

Impedance Matching for Microphones - Is It Necessary?

What is impedance?

Impedance is how much a device resists the flow of an AC signal, such as audio. Impedance is similar to resistance which is how much a device resists the flow of a DC signal. Both impedance and resistance are measured in ohms, the symbol for which is ' Ω '.

What is the difference between low, medium, and high impedance?

When referring to microphones, low impedance is less than 600 Ω ; medium impedance is 600 Ω to 10,000 Ω ; high impedance is greater than 10,000 Ω .

For audio circuits, is it important to match impedance?

Not any more. In the early part of the 20th century, it was important to match impedance. Bell Laboratories found that to achieve maximum power transfer in long distance telephone circuits, the impedances of different devices should be matched. Impedance matching reduced the number of vacuum tube amplifiers needed, which were expensive, bulky, and heat producing.

In 1948, Bell Laboratories invented the transistor — a cheap, small, efficient amplifier. The transistor utilizes maximum voltage transfer more efficiently than maximum power transfer. For maximum voltage transfer, the destination device (called the "load") should have an impedance of at least ten times that of the sending device (called the "source"). This is known as BRIDGING. Bridging is the most common circuit configuration when connecting audio devices. With modern audio circuits, matching impedances can actually degrade audio performance.

Are low impedance mixer inputs really low impedance?

Audio mixers often have inputs labeled as "low impedance". Actually, these inputs have impedances between 1000 Ω and 2000 Ω in order to properly bridge the low impedance microphone. A low impedance microphone may always be connected to an input with a higher impedance. However, the microphone may not always be able to provide enough signal strength to properly drive the mixer's audio input. Always compare the microphone's output level (or sensitivity) to the required mixer input level.

What happens when a high impedance microphone is connected to a low impedance input?

When a microphone is connected to a mixer input with lower impedance, there will be some loss of the microphone signal. To determine the amount of signal loss (or "load loss") in dB, use the following equation:

$$LoadLoss = 20 * \log \left(\frac{R_{load}}{R_{load} + R_{source}} \right)$$

R_{source} is the actual microphone impedance. R_{load} is the actual mixer input impedance
As a rule of thumb, a loss of 3.5 dB or less is acceptable.

