CD programmable pulse generator for Rife type machines

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Introduction

This article presents a very cheap, convenient and effective way of driving Rife type devices from frequencies recorded on CDs using a commercial CD player.

The problem

Before we look at the CD programmable pulse generator, let's consider the requirements for pulse generators for Rife type machines:

1) It must generate TTL square waves over the audio range of frequencies.
2) The frequencies should be as accurate as possible and not drift.
3) We must be able to hold each frequency for a particular amount of time.
4) We must be able to output a sequence of frequencies, each held for a set amount of time before moving on to the next.
5) It should be possible to sweep over a range of frequencies over a given time period.
6) It should be very repeatable.
7) It should be simple to operate – switch on and go.

My understanding is that when setting the frequencies for Rife devices, accuracy is not that important, and some drift may actually be desirable. However, the advantage of a very accurate frequency generator is its repeatability – we can program in "drift" as sweep over a small range of frequencies around the target frequency.

The solution

The circuit for the solution I came up with is shown below. It uses a CD player to play a CD on which the required frequencies are recorded as sine waves. Each frequency is recorded as a separate track on the CD, and each track can last as long as needed up to the capacity of the CD. We'll look at how these special CDs and tracks are created in the next section.

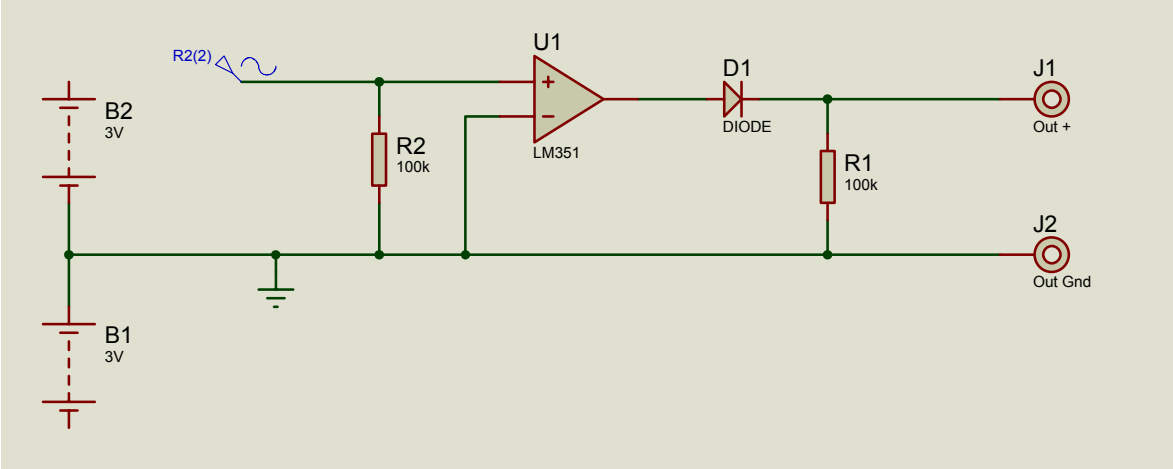

Figure 0-1

The circuit is just a simple comparator used as a sine to square wave converter. The circuit earth is connected to the CD player earth, and one stereo channel from the line out of the CD player is fed into the non-inverting input of U1. The inverting input of U1 is held to Gnd, and so when the sine wave output from the CD player swings negative, it is less than the voltage on the inverting input, and the output of the comparator swings down to within about 1V of the negative supply rail. When the sine wave output of the CD player swings positive, the output of the comparator swings to within about 1V of the positive supply rail. This converts the sine wave to a square wave.

I was using a battery operated Matsui CD player. This gives about 1V pp on line out which is more or less standard. The Matsui is about the cheapest CD player you can get, but still gives excellent results in this application - any other CD player should work just as well.

For my application, I just take the rectified output of the comparator U1, which is a square wave based on 0V and amplitude about 2V. This is fine to drive the input of Aubrey Scoon's magnetic pulser.

For more general use, the output from the comparator may be taken to a CMOS or TTL Schmidt trigger (e.g. a 74LS13) to convert the waveform into accurate TTL or CMOS logic levels.

The circuit is so simple that it may be easily constructed on stripboard.

Creating the frequency program

This involves creating a CD that has tracks of the appropriate length for each desired frequency. The length of the track determines how long the frequency will be output for. The procedure is as follows:

1) Create the desired frequencies as .wav files
2) Burn a CD, writing each .wav file as a separate audio track

This requires a certain amount of hardware, which many people have nowadays:

1) A multimedia PC or Mac
2) A CDRW drive

It also requires some software. The CD burning software that comes with the CDRW drive will allow you to create an audio CD from one or more WAV files, so all we need now is some way of generating WAV files that contain the frequency of interest.

