



Triton Delay: Dual Delay Time with Glissando Modulation

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1 General Information

1.1 Circuit Overview / Roots

The Triton Delay is yet another PT2399-based delay circuit that, at its tonal and topological core, is substantially similar to the Rebote 2.5 by Tonepad, which itself is highly derivative of the original example circuit in the PT2399 datasheet. This same basic design has been used in quite literally hundreds of commercial products and DIY projects.

The Triton, however, diverges from the base concept by adding a second Delay Time potentiometer and a unique (in the DIY world) modulation effect. The Delay pots are selectable via footswitch (latching), and when switching from one time setting to the other, the delay time change happens slowly, just as if you were manually turning the delay time pot on a standard delay pedal. This causes a gradual pitch bend that slowly resolves to unison if a note or chord is struck and held when toggling between Delay pots.

To control the speed of the pitch bend/resolve, there is a pot labelled “Slow”. Making the transition speed slower also makes overall delay time longer. It’s a very interactive system.

The idea for this type of modulation came from the nearly legendary Toneczar Echoczar analog delay pedal, which features a functionally similar set up (two Delay pots and a gradual transition when toggled). The implementation in the Triton is quite different, but the modulation effect is quite similar. Note that no claim is being made that the Triton shares tonal similarities with the Echoczar.

The other tweak to the old Rebote design is a tone control for the delay line. The control is an on-board trimmer and is a rather simplistic single-order passive RC low-pass filter.

1.2 Usage of Project Materials

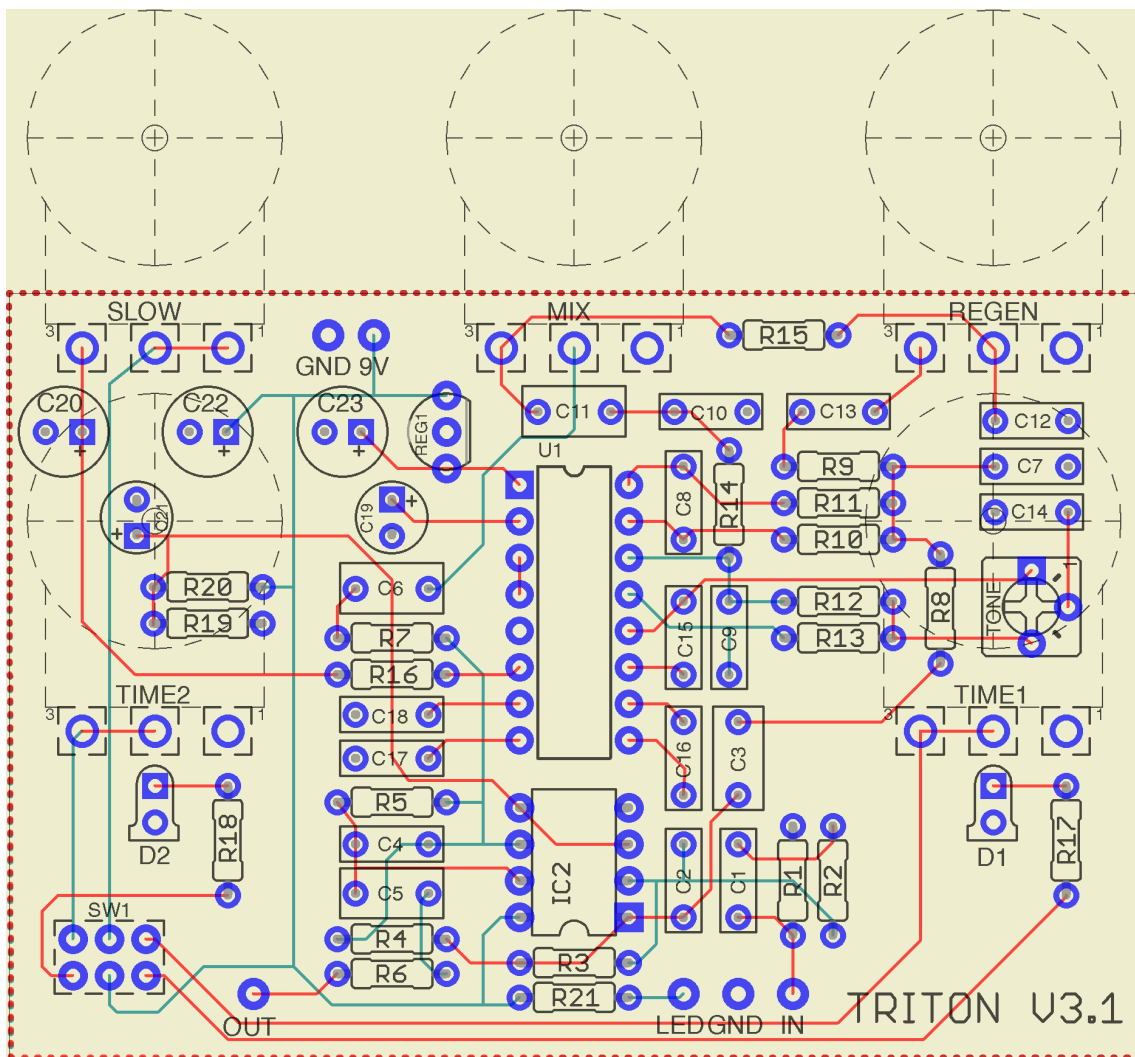
The circuit, name of the project, and the project PCB can all be used for any purpose. That includes commercialization though the sale of completed pedals, populated



