TAPPY

FX TYPE: Tap Tempo Controller
Based on the Electric Druid TAPLFO3
Enclosure Size: 1590G
"Softie" compatibility: none

Overview

The Tappy is a standalone controller for the Electric Druid TAPLFO3. It allows for up to three separate control outputs: optical, resistive and VCO. It was primarily designed as a tap-tempo plug-in for the mbp Glasshole phaser project (and will also interface with some future projects) but it can be adapted to work in other effects. In the notes section, I will illustrate a few possible applications you might consider for the Tappy.

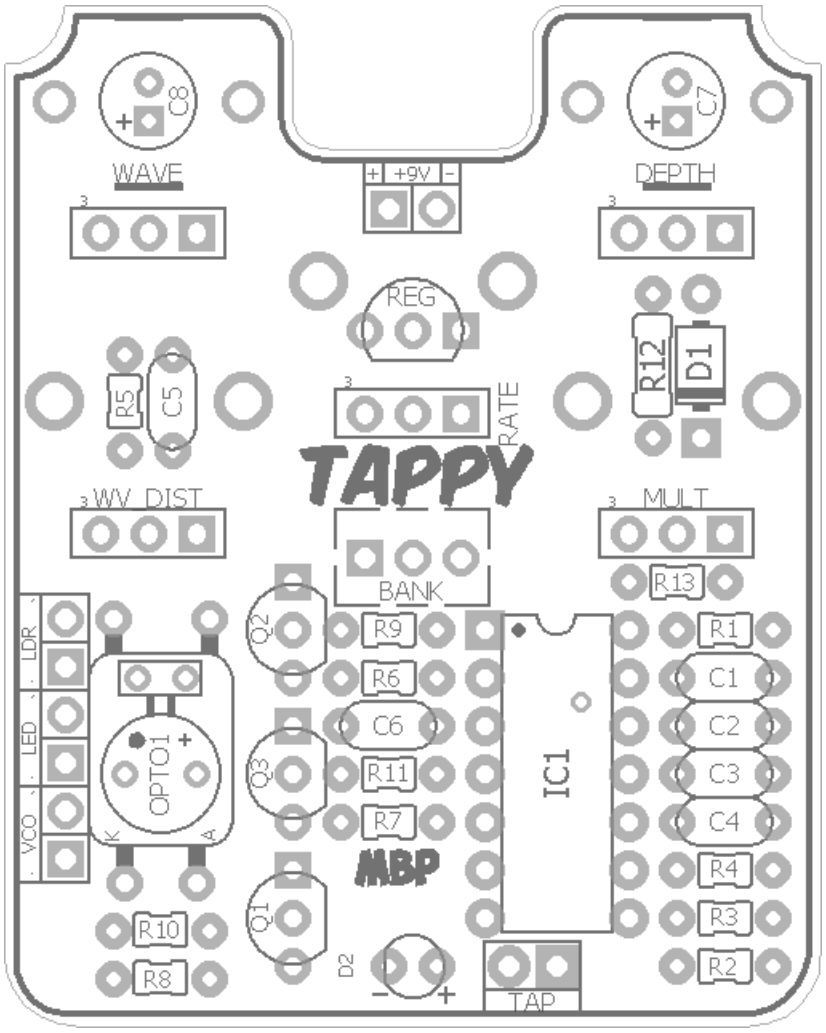
The Tappy design is identical to the implementation used on the Wavelord tremolo project but without the actual tremolo portion. If you've built the Wavelord, you already have most of the functionality of the Tappy, since it also includes a separate output to drive another effect.

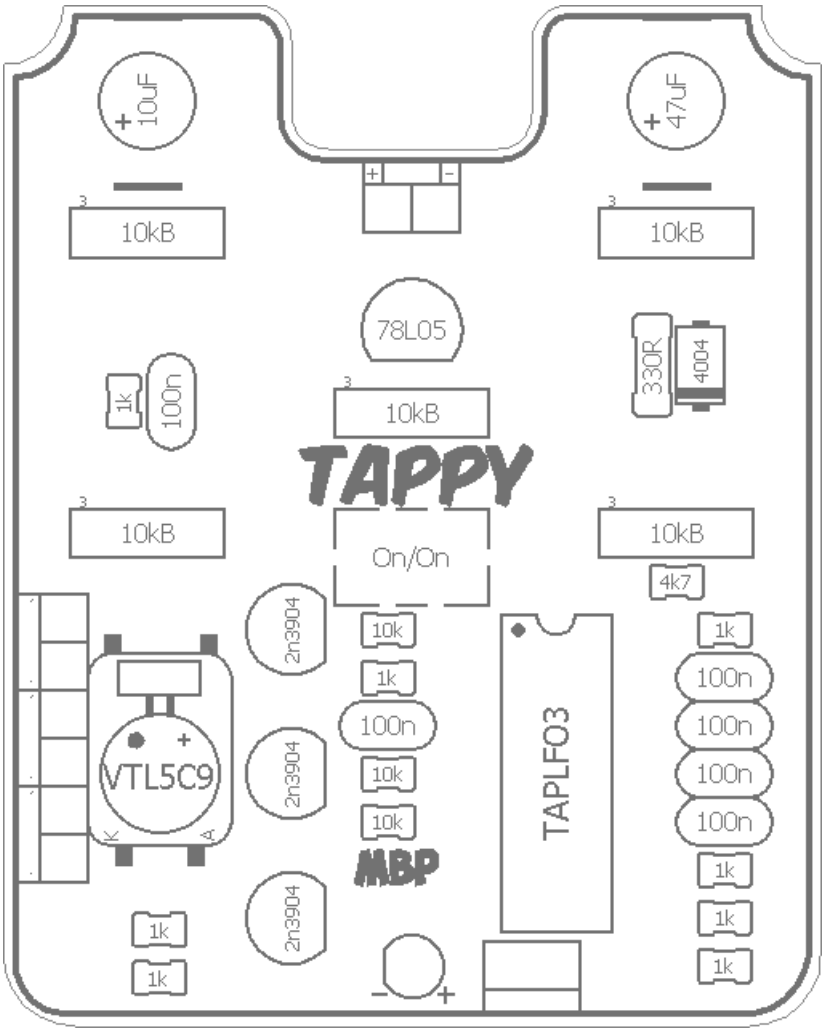
The Tappy has an optional faceplate design that can be purchased for use as enclosure artwork. The faceplate is done on 0.8mm FR-4 and professionally manufactured. The artwork shows all the available waveforms.

