

# KICKER TECHNICAL BRIEF 1: Level Setting

This Tech Brief is designed to provide a simple and accurate procedure for setting levels (gains) in mobile audio systems.

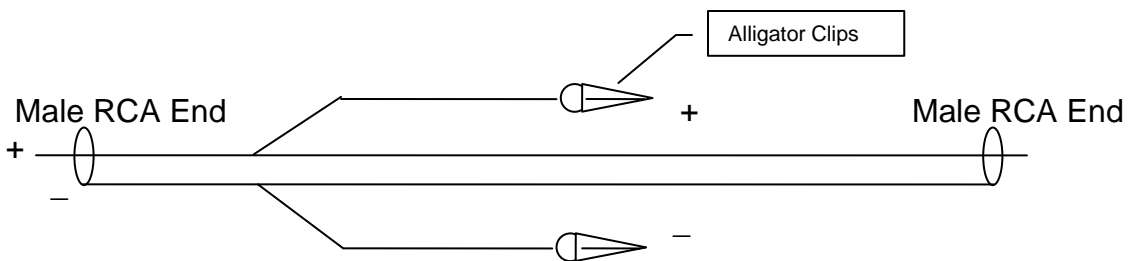
Tools & Equipment Required:

Digital Multimeter (DMM)

Oscilloscope

Test CD with 1kHz test tone recorded at 0dB and -10dB (Additional frequencies may be required)

Adapter cables for O-Scope and DMM probes (see drawing below) Fabricate as needed.



1. Unplug all component RCA cables and remove the speaker wires from the amplifiers.
2. Plug male end of adapter cable into RCA output(s) of source unit.
3. Turn on source unit, set bass and treble controls to zero and set balance and fader controls to center. With equalizers, set all controls to “zero” or set switch to “bypass” (EQ in/out switch to “out” position).

**Note: All processing and equalization MUST be bypassed during this procedure. Gain applied at 1kHz by an EQ or other processor while using a 1kHz sine wave will effect your overall gain adjustment.**

4. Insert test CD into source unit, set to track with 1kHz tone recorded at 0dB, and set track to repeat.
5. Turn up level of source unit to approx. 1/2.
6. Attach O-scope probes to alligator clips on adapter cable. Set scope to see unclipped 1kHz sine wave from the output of the source unit.
7. Slowly increase level of source unit until sine wave on scope starts to clip (flattening of the top and bottom of the sine wave), then reduce level until clipping disappears. Make note of this level number (or amount of vol. knob rotation) on the source unit. This is the maximum undistorted output level of the source unit. If you want, select AC volts on the DMM (20V scale) and attach the meter probes to the alligator clips to read the voltage.
8. Remove adapter cable from the source unit and connect the source unit to the next component in the signal path.
9. Connect the adapter cable to the output of that component and hook the o-scope probes to the alligator clips.

- A. Component has an input level control as well as an output level control: Turn the output level control to approx. 1/4. With the source unit at maximum output level, slowly increase the components input level control until the sine wave clips. Turn down the level until the clipping stops. This is the maximum signal level that processor can handle at its input. Attach the probes of the DMM and note the voltage reading. Turn the output level control up as high as possible without clipping and move on.
  - B. Component has output level control only: Turn up the output level control until clipping starts. (If component does not clip, leave level control all the way up) Reduce level until clipping stops. Attach DMM, note voltage and move on.
  - C. Component has no input or output level controls (unity gain): You should see no clipping on its output. If clipping does occur, raise or lower the output level of the component BEFORE this one until maximum unclipped output is reached. If the source unit is before this component and the source unit must be turned down to prevent clipping, consider replacing that processor.
10. Working down the signal path toward the amplifiers, repeat the above procedure (A,B, or C above) for all remaining components.
11. Set the input level of the amplifier(s) to minimum (all the way down). Hook the o-scope probes to one pair of speaker outputs. Set the scope to see the sine wave. If the wave is clipped with the amps input level fully counterclockwise, reduce the output level of the component BEFORE the amplifier(s) until the clipping stops. If there is no clipping of the amp output with the level control all the way down, slowly increase the amp level control until clipping starts. Reduce the level until the clipping disappears. You are done!

The procedure up to this point will give you a system with the maximum signal to noise ratio. It is perfect for IASCA or USAC sound quality competitions. For customers wanting more amplifier output, perform the following step:

12. Select the track on the test CD with the 1kHz tone recorded at -10dB and set it to repeat. Re-set the amplifier level control(s) to provide maximum unclipped output. This 10dB increase in amplifier level should satisfy most customers.

Final Note: If precision gain setting of individual crossover outputs (i.e. lowpass, bandpass, highpass, etc) is needed, simply choose a sine wave frequency close to the center of the pass band selected for adjustment. Example: If setting the output level of a crossover with a bandwidth of 30Hz to 100Hz, use of a 60Hz sine wave would be advisable.