

Impedance in the Recording Studio

Impedance is the combined resistance and reactance in a piece of electronic gear. Like resistance, Impedance is measured in Ohms.

Studio gear is divided into two categories, High and Low Impedance, also called Hi-Z and Lo-Z. Your concern is the input or the output of a device, such as a “Hi-Z output” or a “Lo-Z input”. You want input and output impedances to match, for best sound quality.

Typical High Impedance – electric guitars, keyboards, effects units, Direct Boxes (input).

Typical Low Impedance – most microphones, Direct Boxes (output).

High and Low Impedance – mixers.

Low Impedance connections are often XLR.

High Impedance connections are often 1/4” or RCA.

Lo-Z signals can travel very far without losing quality. Mic cables may be as long as 100’.

Hi-Z signals that travel very far are prone to EMF & RF, and high-frequency attenuation.

When Hi-Z signals must travel more than 15 or 20 feet, like in a concert hall, they should be converted to low-impedance, with a Direct Box.

Impedance Matching.

- Ideally, the output impedance on the source (like a microphone) exactly matches the input impedance on the destination (like a preamp).
- You should never connect a Hi-Z output to a Lo-Z input, or you’ll overload the input and get distortion. Use a Direct Box to reduce the impedance of the Hi-Z signal before it enters the Lo-Z input.
- You can connect a Lo-Z output to a Hi-Z input, but you’ll need a lot of gain to bring the signal up to a usable level, which might add noise. Instead, you can use an impedance transformer to bump the Lo-Z up to Hi-Z, or you can use a Direct Box in reverse, increasing Lo-Z to Hi-Z. This is sometimes called “re-amping”.