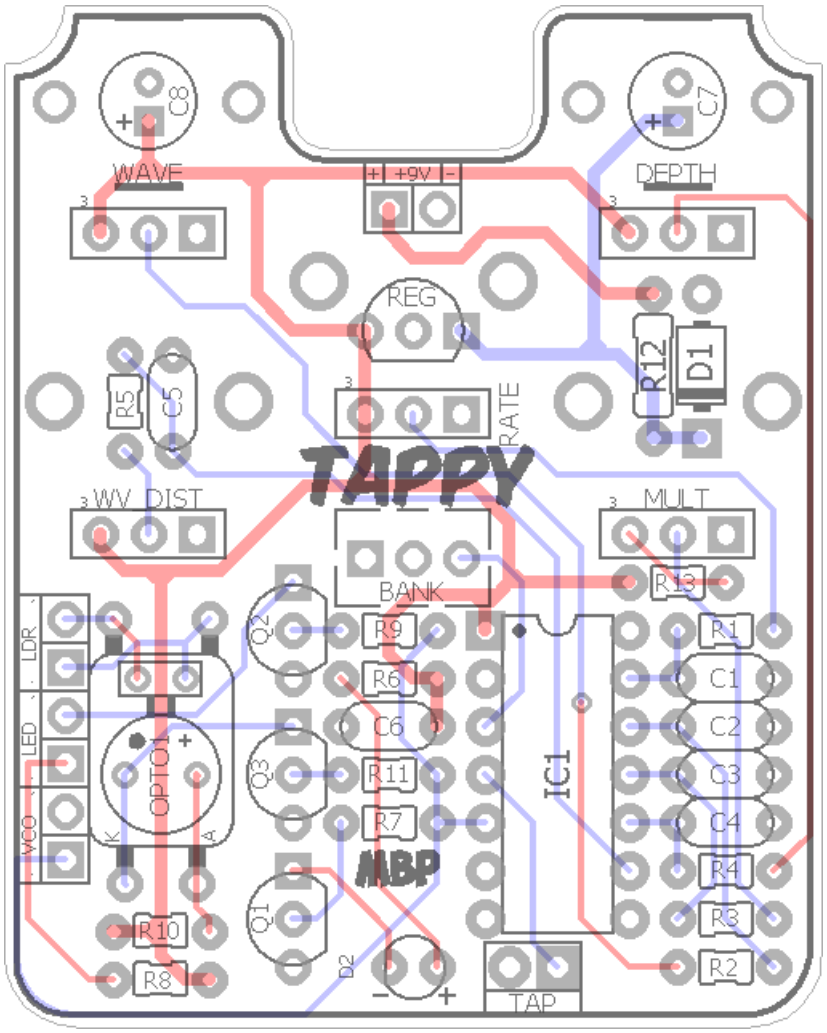
Controls

- **Tap:** Sets the quarter note pulse based on the average of two or more taps.
- **Rate:** Sets the tempo via a pot as an alternative to tapping the BPM.
- **Mult:** The multiplier sets the quarter note pulse division. From left to right this is 0.5x, 1x, 1.5x, 2x, 3x, 4x (note some tempos at 4x speed will simply be too fast for the opto device to respond so it will do nothing).
- **Depth:** Intensity of the effect.
- **Dist:** Changes the duty cycle to push the peaks or valleys of each waveform to the beginning or end of the cycle. Zero distortion is at 50%.
- **Wave:** Selects between 8 waveforms per bank.
- **Bank:** This switch toggles between bank 1 and 2, giving you a total of 16 possible tremolo waveforms.
- **LED, LDR, VCO:** These 1/8" isolated jacks are the three possible control outputs. For the Glasshole, you only need to use the LED output. The LDR output can be quite useful and is explained the Notes section. The VCO output is left to the user. See the TAPLFO datasheet for applications.

