4042) or equivalent: req. 2-3 input with IEPE power, 1 output

## Software Requirements

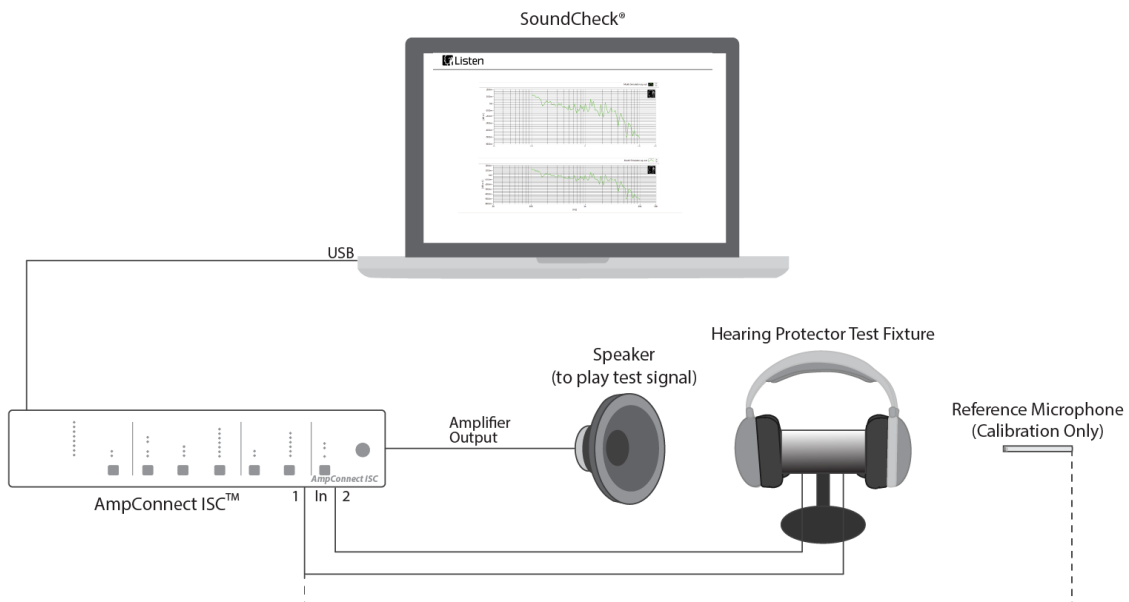
SoundCheck 19

## Hardware Setup & Calibration

1. Connect the reference microphone to input 1 of the audio interface.
2. Calibrate the reference microphone as instructed in the SoundCheck manual.
3. Position the reference microphone as close to one side of the hearing protector test fixture as possible and calibrate the source speaker as instructed in the SoundCheck manual.
4. Disconnect the reference microphone and connect the hearing protector test fixture to your audio interface; left side into input 1, right side into input 2

You are ready to start the sequence.

## System Diagram



## Sequence Logic

Type	Step Name	#	Out	In
Mes	x=3k	1	// Create x=3k	
Mes	x=4k	2		
Mes	x=6k	3	// Create x=6k	
Mes	x=8k	4		
Mes	Operator Dialog	5		
Mes	Operator Dialog	6	// Prompt operator to recall example data	
Rec	Recall curves	7	// Recall example data	
Rec	Recall curves	8		
Pos	Curve Subtraction	9	// Create Dummy x Value	
Mes	Number of Trials	10		
Mes	Operator Dialog	11	// Prompts operator to recall previously saved unoccluded ear curves	
Rec	Recall curves	12	// Recall previously saved unoccluded ear curves	
Mes	Operator Message	13		
Acq	Virtual Instruments	14	Source Speaker	Ear Sim L Ear Sim L Ear Sim R Ear Sim R
Pos	Windowing	15		
Mes	Operator Dialog	16	// Prompts operator to save unoccluded ear curves	
Aut	Save to Dat - Append	17	// Autosave Unoccluded Ear Curves	
Mes	Operator Message	18	// Prompts operator to place DUT on test fixture	
Acq	Virtual Instruments	19	Source Speaker	Ear Sim L Ear Sim R
Pos	Windowing	20		
Sta	Curves	21		
Lim	Loop Index	22		
Mes	Operator Message	23		
Dis	Measurements	24		
Com	comment	25 - 62	// Attenuation Curve Post-processing	
Lim	Single Value - Lower Only	63	// Limit step for Std. Deviation jump logic	
Com	comment	64 - 101	// Standard Deviation Curve Post-processing	
Aut	Save to Dat - Overwrite	102		
Rec	Recall curves	103		
Pos	Curve Division	104		
Pos	Curve Division	105	// APV98 [L]	
Pos	Curve Division	106		
Pos	Curve Division	107	// APV98 [R]	
Pos	Curve Division	108	// Occluded Ear [L] A Wgt. / APV98 [L]	
Pos	Curve Division	109	// Occluded Ear [R] A Wgt. / APV98 [R]	
Pos	Power sum	110	// Power Sum C Weighted Unoccluded Ears	
Pos	Power sum	111	// Power Sum Occluded Ear A Wgt. / APV98	
Pos	Curve Division	112	// Unoccluded Ear C Wgt. Sum / (Occluded Ear A Wgt / APV98)) [L]	
Pos	Curve Minus Constant dB	113	// Above -3dB	
Pos	Curve Division	114	// Unoccluded Ear C Wgt. Sum / (Occluded Ear A Wgt / APV98)) [R]	

Pos	Curve Minus Constant dB	115	// Above -3dB
Dis	Final	116	

### Further sequence development

To further develop the sequence, you can:

- Use multiple loudspeakers to create a noise field around the DUT, instead of a single source speaker
- Add a step to autosave data