PCBs, kits of parts, reselling un-populated PCBs at a profit, making your own original PCB layout and selling boards, or anything else you greedy would-be bourgeois pigs can dream up to make a quick buck. Knock yourselves out.

2 Project Information

2.1 PCB Layout





2.2 Bill of Materials

Part	Value	Package	Part	Value	Package
R1	1M	1/4-watt	C1	22n	Box Cap
R2	150K	1/4-watt	C2	100p	Box Cap
R3	330K	1/4-watt	C3	470n	Box Cap
R4	22K	1/4-watt	C4	100p	Box Cap
R5	12K	1/4-watt	C5	470n	Box Cap
R6	1K	1/4-watt	C6	470n	Box Cap
R7	18K	1/4-watt	C7	10n	Box Cap
R8	22K	1/4-watt	C8	2n2	Box Cap
R9	22K	1/4-watt	C9	2n2	Box Cap
R10	10K	1/4-watt	C10	10n	Box Cap
R11	10K	1/4-watt	C11	470n	Box Cap
R12	22K	1/4-watt	C12	47n	Box Cap
R13	10K	1/4-watt	C13	22n	Box Cap
R14	1K	1/4-watt	C14	56n	Box Cap
R15	1K	1/4-watt	C15	100n	Box Cap
R16	2K2	1/4-watt	C16	100n	Box Cap
R17	4K7	1/4-watt	C17	100n	Box Cap
R18	4K7	1/4-watt	C18	100n	Box Cap
R19	10K	1/4-watt	C19	47u	Electrolytic
R20	10K	1/4-watt	C20	220u	Electrolytic
R21	4K7	1/4-watt	C21	47u	Electrolytic
			C22	100u	Electrolytic
D1	LED	3mm	C23	100u	Electrolytic
D2	LED	3mm			
U1 / IC1	PT2399	DIL16	MIX	B50K	16MM PCB-Mount
U2 / IC2	TL072	DIL08	REGEN	B50K	16MM PCB-Mount
REG1	78L05	TO-92	TIME1	B50K	16MM PCB-Mount
			TIME2	B50K	16MM PCB-Mount
SW1	DPDT Latching	Solder Lug	SLOW	B10K	16MM PCB-Mount
			TONE	10K	2262 Trimmer



3 Build Notes / Modifications

3.1 General Notes

- Each Time pot has its own LED (3mm) indicator to show when it is active. The pads for these LEDs are placed on the PCB so that they can be board-mounted for minimized wiring and convenience. However, these are optional and can be omitted (along with R17 and R18), if desired. One of the two Time pot indicator LEDs will always be on, even if the pedal is bypassed.
- There is no polarity protection scheme in this circuit. I figured most DIY projects aren't likely to have a -9V wall wart plugged in; also, many hobbyists these days are using 3PDT utility PCBs that often contain power supply parts. A simple "parallel" protection diode (1N4001) can be added directly to the power supply jack lugs, if desired.
- R21 and the pad labeled "LED" are for the main bypass indicator LED (not on the PCB). If you want to wire your bypass LED separately, you can omit R21 and ignore the "LED" pad.
- All of the caps that are specified at 470n can be changed to 330n or 220n without much (if any) change in tone. I have tested with metal film and multi-layer ceramics, and I can't hear any consistent and definite difference in type or value. YMMV, as they say. 😊

3.2 PT2399 Noise Notes

- Over the past 18-24 months (as of January 2016), PT2399 chip quality has become very inconsistent. Because this circuit was designed to push the chip to its limit, it would be a good idea to buy several PT2399 ICs and audition them for lowest noise.
- Stock Time pot values are B50K. This will provide a very long delay time at maximum (~800ms), and also a lot of chip noise. This value was selected because the beautiful and haunting glissando modulation effect is most pronounced when transitioning from a shorter delay time to a very long delay time.