Check out the TAPLFO3 info and datasheet from our DIY friend Tom over at Electric Druid!
https://electricdruid.net/product/taplfo3/


C8
C7
WAVE
+9V
DEPTH
REG
R12
D1
R5
C5
RATE
TAPPY
WV DIST
MULT
BANK
R13
LDR
LED
VCO
Q2
R9
R1
R6
C1
C6
C2
OPTO1
Q3
R11
C3
IC1
R7
C4
MBP
R4
Q1
R10
R3
D2
R8
R2
TAP


10uF
47uF
10kB
10kB
78L05
330R
4004
1k
100n
10kB
TAPPY
10kB
On/On
10kB
4k7
2n3904
10k
1k
100n
10k
10k
VTL5C9
K
A
2n3904
MBP
TAPLFO3
1k
100n
100n
100n
100n
1k
1k
1k
2n3904
1k
1k


C8
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WV DIST
MULT
BANK
R13
R9
R6
C6
R11
R7
R1
C1
C2
C3
C4
R4
R3
R2
IC1
LDR
LED
VCC
OPTO1
K
A
Q2
Q3
Q1
MBP
R10
R8
D2
TAP

Resistors		Diodes	
R1	1k	D1	1N4004
R2	1k	D2	LED
R3	1k	**Transistors**	
R4	1k	Q1 - Q3	2n3904
R5	1k	**IC**	
R6	1k	IC1	TAPLFO3
R7	10k	**Regulator**	
R8	1k	REG	78L05
R9	10k	**Optical**	
R10	1k	OPTO1	VTL5C9
R11	10k	**Switches**	
R12	330R	BANK	On/On
R13	4k7	TAP	Mom.
Caps		**Jacks**	
C1	100n	LED	Jack
C2	100n	VCO	Jack
C3	100n	LDR	Jack
C4	100n	**Pots**	
C5	100n	DEPTH	10kB
C6	100n	MULT	10kB
C7	47uF	RATE	10kB
C8	10uF	WAVE	10kB
		WV_DIST	10kB

Value	Qty	Type	Rating
330R	1	Metal / Carbon Film	1/4W
1k	8	Metal / Carbon Film	1/8W
4k7	1	Metal / Carbon Film	1/8W
10k	3	Metal / Carbon Film	1/8W
100n	6	Film / MLCC	16v min.
10uF	1	Low-Profile Electroltyic	16v min.
47uF	1	Low-Profile Electroltyic	16v min.
1N4004	1		
LED	1	diffused, any color	3mm
2n3904	3		
TAPLFO3	1		
78L05	1		
VTL5C9	1	*see notes	
SPDT	1	On/On, Mini	
Mom.	1	Normally Open	
Jack	1-3	Mini, isolated - see notes	1/8”
10kB	3	PCB Right Angle, Plastic Shaft	9mm
10kB	2	PCB Right Angle, Metal Shaft	9mm

Low Profile Electrolytic caps (required for building in 1590G):
http://smallbear-electronics.mybigcommerce.com/electrolytic-radial-low-profile-16v-1-f-100-f/

TAPLFO 3: http://www.smallbear-electronics.mybigcommerce.com/ic-electric-druid-taplfo-3c/

VTL5C9: http://smallbear-electronics.mybigcommerce.com/photocoupler-vactec-vtl5c9/

SPDT (Mini):
http://smallbear-electronics.mybigcommerce.com/spdt-sub-mini-short-lever-pc-mount-on-on/

10kB 9mm Metal Shaft:
http://smallbear-electronics.mybigcommerce.com/alpha-single-gang-9mm-right-angle-pc-mount/

10kB 9mm Plastic Shaft:
http://www.smallbear-electronics.mybigcommerce.com/alpha-single-gang-9mm-right-angle-pc-mount-w-knurled-plastic-shaft/

Momentary NO:
http://www.smallbear-electronics.mybigcommerce.com/momentary-spst-no-soft-touch/

Thinline DC Jack:
http://smallbear-electronics.mybigcommerce.com/dc-power-jack-all-plastic-unswitched-2-1-mm/

1/8” Jack:
http://www.smallbear-electronics.mybigcommerce.com/1-8-mono-pc-mount/

For 1/8” plugs, you can also use pre-made TRS ones. There are a number of inexpensive ones on Amazon. For most of them, the ring of the TRS plug will end up connecting to the tip of the jack. This is okay, though, since they are plastic and isolated from the enclosure.

https://www.amazon.com/gp/product/B01N2MY88J/ref=ppx_yo_dt_b_asin_title_o03_s04?ie=UTF8&psc=1

https://www.amazon.com/gp/product/B072TYZ89H/ref=ppx_yo_dt_b_asin_title_o03_s00?ie=UTF8&psc=1

