Don't Tell Ray

PT2399-Based Oil Can-Style Delay

Overview

When it comes to delay, we are all aware of the tape, analog, digital, and even magnetic drum style delays like the Echorec. However, there is one design that has been almost lost to time, and that is the oil can delay. Invented by the founder of Tel-Ray, the oil can delay operates by using a spinning magnetic disk with carbonized rubber read and write heads. The disk spins in a can of special oil that helps to keep the rubber heads lubricated and to help prevent the leakage of the magnetically stored data.

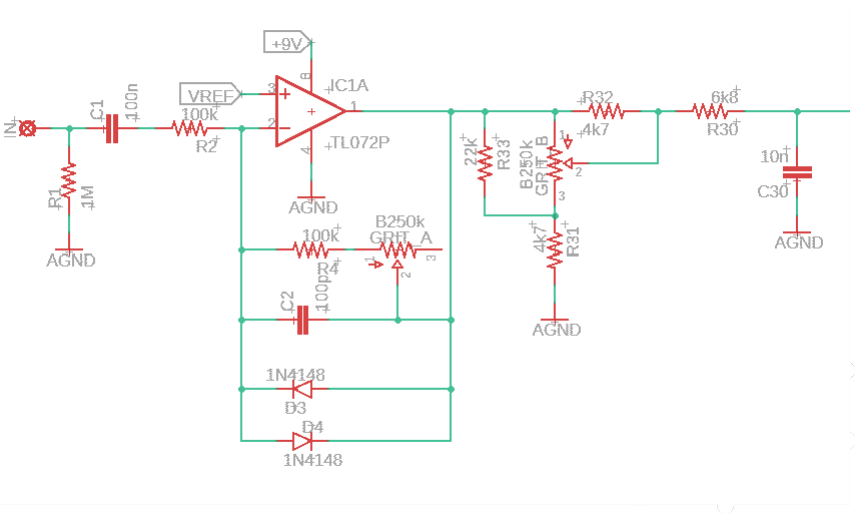
In the guitar pedal world, there has been a small resurgence of interest in the oil can delay due to its unique, murky sound. Old Blood Noise Endeavors and Catalinbread both have digital emulations of them, but as far as I could tell, no DIY designs existed. I decided to see what I could do with the ubiquitous PT2399. Over the course of a few months, I spent hours reading and watching everything I could find on them, detailing things like delay time ranges, RPM, methods of degradation, etc. so that I could take them into account as best I could. While I don't claim this circuit to be an exact emulation, it does a great job of getting some of that super old school vibe in a DIY-able circuit. And because it's supposed to mimic a Tel-Ray, I have decided to call it Don't Tell Ray.

How it Works

So what makes the Don't Tell Ray (DTR) different from other PT2399-based delays? Well, there are a couple of things and they have to do with some of the quirks of oil can delays. For example, many have a tube preamp which, in conjunction with the breakdown of the oil and rubber heads, can add some grit to the sound, so I decided to add a soft clipping set of diodes in the input buffer. Another thing about them is that, due to the spinning nature of the disk, modulation due to imbalances are sinusoidal, so the LFO is much more sinusoidal than the typical LFO scheme seen in other delays. So with that said, let's

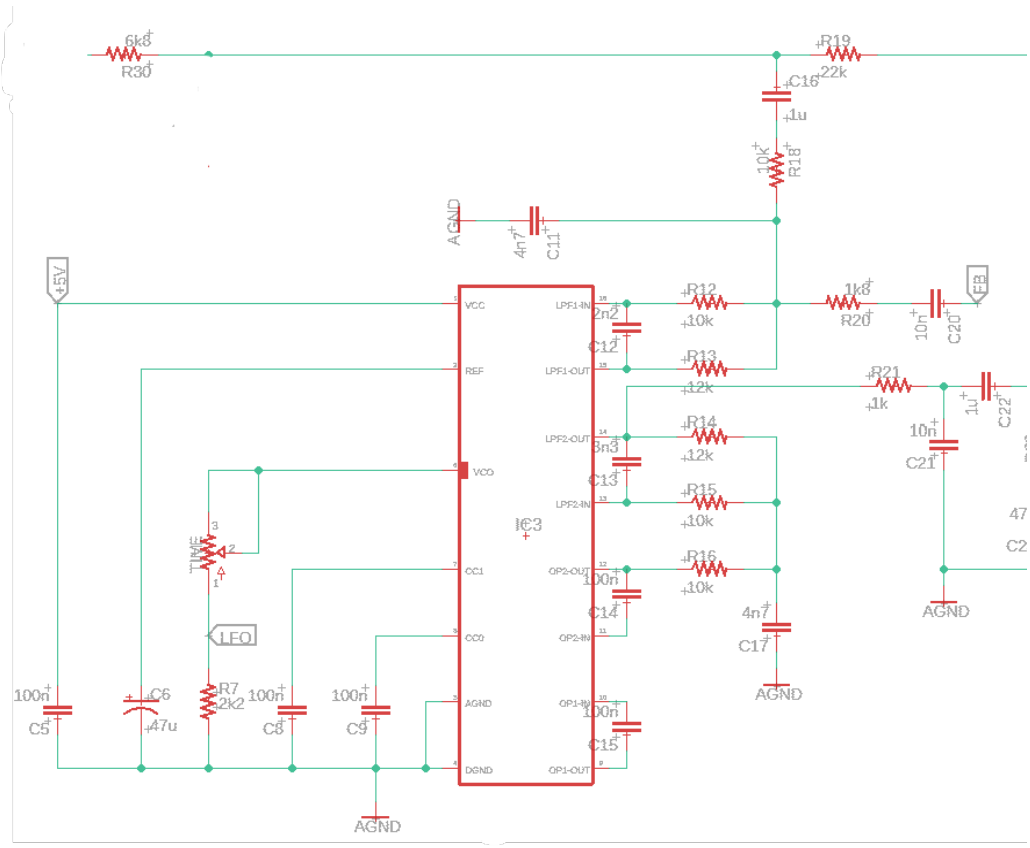
take a look at the circuit.

