Neptune Delay (V1-3)

The Neptune Delay is a PT2399-based digital delay with footswitch-controlled modulation. The base/core circuit was derived from the Sea Urchin circuit drawn up by madbeanpedals.com (no longer in production). The Neptune differs from its predecessor in a few key ways, however: the delay line filtering has a much lower cutoff frequency (high pass filtering), leading to very smooth and murky repeats that are virtually free of the digital noise that often plagues PT2399 delay circuits; and it also has a momentary footswitch that modulates the delay time in very interesting ways. There is a lot of room for modifications, so please check out the info on Page 2.

A full-size schematic and layout image are included in the zip file with this document.
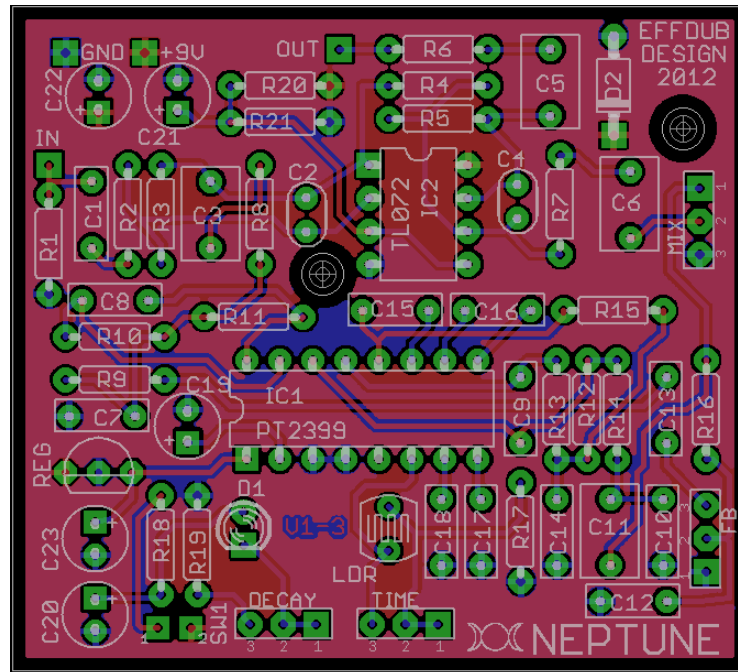
R1	1M	C1	22nF (box)	D1	LED – 3mm	
R2	150K	C2	100pF (disc)	D2	1N4001	
R3	330K	C3	1µF (box)	REG	7805 or 78L05[2]	
R4	22K	C4	100pF (disc)	IC1	PT2399	
R5	10K	C5	1µF (box)	IC2	TL072	
R6	1K	C6	1µF (box)			
R7	22K	C7	10nF (box)	SW1	SPST NO Momentary[3]	
R8	22K	C8	2.2nF (box)			
R9	1K	C9	2.2nF (box)	FEEDBACK	B50K	
R10	10K	C10	10nF (box)	MIX	B50K	
R11	10K	C11	1µF (box)	TIME	B25K	
R12	22K	C12	47nF (box)	DECAY	B5K	
R13	10K	C13	22nF (box)			
R14	1K	C14	47nF (box)			
R15	10K	C15	100nF (box)			
R16	1K	C16	100nF (box)			
R17	18K	C17	100nF (box)			
R18	15K	C18	100nF (box)			
R19	470R	C19	47µF (electro)			
R20	10J	C20	100µF (electro)			
R21	10K	C21	47µF (electro)			
LDR	CdS Cell[1]	C22	100µF (electro)			
		C23	100µF (electro)			

Parts Notes / Sourcing

1 – The LDR is the variable resistor that allows the circuit to do all the funky pitch bending stuff. The value range is not terribly critical, but it should have a dark resistance of 1M or greater, and preferably a light resistance of 100K or less. If in doubt, socket this part on the PCB and test multiple LDRs.

Sourcing: You can get these parts at a variety of sources, including Radio Shack, Tayda Electronics (KE-10720), and Smallbear (2506A). As an alternative to using an LDR, a sealed optocoupler can be used. Because of the limited space on the PCB, I recommend Silonex NSL-32SR2 or NSL-32SR2. Smallbear has these (part numbers 2515A and 2515B, respectively). NSL-28 would also work.

2 – The regulator can be either 7805 or 78**L**05. The silkscreen shape on the PCB shows the proper orientation for a 7805 regulator. <u>If you have or plan to use 78**L**05, be sure to orientate the part the opposite of what is shown on the PCB.</u> If you have doubts, I recommend socketing this part and then testing it under power for 5v output (but do this before you mount the PT2399 on the PCB).

3 – SW1 should be a normally open momentary SPST footswitch. Most pedal parts suppliers carry these. Sometimes they are also called "normally off". You could use any momentary (DPDT, for example), just use one pole and one throw and leave the other lugs open.

Tweaks and Modifications

Min/Max Delay Time Mods

There are two main ways to change the range of delay times: Change the value of the TIME pot (smaller value = shorter maximum delay time, larger value = longer maximum delay time), or change the value of R17. R17 plays two roles: It sets the minimum delay time possible when TIME is fully CCW (or when SW1 is depressed), and it also extends the max delay time by increasing the maximum possible resistance from the TIME pot. The stock value of 18K will give the circuit a minimum time of ~200ms and a max time of ~550ms. Smaller values for R17 will allow for a shorter minimum and shorter maximum delay time. Larger values do the opposite. Experiment!

Filtering Mods

The simplest way to adjust how dark the repeats are is to change the value of C14. The stock value is 47nF. Larger values decrease the cutoff frequency of the low-pass filter (more highs are cut); smaller values do the opposite. The same thing applies to C7, C10, and C12, but they have far less of an effect tonally. Feel free to socket all four caps and try values until the repeats have the tone you like.

Decay Time / Modulation Mods

R18 (in conjunction with C20) determines how quickly D1 lights up. Larger values slow down the light-up time.

Commercial Use

The Neptune PCB is provided for any and all uses. This includes commercial resale in any form (kits, finished pedals, etc). The layout artwork remains the intellectual property of EffDub Design.

If you would like to have custom PCBs made with your brand and product name on the silkscreen, please contact me at effdub@gmail.com.