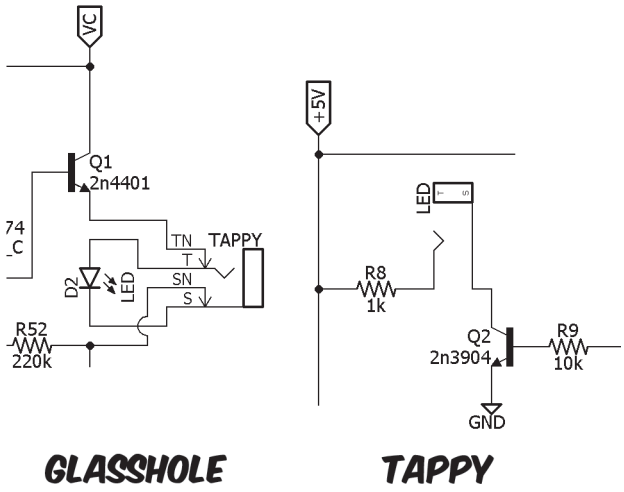
Optional, but recommended: 14-pin low-profile socket for the TAPLFO3 chip:
https://www.mouser.com/ProductDetail/575-893314

You can also use two of the 8-pin versions and simply cut one row off to make a 14pin socket (this is what I did):
https://www.mouser.com/ProductDetail/575-343308

Build Tips:

1. Solder your wires to the 9v jack before soldering in the Rate pot.
2. Use BlueTac or similar to hold the mini SPDT in place when soldering. I usually solder one pin first, then check to make sure the jack is still flush to the PCB before doing the two remaining pins.
3. You need to install the LED jack to use it as a tap-tempo controller for the Glasshole. The LDR is optional but may have some applications you find useful. Unless you have a specific need for the VCO output, I suggest leaving that ~~jack off~~ ...empty.

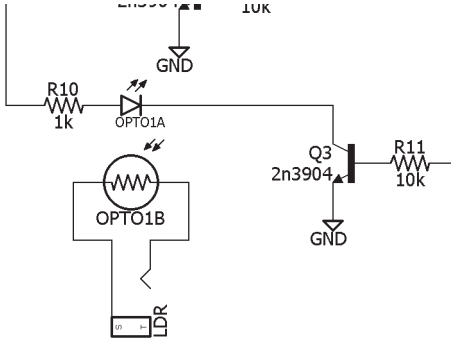
LED Jack:

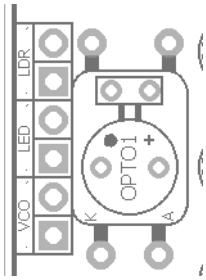


Here's how the LED jack works: the Glasshole uses an internal LFO to drive an LED. Its brightness changes the resistance values of the 8 LDRs in the effect to produce the phase sweep. That LED is wired to a jack which disconnects the LFO when a 1/8" plug is inserted. On the Tappy end, the TAPLFO3 chip subs a different driving mechanism to power the LED. That mechanism is tap-tempo driven and has different waveforms. Not all of those waveforms are ideal for a phaser but there are plenty that offer something unique.

If you are designing or retro-fitting an existing effect for Tappy control, simply copy the jack wiring shown in the Glasshole. IOW, disconnect the internal LED of the effect so it can be driven by an external source.

LDR Jack:





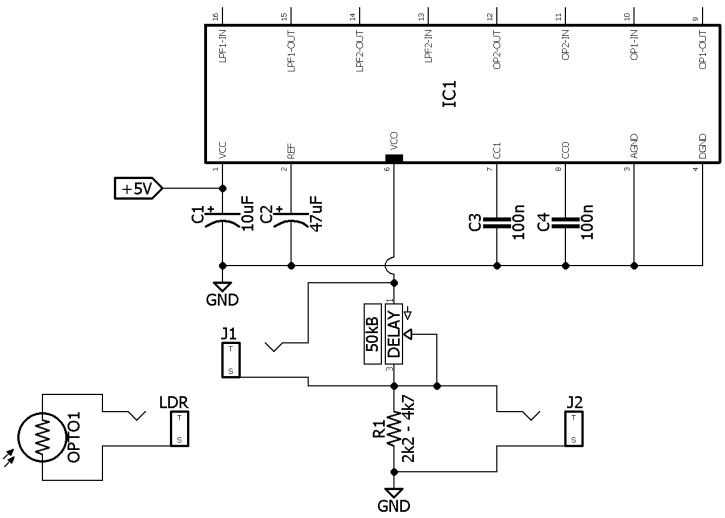
To use the LDR output, a vactrol must but installed in OPTO1 of the Tappy PCB. Here the output is taken directly from the internal light dependent resistor of the vactrol which allows you change the resistance of a parameter in another effect. The output jack is symmetrical on both sides so it doesn't require you to connect to that parameter in a particular way (IOW, resistors don't have an orientation). The OPTO1 device does have pads to use an NSL32-R3, but I recommend the VTL5C9 for best results.