As mentioned, oil can delays can have a gritty, dark texture to them, so I augmented the typical inverting input buffer with a pair of clipping diodes. This section doesn't get super dirty, as this isn't a distortion pedal, but it does give a little bit of hair if needed. However, because increasing the gain in the feedback loop raises the level of the output signal, we need to turn down the volume as the gain increases so that we don't have drastically different signal levels with different amounts of grit. To do this, I used a dual gang potentiometer with two additional resistors. One resistor sets the overall value of the potentiometer from lug 1 to 3 while the other resistor results in more of a quasi-log response to keep the volume effect smoother over the course of rotation. It's not perfect, but it works pretty well. After the volume control, we roll off a little bit of the high end, since oil can delays were typically rather dark. We don't want to lose too much, though.



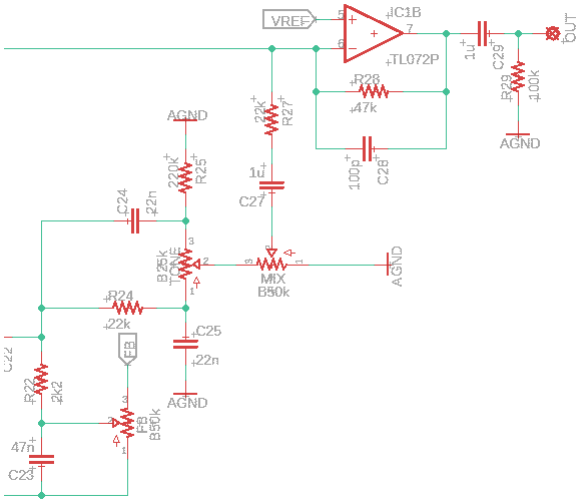
Don't Tell Ray Input Stage

After the input stage, the PT2399 delay stage is fairly standard. The only item to note here is that the caps between pins 15/16 and 13/14 are larger than usual. This helps roll off just a little bit of the highs as well, in keeping with the general mellow tone of an oil can delay.



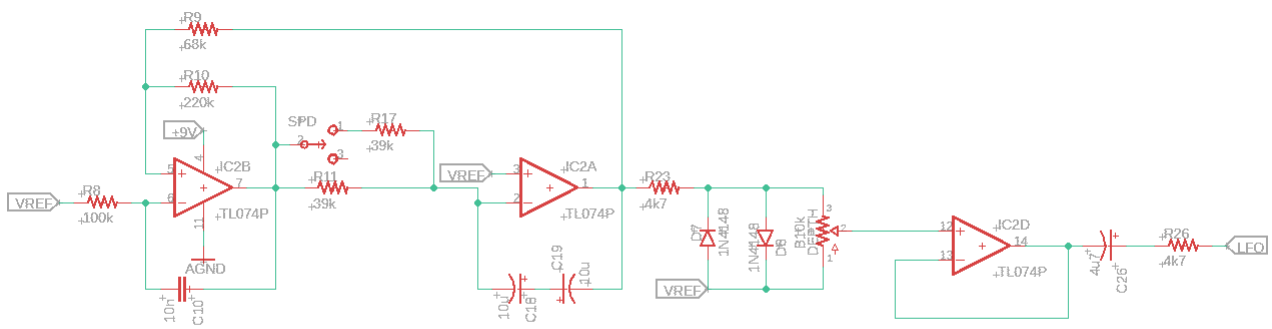
Don't Tell Ray Delay Stage

The remainder of the audio path consists of a tone control that allows for some real darkening of the tone, which can be useful if trying to replicate the really dark, murky tone of an oil can delay that has been around for years without the best of care. After that, it's a pretty standard mix control and output summing amplifier.