The best program that I have found for working with audio is Cool Edit 2000 (www.syntrillium.com). This is a very low cost package that can be bought online for about $70. It puts a complete recording studio on your PC!

Cool Edit has many excellent features, but the one we are interested in is tone generation. This can be found under the menu Generate/Tones…

When this menu item is selected, you will be prompted to select a sample rate, number of channels and a sampling resolution. I generally use:

Sample Rate	44100
Channels	Stereo
Resolution	8-bit

This will generate CD quality tones.

Here is a screen shot of Cool Edit set up to generate a frequency of 728Hz for 120 seconds:

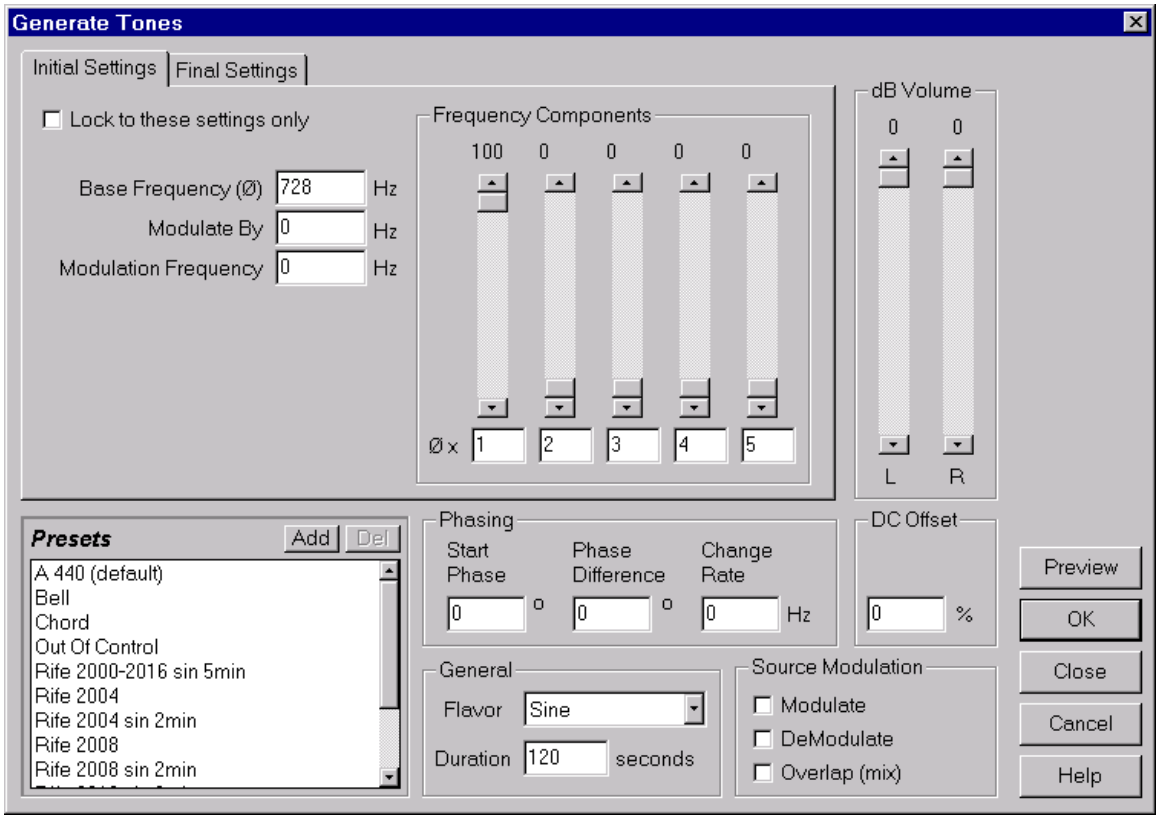

Figure 0-2

As you can see, Cool Edit is really flexible. Here I am just generating a single frequency sine wave for a fixed amount of time. But by setting the “Final Settings” it is also possible to generate a sweep between two frequencies. By playing about with Cool Edit, it is possible to generate completely arbitrary sweeps between multiple frequencies.

Although Cool Edit allows you to generate square waves directly, I don’t recommend this option. The square waves seem to be generated by adding together sine waves, and so are not particularly well formed. It is best to stick to sine waves and convert to square waves later using the circuit in Figure 0-1. Sine waves, because they have fewer harmonics (theoretically zero harmonics) suffer almost zero distortion on recording onto a CD.

The frequencies of the sine waves produced by Cool Edit are *really* accurate. When I recorded a CD with a frequency of 2kHz, and measured the output of my pulse generator using my Instek frequency meter, the frequency was accurate to better than 1 part in 1,000,000.

