

To Build a Theremin

By Christopher Needham

The theremin, the most dastardly contraption that 1919 had to offer the world. An instrument that is played through no physical contact is very interesting and tends to catch the attention. Against the likes of Russian physicist Leon Theremin and his electric musical instrument I would test my might. This was to be a challenge indeed, and I needed much preparation before I would even stand a chance.

1. Research

As with all things strange, unusual, obtuse, esoteric, or just uncommon I turn to the Internet to find that there are a thousand things just like it, one hundred thousand people that do it daily, and at least one guy (invariably wearing a Star Trek uniform) that took it all way too far. The theremin was no exception. I found several very informative sites with a good deal of information, as well as sound samples, news groups, and other things.

Two of the best were [Theremin World](#) and [Maxies Pages](#). These two pages gave me most of what I was looking for, general info and schematics. Eventually I settled on the design I would use. [Here](#) it is, and the [article](#) with it

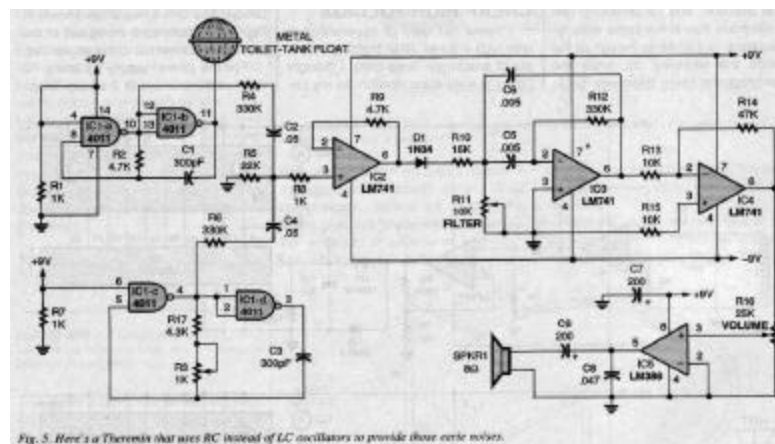


Fig. 5. Here's a Theremin that uses RC (instead of LC) oscillators to provide those eerie notes.

This design has several things going for it. Firstly it's simple enough that even I, with my limited knowledge of circuitry understand it. Secondly, all the parts are very common, and, most important to me, they are all stocked in the back room of the circuits lab. This circuit uses RC resonance to create the waveforms and not LC like most theremin designs. This helps because finding variable inductor coils is a bit difficult. Lastly, it's small. The oscillators are the NAND gates on the 4011 chip. Everything else is pre-amp. It's a theremin on a chip!

I had my road map to theremin glory, now I needed a car to get me there.

2. Building it

This part was fairly simple; just follow the directions. Of course not everything was peaches and cream. I did have to power the thing. After experimenting around with the power supplies in the lab and trying to bias them to the +9 and -9 volts needed I opted for two 9-volt batteries. Simple is better, and more portable.

Tuning was another matter of some trouble. After going over the circuit several times to make sure I hadn't made a mistake I sat down to adjust the knobs till it made sound. This took several hours of turning the three little variable resistors with a tiny screwdriver till I decided to get rid of the one that controlled volume. I skirted around the 386 audio output amp and used a guitar amp for the last section of the schematic. This worked well. It added a better amplification stage than the 386 could do, and had a better speaker. This means that it could be louder (always a plus in my book).

Keeping the car analogy; this is no BMW, it's more like something built by the contestants on TLC's *Junkyard Wars*, but it works.

3. Playing

Here we see a monkey playing a theremin.



How hard could it be for me to play?

Turns out the monkey must have a really nice model (it does have a volume antenna). Mine seems to detune a bit, requiring adjustment with the tiny screwdriver. You will also see in the diagram a resistor marked “filter.” This is a poor man’s tone control, but from what I can tell it controls whether the theremin sounds more like a kazoo vs. more like a duck caught in a garbage can. It did make some interesting dolphin noises in the middle, which seemed passably aesthetic.

4. The end result

I do have a working theremin; there is much to be said of that. It does sound like a duck, which is odd, and most likely why LC resonance has been traditionally used in these devices. The next step would be to cram it all into a little box so it would look nice

and, perhaps, add a volume control antenna using another 4011 CMOS chip in a similar configuration.

All and all it seems well. I shall call this experiment a draw with Leon Theremin.