



# Tech Info Library

## Macintosh: RMS, Peak-to-Peak, Line Level Definitions (4/95)

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TOPIC -----

This article contains questions and answers concerning microphones and definitions related to them.

DISCUSSION -----

Question: I am looking for information about audio input and output voltages to different Macintosh computers. Some specifications show the value in "Peak-to-Peak" while others are in "RMS" and I have also heard of a term "Line Level". What do these terms mean?

Answer: Peak-to-Peak and RMS are ways of measuring the voltage of an audio or AC signal. Line Level is an industry standard used in audio equipment.

Question: Are Peak-to-Peak and RMS the same thing? Can the terms be used interchangeably?

Answer: No. Peak-to-Peak is the measurement of any signal from the positive most peak to its negative most peak, in other words, its extremes. RMS stands for Root Means Square and it is the value of a signal's "Effective Value" or the work it can do.

Question: How do I convert from one to the other?

Answer: There are two simple equations that you can use based on the assumption that the signal is a "sine wave". They are:

To Find -----	Equation -----
Peak-to-Peak	RMS * 2.828
RMS	Peak-to-peak * 0.3535

RMS is defined first by the "means" of the "square" ( $\wedge 2$ ) of every angle through a given wave. With sine waves the mean is 0.707 which is 1 divided by the square root of 2. Therefore, the  $(1/\text{SQRT } 2)$  is the root means of the squares of all the

angles.

The RMS of one half of a sine wave is 70.7% of the peak value or [Peak \* 0.707 = RMS].

The Peak value of a sine wave is 1/2 of the peak-to-peak value.

Question: What is the voltage rating of "Line Level" in, RMS or Peak-to-peak?

Answer: Line Level has no voltage standard. It is actually an impedance or "Signal Resistance" value set at 47,000 Ohms. There is no way of converting this information alone into any voltage specification.

Line Level provides an industry standard so that all audio and other electronic equipment can operate properly together. Most VCRs, including both home and professional audio equipment use Line Level as a standard. They are commonly used where you find an "RCA" connector. The RCA plug looks similar to a four leafed flower with a center single conductor pole. The RCA jack usually sticks out about 1/4-inch from the chassis and is about 1/4-inch around with a 1/8-inch center hole.

Question: How do I convert my microphone signal to a Line Level signal?

Answer: The easiest way is to use any home audio equipment that accepts microphone inputs. Tape recorders, audio tuners, audio mixers, and video cameras are all common equipment that usually provide a microphone input.

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