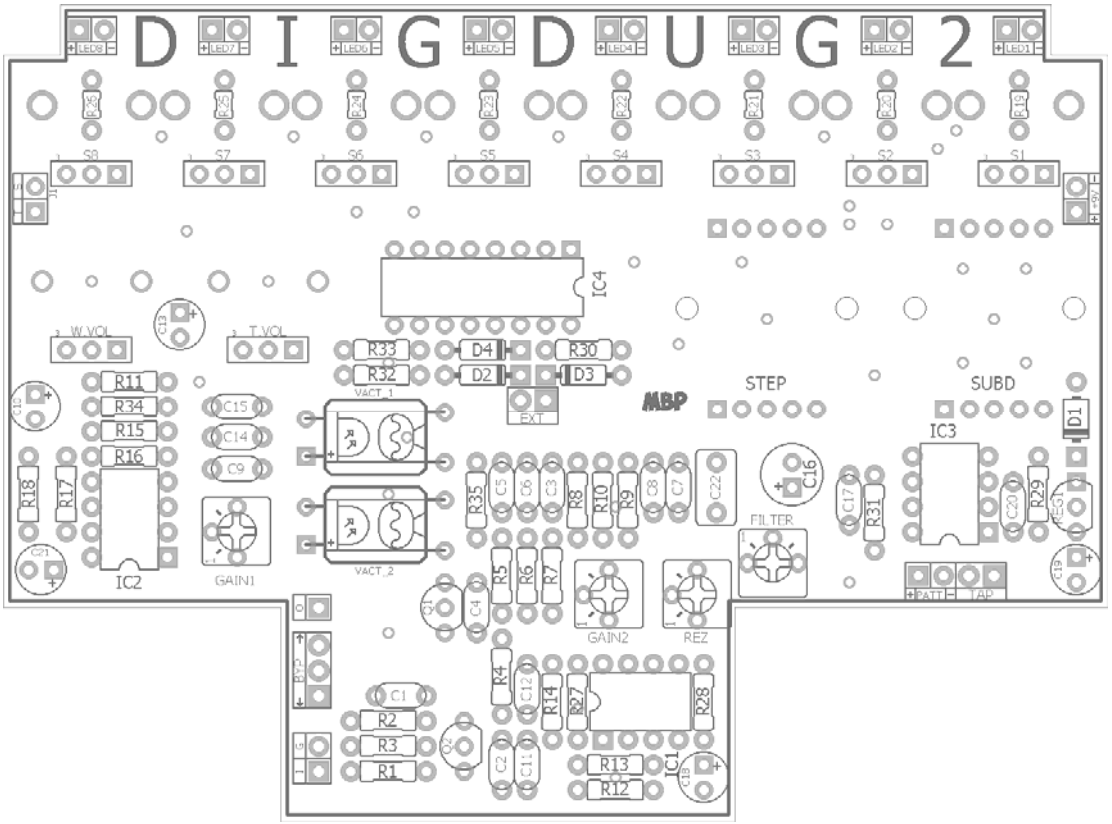
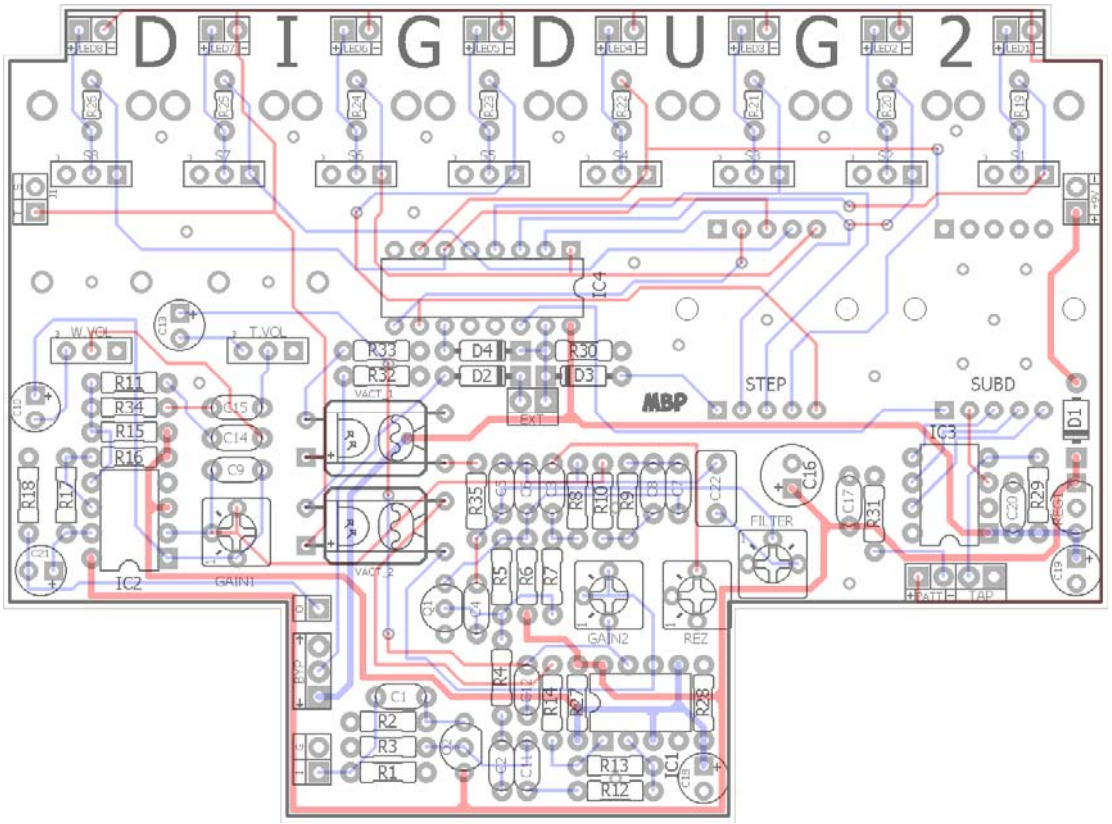
DIG DUG2