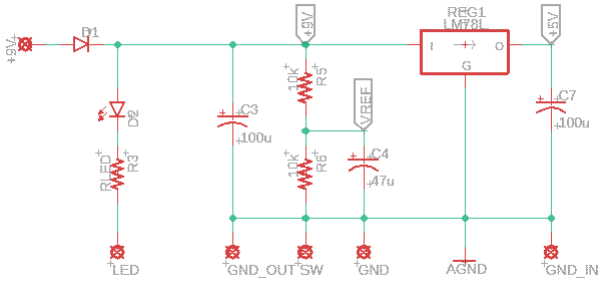
Don't Tell Ray Output Stage

One thing that really sets an oil can delay apart from others is the modulation produced. Because it is a disk spinning in a circle on a rod, the modulation tends to be sinusoidal and gets more pronounced if the disk becomes unbalanced. The balance control dictates the amount of this sinusoidal modulation. Because I sought to recreate the oil can delay, there are only two modulation speeds available. One corresponds to the guitar-oriented Adineko, which is about a 300 ms period, and the faster, organ-oriented Organ Tone delay, which has a wheel speed of about 150 ms. The LFO architecture is a truncated version of the exponentiated sine wave LFO from the ROG Tri-Vibe.



Don't Tell Ray LFO

The final portion of the circuit is the power section. This is a very standard PT2399 power section, with +9V, VREF, and +5V. Not a lot to say about that.



Don't Tell Ray Power Section

BOM

The BOM below is the list of parts I used for mine along with quantities. All parts are through hole with resistors being 1/4W. I got everything from Tayda.

Part	Qty.	Notes
1k Resistor	1	
1k8 Resistor	1	
2k2 Resistor	2	
4k7 Resistor	4	
6k8 Resistor	1	
10k Resistor	6	
12k Resistor	2	
22k Resistor	4	
39k Resistor	2	
47k Resistor	1	
68k Resistor	1	
100k Resistor	4	
220k Resistor	2	
1M Resistor	2	
Current Limiting Resistor	1	
100pF Capacitor	2	
2.2nF Capacitor	1	
3.3nF Capacitor	1	
4.7nF Capacitor	2	
10nF Capacitor	4	
22nF Capacitor	2	
47nF Capacitor	1	
100nF Capacitor	6	
1uF Ceramic/Film Capacitor	4	
4.7uF Electrolytic Capacitor	1	
10uF Electrolytic Capacitor	2	
47uF Electrolytic Capacitor	2	
100uF Electrolytic Capacitor	2	
B10k Potentiometer	1	16mm PCB Mount

B25k Potentiometer	1	16mm PCB Mount
B50k Potentiometer	3	16mm PCB Mount
B250k Potentiometer	1	16mm PCB Mount, Dual Gang
SPDT Toggle Switch	1	
1N5817	1	
LED	1	
78L05	1	
TL072	1	
TL074	1	
PT23299	1	16 pin DIP
Enclosure	1	
1/4” input jack	2	
DC power jack	1	
3PDT footswitch	1	

Schematic

The schematic for this project is a little big to be legible on a single sheet, so it is included as a separate image in the project documentation folder.

Build Notes

Here are some things I noted from building the Don't Tell Ray that might be helpful to you. Please read this section to make sure you don't go through excessive frustration.

Enclosure Size/Drilling

Don't Tell Ray fits nicely into a 125B. The board is a little too wide to fit a 1590B. Drilling for the footswitch should be done with some amount of care, as the board is a little longer than my usual 125B boards.

Jacks

Whatever jacks you use for in/out and power in 125B are fair game; no restrictions here.

Feedback/Repeats

The DTR is purposely designed so that feedback doesn't go into self oscillation, but that is easily changed by reducing the value of R20.

Modulation Speed

The DTR is purposely designed with only two modulation speeds which correspond to the rate at which the magnetic disk spins in a real oil can delay. However, if you wish to have more control over the modulation speed, the toggle switch and R17 can be eliminate and R11 replaced with a potentiometer. It is a good idea to put a small series resistor here to limit the max speed and prevent poor LFO operation. Something like 4.7-10k is probably fine.

In Closing

Hopefully you will enjoy getting some of the great, old-school swampy delay tones with this project. I'm not aware of any other DIY oil can-style delays out there, so have fun with it.