Suggestions on parameters one could control are:

- Delay modulation (like a PT2399 delay).
- A vibrato or tremolo effect (such as the Magnavibe and Tremulus Lune, resp).
- Adapt a fixed filter into a tap tempo swept filter such as the Colorsound Inductorless Wah.

Advanced Users

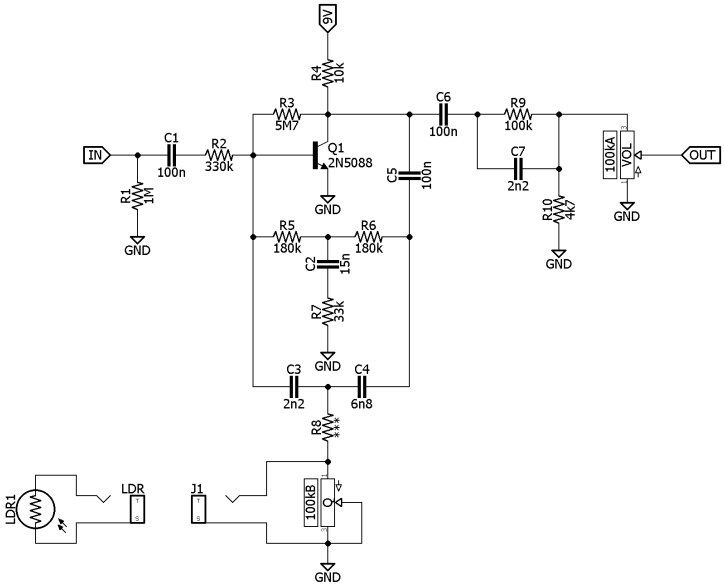
Here a some suggestions on possible applications using the Tappy as a controller for other effects. These are not actual verified setups, but suggested starting points if you are interested in expanding on the use of the Tappy.



Here's an example of a possible delay modulation controller using a typical PT2399 setup. There are actually two ways you could do it.

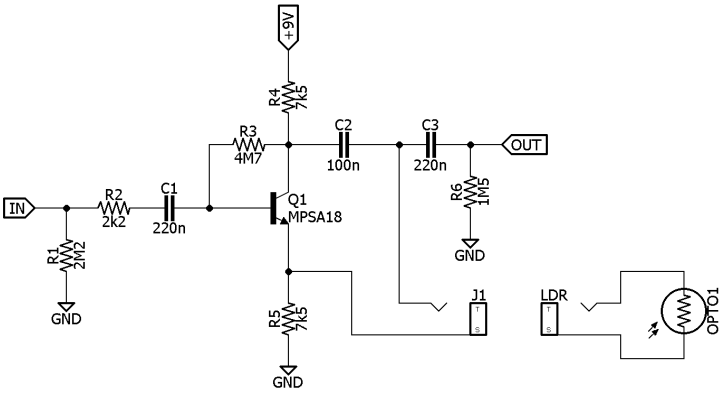
1. Hook the LDR jack in parallel with the delay pot (J1). In this setup the width of the modulation will change as the delay times are changed.

2. Put the LDR in parallel with the R1 "stopper" resistor (J2). This keeps the modulation width fixed regardless of delay time. This method is probably more subtle and musical sounding whereas the first would be more suited for wacky noise-making.