FX Type: Sequencer

4.15” W x 3.25” H





B.O.M.

Resistors		Caps		Diodes	
R1	1M	C1	100n	D1	1N5817
R2	1M	C2	220n	D2 - D4	1n914
R3	10k	C3	15n	LED1 - 8	3mm Red
R4	330k	C4	2n2	PATT	3mm Red
R5	4M7	C5	6n8	**Transistors**	
R6	10k	C6	100n	Q1	2N5088
R7	180k	C7	100n	Q2	2n5457
R8	180k	C8	22n	**IC's**	
R9	10k	C9	100pF	IC1	TL072
R10	10k	C10	1uF	IC2	TL072
R11	10k	C11	220n	IC3	MV-52B
R12	10k	C12	100pF	IC4	CD4017
R13	20k	C13	1uF	**Regulator**	
R14	100R	C14	100n	REG1	LM78L05
R15	10k	C15	100n	**Switches**	
R16	10k	C16	100uF	STEP	1P8T
R17	20k	C17	100n	SUBD	2P4T
R18	100k	C18	10uF	EXT	SPST
R19	330R	C19	10uF	TAP	Mom.
R20	330R	C20	100n	**Jack**	
R21	330R	C21	1uF	J1	1/"8 Jack
R22	330R	C22	220n	**Vactrols**	
R23	330R			VACT_1	VTL5C9
R24	330R			VACT_2	VTL5C3
R25	330R			**Trimmers**	
R26	330R			GAIN1	50k
R27	10k			GAIN2	50k
R28	10k			FILTER	100k
R29	10k			REZ	100k
R30	100k			**Pots**	
R31	1k			W.VOL	100kB
R32	330R			T.VOL	100kB
R33	330R			S1 - S8	2kB
R34	10k				
R35	220R				

Shopping List

Value	QTY	Type	Rating
100R	1	Carbon / Metal Film	1/4W
220R	1	Carbon / Metal Film	1/4W
330R	10	Carbon / Metal Film	1/4W or 1/8W
1k	1	Carbon / Metal Film	1/4W
10k	12	Carbon / Metal Film	1/4W
20k	2	Carbon / Metal Film	1/4W
100k	2	Carbon / Metal Film	1/4W
180k	2	Carbon / Metal Film	1/4W
330k	1	Carbon / Metal Film	1/4W
1M	2	Carbon / Metal Film	1/4W
4M7	1	Carbon / Metal Film	1/4W
100pF	2	Ceramic	16v min.
2n2	1	Film	16v min.
6n8	1	Film	16v min.
15n	1	Film	16v min.
22n	1	Film	16v min.
100n	7	Film	16v min.
220n	3	Film	16v min.
1uF	3	Electrolytic	16v min.
10uF	2	Electrolytic	16v min.
100uF	1	Electrolytic	16v min.
1N5817	1		
1n914	3		
3mm Red	9	Diffused LED	
2N5088	1		
2n5457	1		
TL072	2		
MV-52B	1		
CD4017	1		
LM78L05	1		
1P8T	1	1 pole 8 pos. rotary	
2P4T	1	2 pole, 4 pos. Rotary	
SPST	1	mini-Switch (SPDT okay)	
Mom.	1	Momentary footswitch	
J1	1	Jack	1/8"
VTL5C9	1		
VTL5C3	1		
50k	2	Bourns 3362P	
100k	2	Bourns 3362P	
100kB	2	PCB Right Angle, metal shaft	9mm
2kB	8	PCB Right Angle, plastic shaft	9mm