- To combat noise, the Tone trimmer was added. It makes the repeats very dark when maxed out, but pretty much eliminates chip noise even at the longest delay times. If you find that you still get chip noise even with Tone maxed out, there are a few options for remedy: 1) increase the value of C14; 2) try a different PT2399; 3) reduce the value of the Time pots to B25K or put a 100K resistor in parallel with each 50K pot to bring the effective pot value down to 33K. Other places you can increase the low-pass filtering: increase the values of C7, C10, and C12.

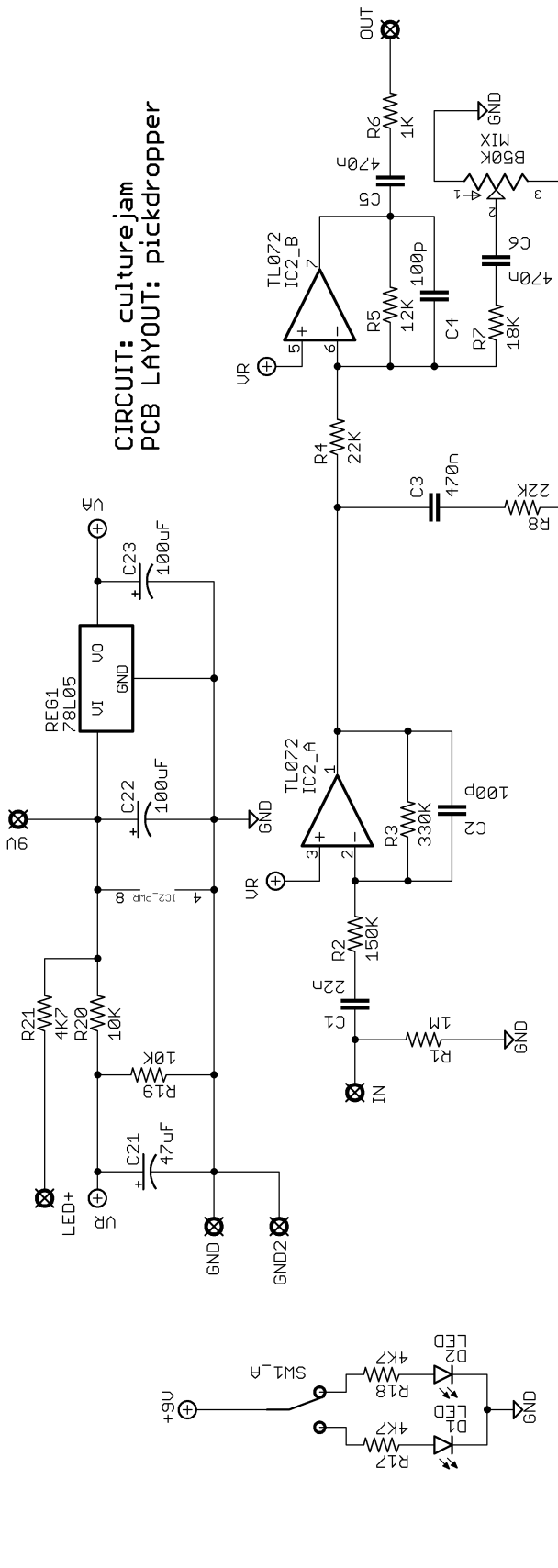
3.3 Glissando Modulation Notes

- The real crux of the whole modulation section is C20. Along with each Time pot and R16, C20 forms a R/C filter that dictates the speed of current change to pin 6 of the PT2399. Pin 6 is the interface to the internal voltage-controlled oscillator that sets the clock frequency (delay time). The voltage is fixed at 2.5V, so changing the available current changes the delay time. Toggling between Time1 and Time2 triggers C20 to begin charging, and that gradually changes the available current to Pin 6. And that's how the pitch bend happens. Or something like that. 😊
- The value of 220u for C20 was chosen to give maximum modulation transition time at shorter delay times (to minimize noise). A good mod is to add a 100u cap in parallel on a switch. This allows for very long modulation transitions while retaining the option of the standard design. Feel free to play around with the value of C20 and see what works best for you.

4 Schematic

The Triton V3.1 schematic is on the following page.

CIRCUIT: culturejam PCB LAYOUT: pickdropper



TRITON DELAY - V3.1

