

Setting Voltage Levels In Car Stereo Using the SA-3050A RTA

Why Level Match?

Usually, high voltage levels in audio systems, give better signal to noise ratios. You want high signal to noise levels so you do not hear the thermal hiss which is present in *all audio systems* (sometimes even worse in digital systems). As shown by Diagram 1, you need the maximum signal level to be below clipping but as far as possible above the noise floor.

Without a bunch of fancy instruments, how do you set all the levels in the sometimes numerous components in a car stereo system? The answer is as close at hand as your trusty real time spectrum analyzer.

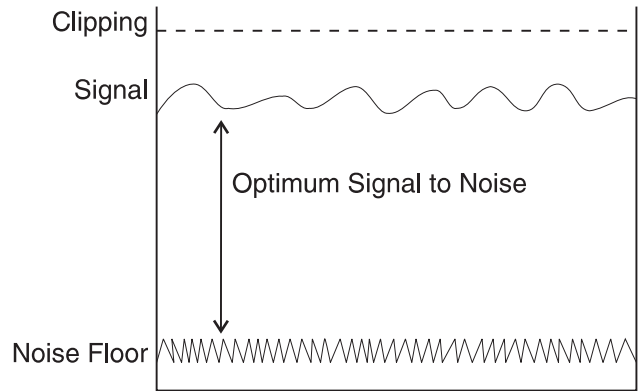


Diagram 1

How to Use the SA-3050A to Set Levels

1. Connect SA-3050A as shown (Diagram 2) with one channel of the output of the unit you are setting plugged into Input 3 (1/4" headphone type balanced input). Note: you will need to unplug the microphone or any other inputs and use an RCA to 1/4" adaptor as pictured in Diagram 2.



Diagram 2

2. Put the SA-3050A on digital SPL (hold the SPL button in for 2 seconds) with

input sensitivity level set according to voltage goal and table on the next page.

3. Play pink noise through unit you are setting. The best way to do this is to use a pink noise CD or tape played from the source unit. You can use the pink noise built into the SA-3050A. For a pink noise CD, our recommendation is IASCA Disc No. 2.

4. First, set one channel then the other. All left/right pairs of channels should be the same. How high should you set the output? The answer to this is to base your settings upon the manufacturer's



specifications for maximum output level. Note that decibels are logarithmic so there is a big improvement in going from 1/4 volt to 4 volts and little difference between 4 and 6 volts.

5. You should start at the first unit in the signal chain and work your way toward the amplifiers. See rules of the road on the next page for some additional advice.

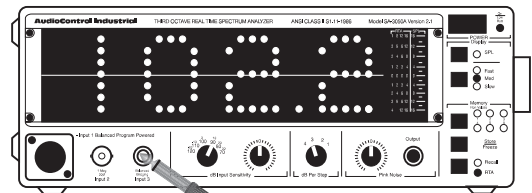


Diagram 3

Converting dB SPL on a SA-3050A into Volts

As noted before, the logarithmic nature of decibels means that the most improvement comes from raising a very low voltage to 3 to 4 volts. As you can see from this chart, an extra one-half volt up around 7 volts doesn't really count for much more signal to noise. (Amazing fact to impress your friends with; 170 dB on this type of measurement is 2,818 volts!!)

Rules of the Road

1. Pay attention to maximum outputs levels from the manufacturer and don't exceed them. There is not much to be gained by pushing the envelope above 4 or 5 volts. If you run any unit in the signal chain into clipping, you will defeat the advantages of the higher signal to noise in the other components.
2. Don't drive the SA-3050A with a source impedance higher than 2k ohms. This should not be a big problem as almost all car stereo components have output impedances below 2k ohms (the AudioControl components output impedance is usually a wonderfully low 150 ohms).
3. If you want to check the output of an amp, see the procedure in SA-3050A manual.
4. If you turn up the gain and the dB reading on the SA-3050A doesn't change, you are clipping something. While clipping is usually associated with amplifiers, you can clip any unit. Particularly, be alert to a component with a lower maximum output level after one with a higher capability. (Hint: if you use AudioControl components together, you will not have this problem.)
5. Get your signal levels as high as possible as early as possible. Frequently the component with the lowest output capability is the head unit. Since the system is *only as quiet as the least quiet piece* (also known as the weakest link theory), carefully select all your components. See the tables below for more on the importance of this.

dB SPL	Volts RMS *	dB SPL	Volts RMS *
81	1	111	3.1
91	3	113	3.9
95	5	115	4.9
101	1.0	117	6.1
105	1.5	119	7.8
107	2.0	121	9.8

*Full Range Using Pink Noise

SPL Adjustment Factor for Pink Noise after a 2-way Crossover		
Crossover Frequency	High Pass	Low Pass
60	+5	+9
90	+1	+8.5
150	+1.5	+7
270	+2	+6
1000	+3	+4
3500	+4	+2.5

Example: 150Hz crossover, SPL reading on low pass is 94. What is the voltage?

Answer: 1.0 volt (94 + 7 = 101dB adjusted)

6. Turn your amplifier sensitivities down (where the volume is the lowest). Then drive a higher voltage signal into them. The result will be the same SPL/ loudness (because the wattage of the amplifier does not change) but with less noise.

7. We know you are going to get the best results using AudioControl Performance Match components as their maximum output levels are very conservatively rated at 7.5 volts.

TW 7/28/95

High Signal to Noise System

Component	Mfg. Spec. Maximum	Adjust to
CD Unit	4 v	3 v
EQT	7.5 v	6 v
24XS	7.5 v	5 v
Amplifier (Input)	5 v	5 v

Crossover is weak link and limits performance of system

Component	Mfg. Spec. Maximum	Adjust to
CD Unit	4 v	3 v
EQL	7.5 v	6 v
Brand Y Crossover	2 v	1.5 v
Amplifier (Input)	5 v	1.5 v