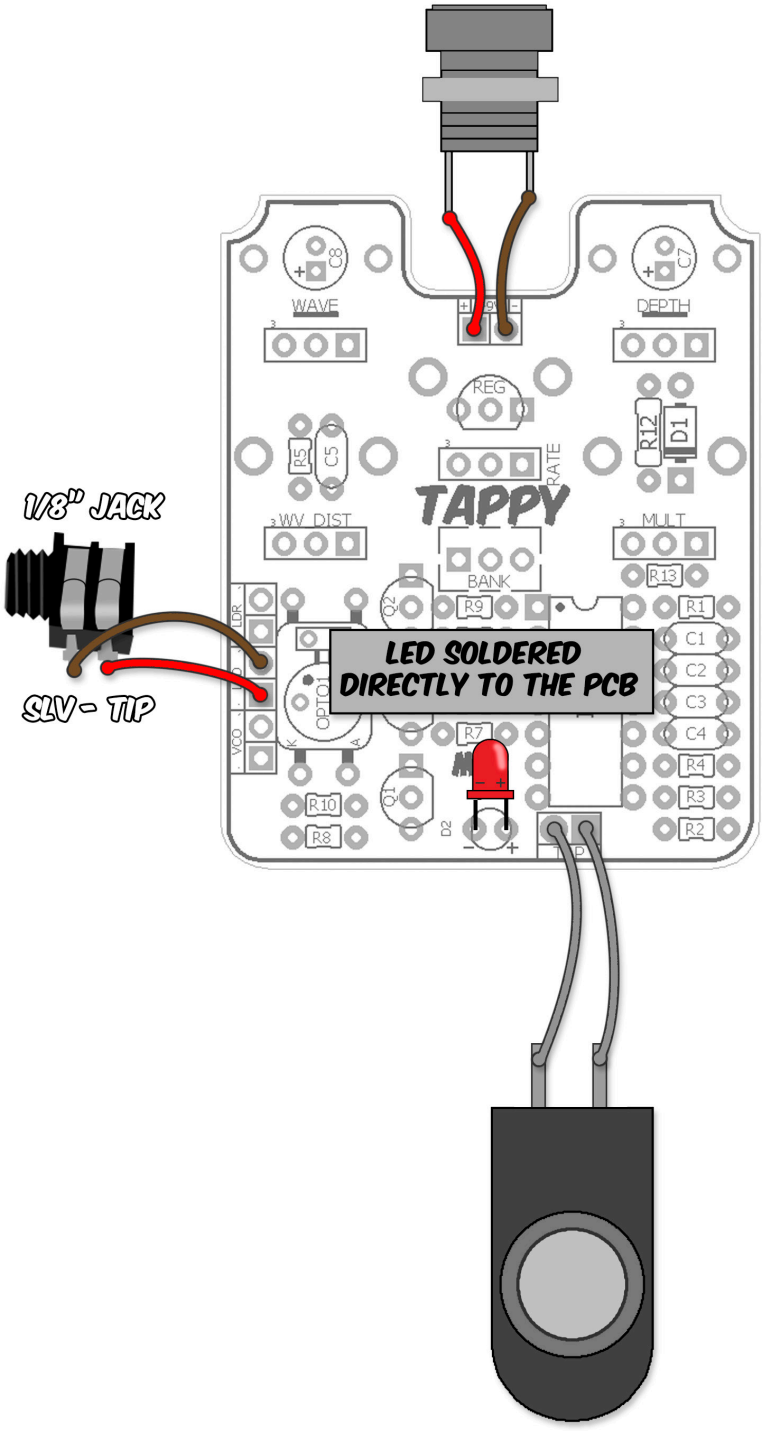
Another possible application using an Inductorless Wah circuit to create a swept filter. Here the LDR from OPTO1 on the Tappy is placed in parallel with the 100kB "Q" filter. Adjusting the Q pot allows you to change the range of the swept filter.

R8 is normally 33k but may require some tweaking of the value to get the optimal result.



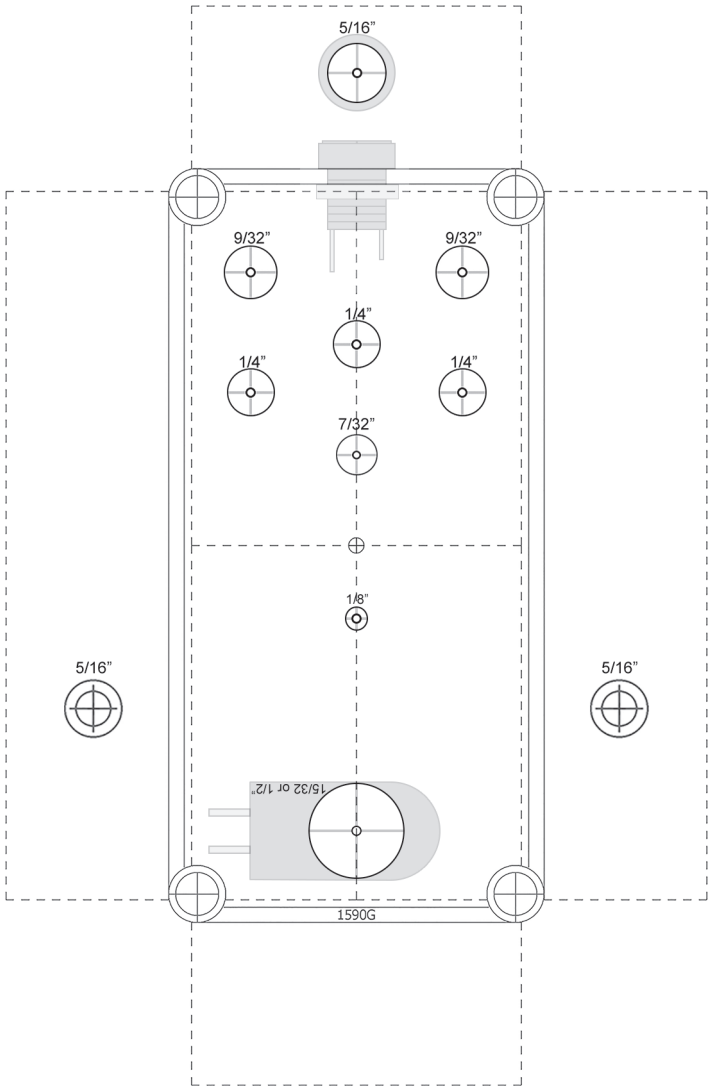
The Magnavibe is a popular DIY Vibrato build (being based on the Tim Escobedo Wobbletron). It would be easy to adapt just the audio portion of the Magnavibe to accept the LDR output of the Tappy, as shown in this example.

If you're really adventurous, you could build a Magnavibe with its stock LFO and then set up the photocell to disconnect and be replaced with the LDR output of the Tappy. You would use the same type of connections on the Glasshole diagram from the previous page.



