

DSP Research Project: Digital Voice Recorder

DSP device requirements

You will design and construct a basic digital voice recorder with the base specifications listed below. Any improvements on these specifications are welcome, but not necessary. Your budget for the project is \$ 250 USD per team.

1. Microphone Input: You must provide a microphone through which external sounds can be recorded. The microphone assembly can already be engineered by another company, but your team must provide any necessary amplification associated the microphone. You may not use a microphone that is already powered. The microphone should be able to record conversation-level sounds at a distance of *1 m*.

2. Speaker Output: The device will have a speaker output which can produce sound at the same level as an answering machine at a distance of *1 m*. Your team will provide all necessary amplification for the speaker. You may only use a basic speaker which is sold without amplifiers or preamplifiers already attached to it. You may not use an engineered speaker system.

3. Memory: Your device should be able to record and playback *1 s* of answering machine quality voice (i.e. the word "hello") or better. You should use the memory of the FPGA for this. While not necessary, you may also use the extra memory chips on the DE2 board to get a longer recording time (if you can figure out how to do this).

4. ADC and DAC: You will need an ADC and a DAC to record and output sound. In order to reduce your work load, you may use either the ADC or the DAC on the 24-bit audio CODEC, **but not both.**

5. External controls: Your device should have input gain control (i.e. depending on whether your sound source is loud or weak) and output volume control. There should be a record button/switch and a playback button/switch.

6. Bandwidth: The input and output audio frequencies should cover the range of 100 Hz to 8 kHz.

7. Power: You must provide some form of power supply for your device, as well as an on-off switch.

9. Other: Since this is an audio device, there are a number of different "bells and whistles" that can be added to enhance the device. You are free to add such features, but they are not necessary for proper completion of the project.

Your device must be a standalone unit that can function on its own (i.e. not connected to a computer) -- It should include the FPGA and associated digital and analog circuitry, as well as power supplies. Everything should be in an enclosure, though the DE2 board can be external.