

A Karaoke and Audio Effects Processor

Overview

This project consists of hardware consisting of the Zilog Z8 Encore Evaluation Board and an analog processing board for conditioning the input analog waveform, and to process the PWM output from the Eval Board. Software was developed on the XTools ZDS II IDE. The software consists of a set of signal processing routines that provide features desired in a typical Karaoke environment such as voice echo, voice reverb, and pitch transformation.

The analog hardware consists of a small board containing a number of op-amps and amplifier sections. It's main purpose is to amplify the input, which could be a microphone or guitar, and provide an anti-aliasing low-pass. It also allows for gain and offset controls in order to maximize the dynamic range of the on-chip Z8 A/D. In addition to the front-end filter, there is a filter that converts the PWM signal from the Z8 into an analog waveform. Finally, there is a small audio amplifier to drive a set of headphones or a small speaker.

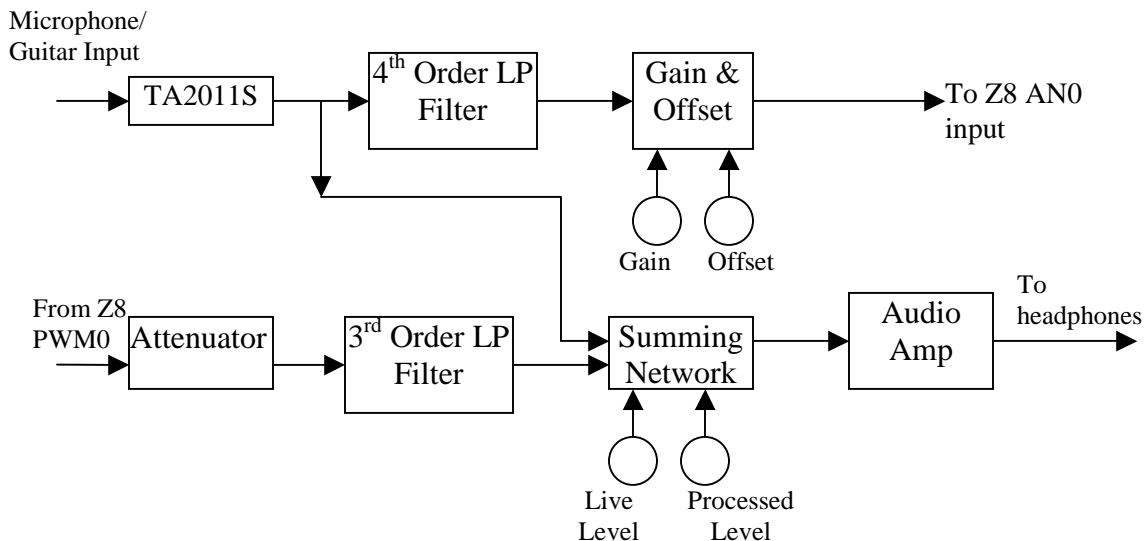


Figure 1—Analog Block Diagram

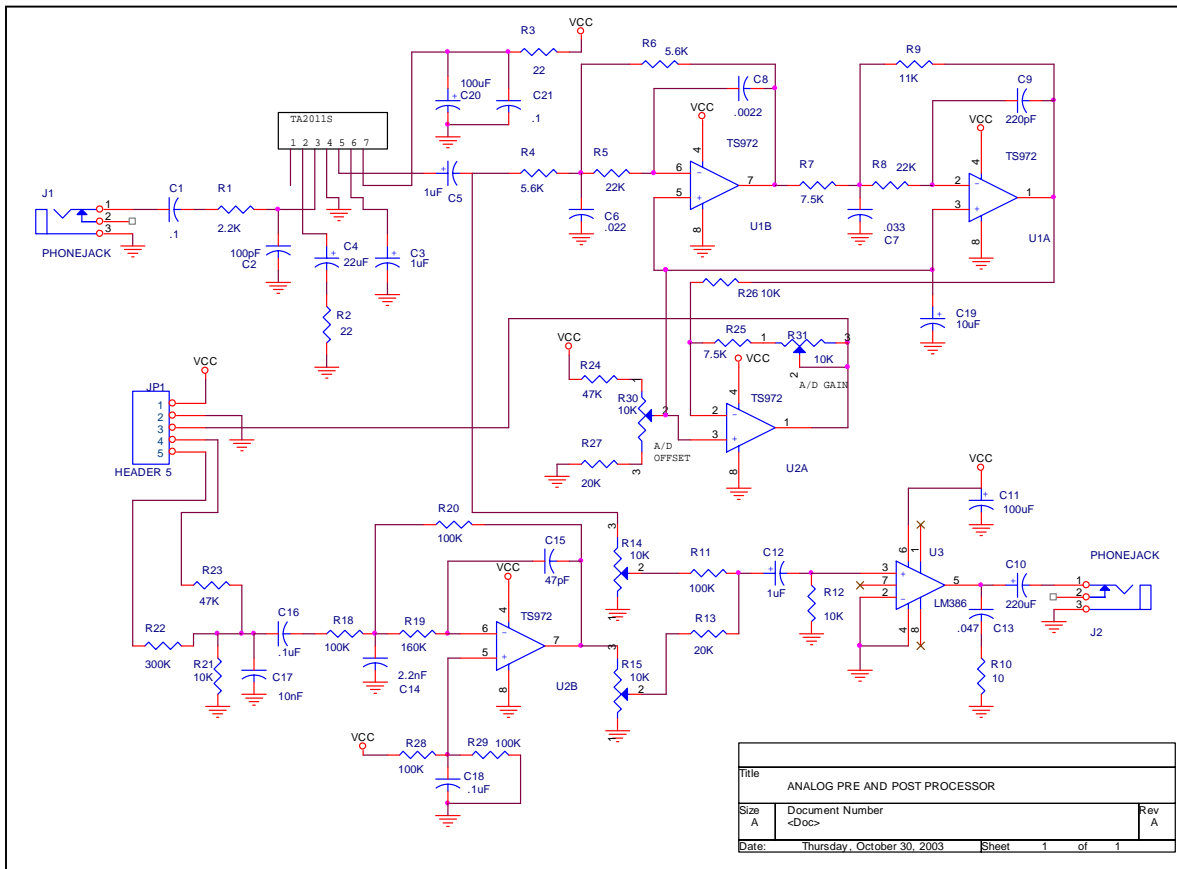


Figure 2 – Schematic of Analog Section

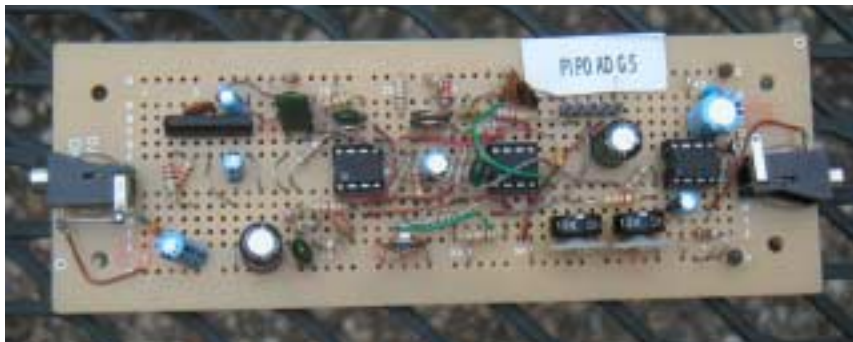


Photo 1 – Analog Board. Microphone input is on the left, and headphone output is on the right.



Photo 2 – Entire system consisting of Z8 Encore Development Board, Analog Board, microphone, and headphone.

Software Description

The software consists of four separate project modules, `pwm.pro`, `reverb.pro`, `pitch_shift.pro`, and `echo.pro`. Each module shares the same `API.C` module. This module was provided by Zilog and is called only once to set up timers. They also share two common header files, `ez8.h` and `api.h`.

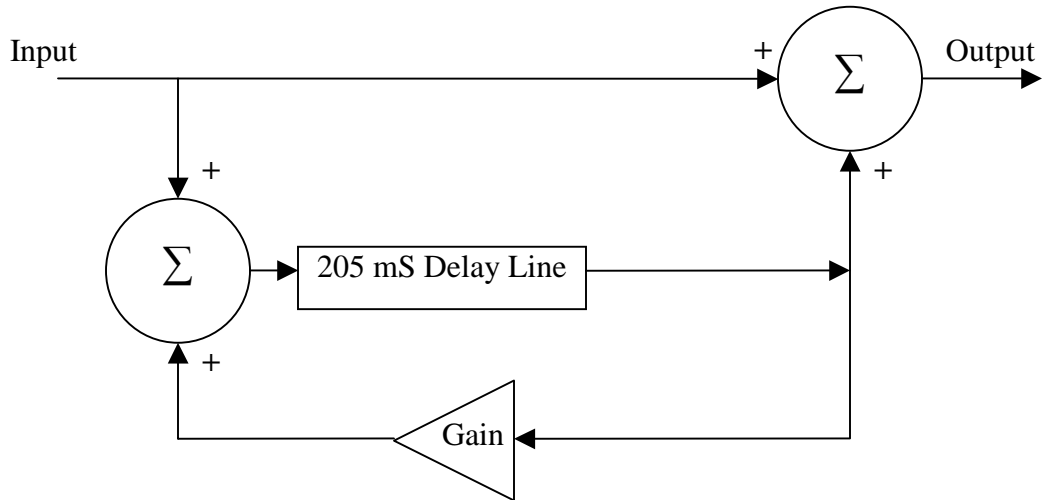


Figure 3 – Echo block diagram.