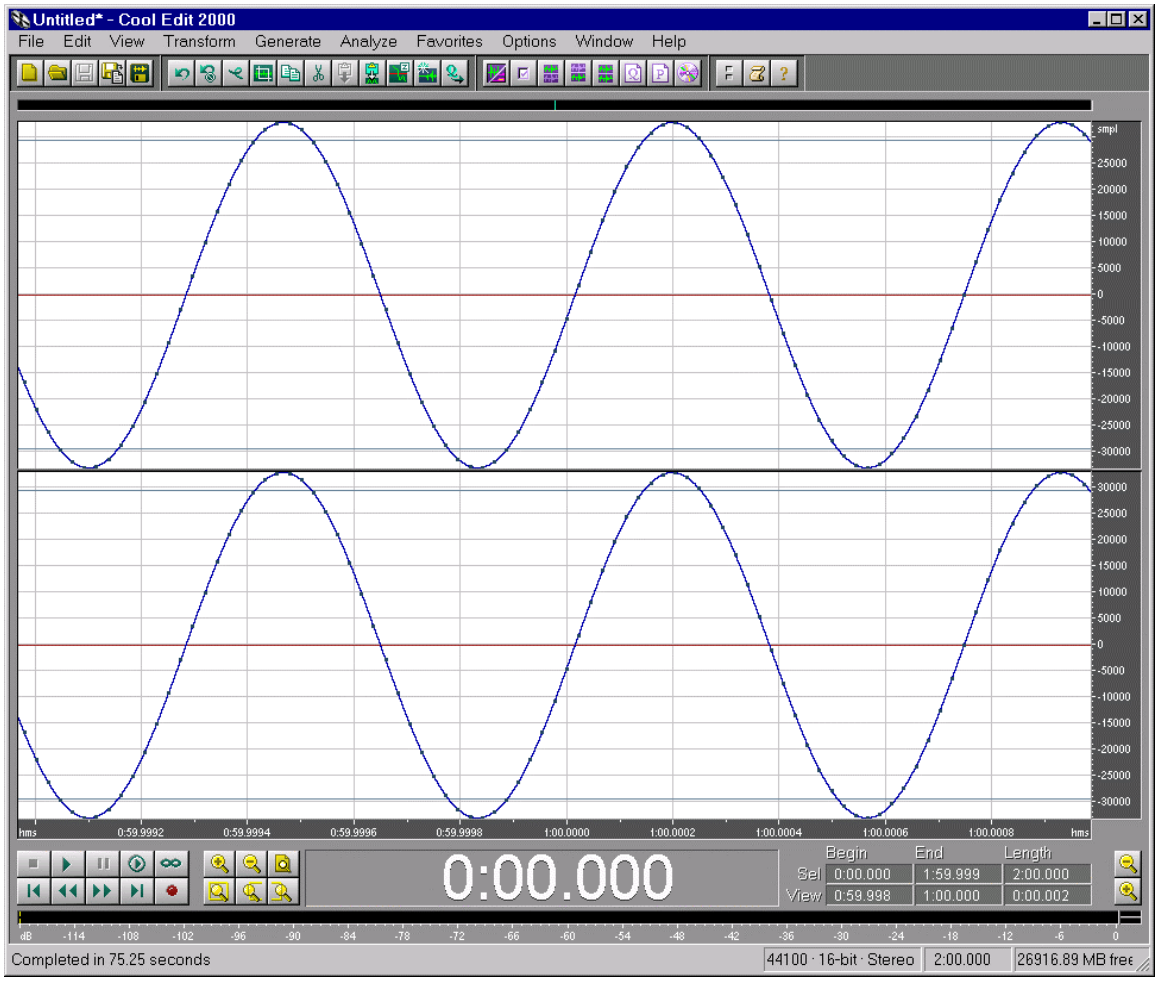

Figure 0-3

Figure 0-3 shows a 728Hz sine wave generated by Cool Edit. Notice that I have generated the same frequency on both stereo channels. It's possible to generate different frequencies on each stereo channel and use a CD Programmable Pulse Generator on each channel.

After creating a frequency, it should be saved as a .wav file.

Once all the .wav files have been created just use the software that came with your CD burner to burn an audio CD. Make sure that this is an *audio* CD – a data CD will not work. I use Easy CD Creator to burn CDs.

Connect up the pulse generator to the line out of your CD player, play the CD, and you should get a nice square wave output from the pulse generator.

Conclusions

I have been using this device to drive one of Aubrey Scoon's magnetic pulsers and it works perfectly. When I aim for a specific frequency I get an accuracy that equals or

exceeds the accuracy of my Instek frequency counter. Also, it is very easy to generate sweeps over a range of frequencies.

Using Cool Edit to create the WAV files is very quick simple once you have created one or two. I generally create 2 minute WAV file for each frequency of interest, and if I want longer than this on a CD, just lay down two tracks. This makes the WAV files reusable.