The wiring is the same for all three possible jacks. Just make sure you keep track of tip (square pad) and sleeve (round pad). I don't recommend the mbp mini-jack adapaters in this build since it only requires two wires per jack.

Note: *Drill Guides are approximate and may require tweaking depending on the types of jacks, switches and pots you use.*



The two drill spots on the sides are for the 1/8” jacks. You should be able to fit a third spot if you plan on using all three possible outputs. **Remember to only drill the spots you need!**

For my build, I put the LED output on the left and LDR on the right.

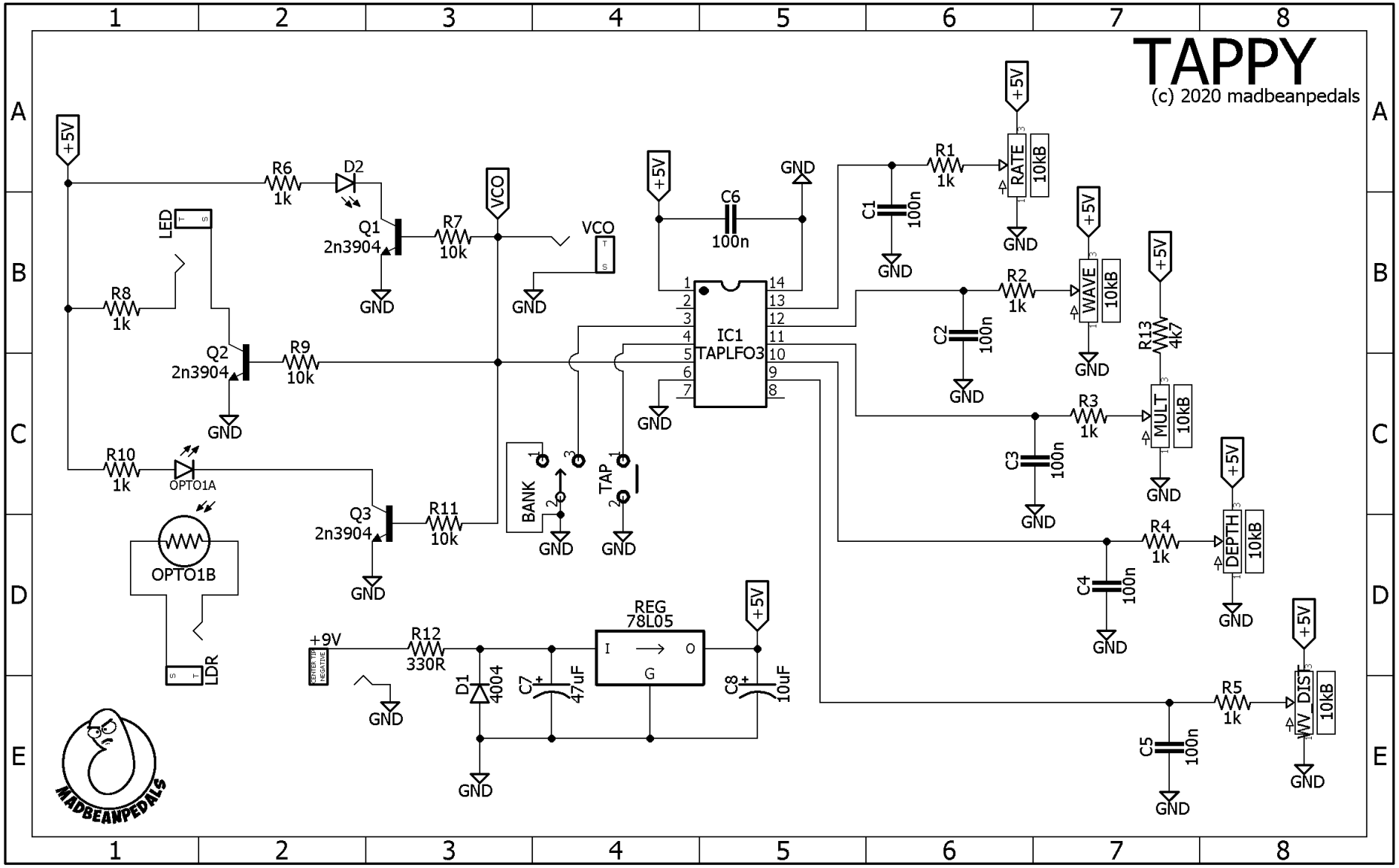
TIP: If you are using the optional faceplate, you can over-drill the pots and switch locations a little. This helps if you are not so hot a drilling precisely which is a problem I most definitely have never had even once. Just ask my wife, Olivia Wilde.

