

# Teardown Report: Chime DAC

Here is a detailed look at design architecture and part selection. **By Jim Hagerman**

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Having built a reputation with analog phonostages, I decided it was time to pursue the dark side of digital. Why not bring the same high quality to the CD format? And so the Chime was born.



*Fig 1. Chime vacuum tube DAC.*

## Features

This is no cheap DAC. It is an all-out assault on the state-of-the-art. Only the best integrated circuits were chosen. The Chime is loaded with features and technology that even the \$10,000 and \$20,000 DACs cannot match. The key to its extraordinary performance is the simplicity and elegance of the architecture. It is purposely designed for 44.1kHz-operation only, shunning SACD or DVD-A inputs. It does, however, have a USB port, which permits you to play CDs from your computer. A phase switch let's you switch output signal polarity on the fly, compensating for misrecorded CDs. A handy volume control eliminates the need for a linestage, allowing a minimalist system configuration.



current sink loaded 12AU7 cathode follower. High quality polypropylene film capacitors are used for output signal coupling and as supply filters.

## HagDac Daughterboard

The conversion from digital to analog is all performed on the HagDac engine. A discrete fully differential input stage receives the incoming S/PDIF and cleans it up for optimal reception by the CS8415A. Careful layout, grounding, and special supply filtering, insure maximum performance by its internal PLL. Regardless, when using such a wideband VCO, there will be measurable jitter. The output signals are then upclocked by 8x and interpolated to 24 bits by a DF1704 digital filter. The output clock from here is the input to the fancy reclocking circuit. A zero-hysteresis HCT9046A phase detector is used in a very slow PLL loop, controlling a low-jitter VCXO. The VCXO clock tracks the input clock, but is a very clean regenerated version without the jitter. This new clock drives the expensive PCM1704 converters.

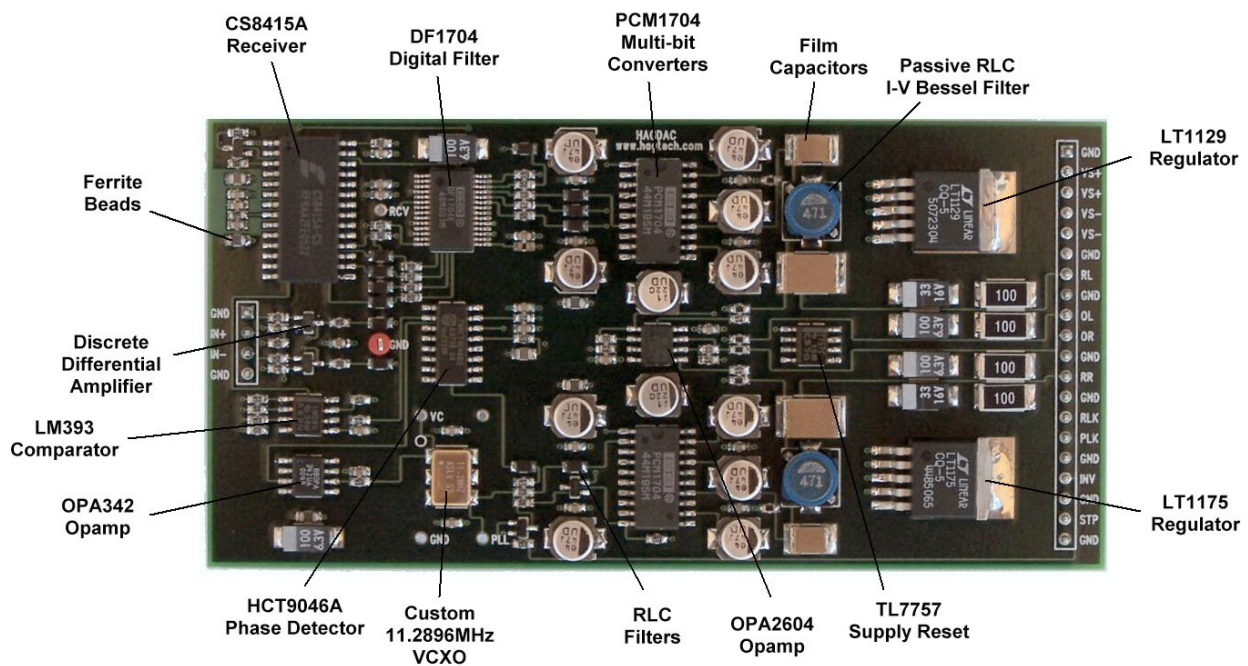


Fig. 3. Breakdown of HagDac daughter card.

The PCM1704 converters have current outputs, which are converted to voltage by an innovative RLC passive Bessel filter. The loading on the converter is 50 ohms in the audio band, so linearity is maintained. The phase-linear low pass filtering removes all ultrasonic switching noise, leaving only a pure and clean audio band signal.

Ferrite beads, power planes, and a specific mixture of ceramic, film, tantalum and aluminum electrolytic capacitors are used to provide clean and isolated supplies for each circuit section. Careful separation and interfacing between digital and analog circuits insures quiet operation. There are fifteen inductors sprinkled across this all surface-mount board.

## **Conclusion**

Exploiting my background in analog design, I was able to bring an innovative twist to conventional DAC circuits, improving them beyond what was traditionally available. The Chime DAC brings top-notch performance within the reach of many.

### **ABOUT THE AUTHOR**

Jim Hagerman owns Hagerman Technology LLC, a supplier of unique DIY half-kits and high-end audio products. He's been designing analog circuits for 23 years. ([www.hagtech.com](http://www.hagtech.com))