

Interface between a Music player and Micro-controller input

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The headphone jack is designed to drive headphones so it has an output impedance in the range of 16Ω to 100Ω . Line level (Input) expects a much higher impedance, typically in the order of 200Ω to $10,000\Omega$ [1]. And therefore this is the first problem: this mismatch results in an inefficient transfer of audio signal so we need to do an impedance matching.

In electronics, impedance matching is the practice of designing the input impedance of an electrical load or the output impedance of its corresponding signal source in order to minimize reflections from the load and/or maximize the power transfer[2]. Signal reflection is conceptually similar to the behavior of waves as they pass between mediums of different densities (Figure1).

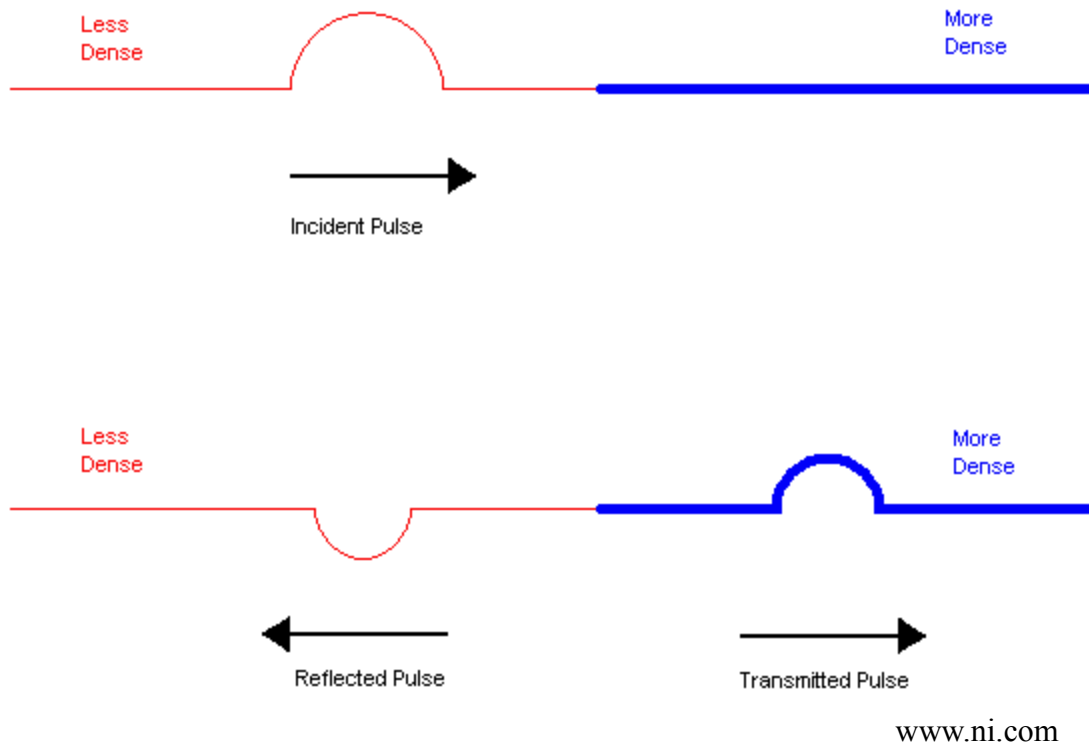


Figure 1. reflection and transmission between mediums of different densities

Signal reflection occurs as a transmitted signal is reflected back toward its origin due to differences in impedance along the transmission line[3]. Also another problem is in case of some music players, where there is a small DC signal on output which is undesirable. One of the solutions for these problems could be using an Op Amp Circuit.(Figure2)

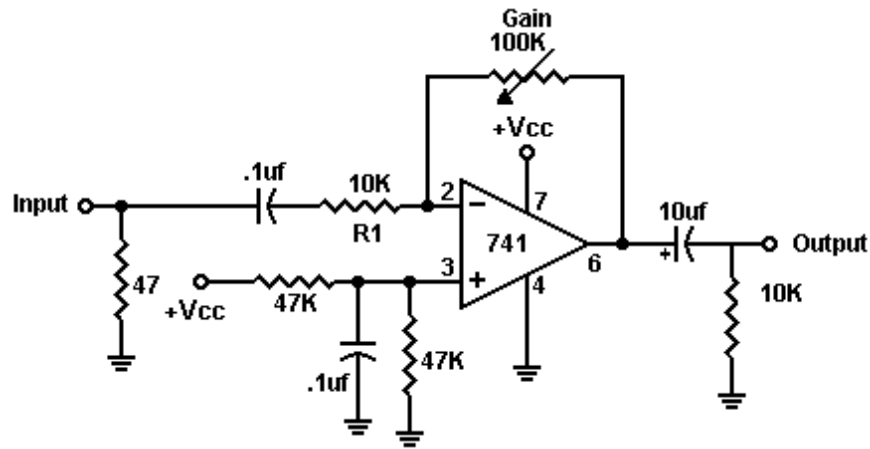


Figure2 – Opamp circuit

While intended for dual power supply operation, Op Amps can be easily configured to a single power supply by the use of a resistor network[4]. In the above example, two 47K resistors place a voltage of 1/2 of the supply voltage across the non-inverting input which causes the output voltage to also be 1/2 of the supply voltage forming a sort of bias voltage. An additional .1uf capacitor has been added to the non-inverting input to reduce noise caused by this configuration. The use of coupling capacitors for input and output is DC isolation from both input and output. The gain can be adjusted by 100k potentiometer. As 741 is a general purpose Op-amp, it does not give the best audio quality and to achieve better quality the NE5532/4 or OP27 or TL072 Op-amps can be used.

References:

- [1] www.beavishifi.com
- [2] Wikipeida - www.wikipedia.com
- [3] National Instrument - www.ni.com
- [4] Radio Amateur Society of Norwich - www.rason.org