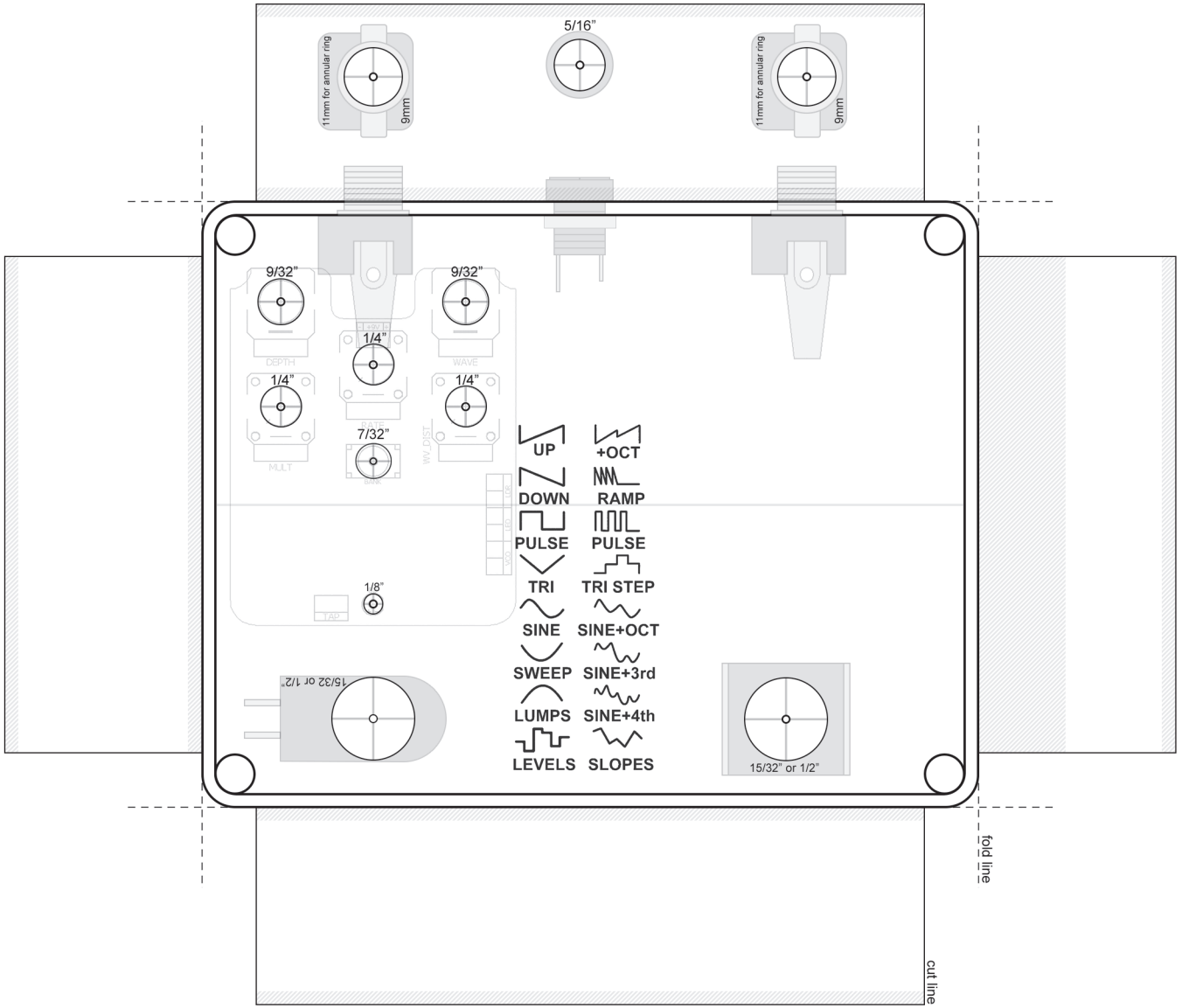
IC1	TAPFLO3
1	4.99
2	4.97
3	4.97
4	4.97
5	2.45
6	0
7	0.6mV
8	4.97
9	2.6
10	0
11	0
12	1.55
13	0
14	0

- 9.42vDC One Spot
- Current Draw ~ 11mA
- Transistor voltages will vary so they aren’t shown here.

For this build I opted for LED and LDR output jacks. I don't foresee ever needing the VCO output, but I could always add it later should I need it.

Even at the 0.8mm thickness of the flaceplate, it's necessary to leave off the nut on the SPDT switch. There's just not enough bushing to lock on to. I also left off the washers for the two 9mm pots and just used nuts to secure them.


TAPPY
(c) 2020 madbeanpedals
IC1
TAPLFO3
REG
78L05
RATE
WAVE
MULT
DEPTH
WV_DIST
BANK
TAP
VCO
LED
LDR
OPTO1A
OPTO1B
Q1
2n3904
Q2
2n3904
Q3
2n3904
D1
4004
D2
+5V
+9V
GND
R1
1k
R2
1k
R3
1k
R4
1k
R5
1k
R6
1k
R7
10k
R8
1k
R9
10k
R10
1k
R11
10k
R12
330R
R13
4k7
C1
100n
C2
100n
C3
100n
C4
100n
C5
100n
C6
100n
C7
47uF
C8
10uF
10kB
MADBEANPEDALS



If you want to incorporate the Tappy PCB into an all in one type build here's a 1590BB template to help get you started. You can find the .PSD template in the zip file for this project.