MV-52B
http://smallbear-electronics.mybigcommerce.com/ic-mv-52b/

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

VTL5C3
http://smallbear-electronics.mybigcommerce.com/photocoupler-xvive-vtl5c3-work-alike/

CD4017
http://smallbear-electronics.mybigcommerce.com/ic-cd4017/

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

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

SPDT mini switch
http://smallbear-electronics.mybigcommerce.com/spdt-on-on-mountain-10tc410/

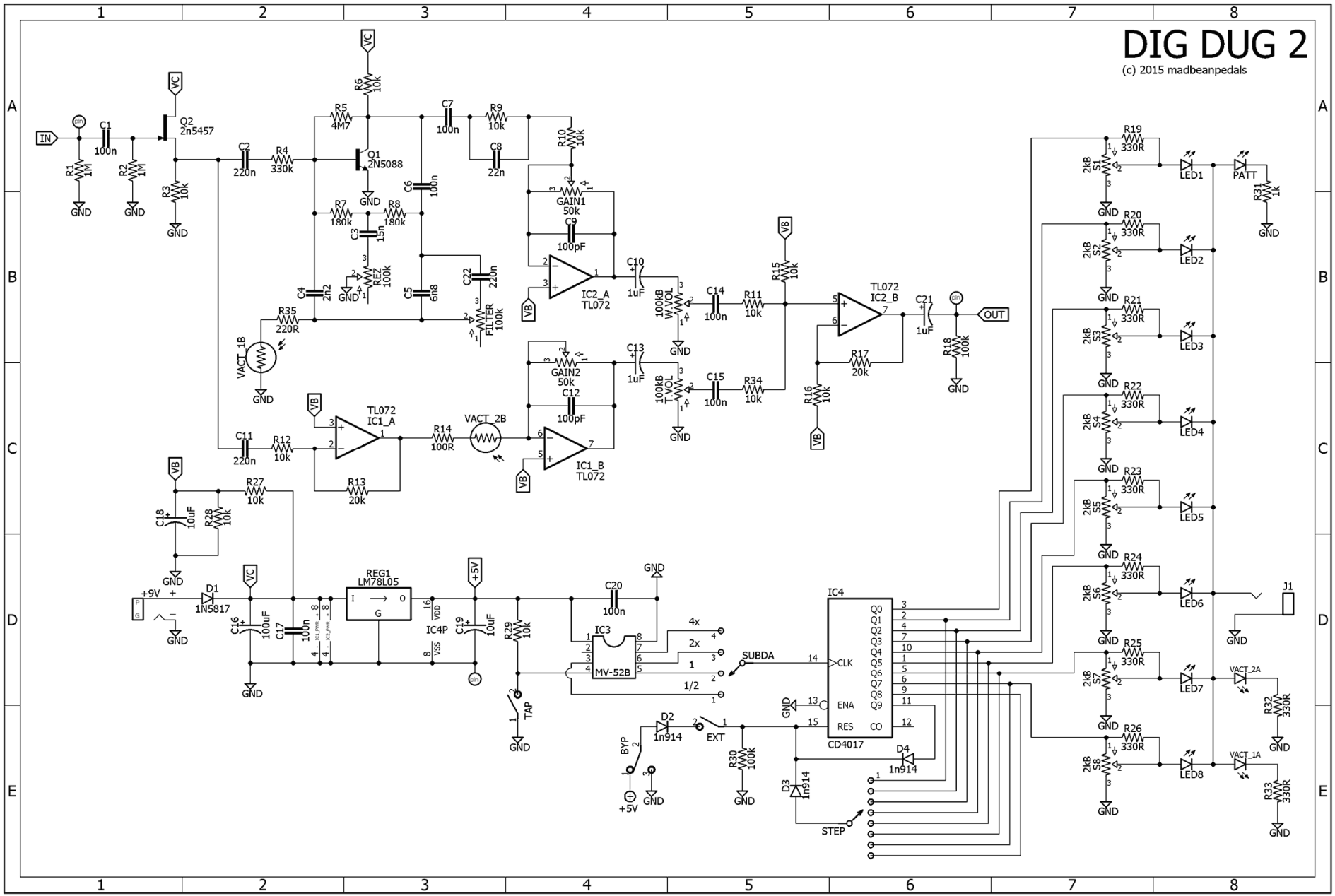
Momentary switch
http://smallbear-electronics.mybigcommerce.com/momentary-spst-no-soft-touch/

1/8” jack
http://smallbear-electronics.mybigcommerce.com/1-8-mono-pc-mount/
or, http://smallbear-electronics.mybigcommerce.com/1-8-mono-panel-mount-n-c-switch/

1P8T
http://www.mouser.com/ProductDetail/Alpha-Taiwan/SR1712F-0108-20F0A-N9-N/?qs=sGAEpiMZZMvNbjZ2WlReYqBsoziRjTWUH8saZNpNioA%3d

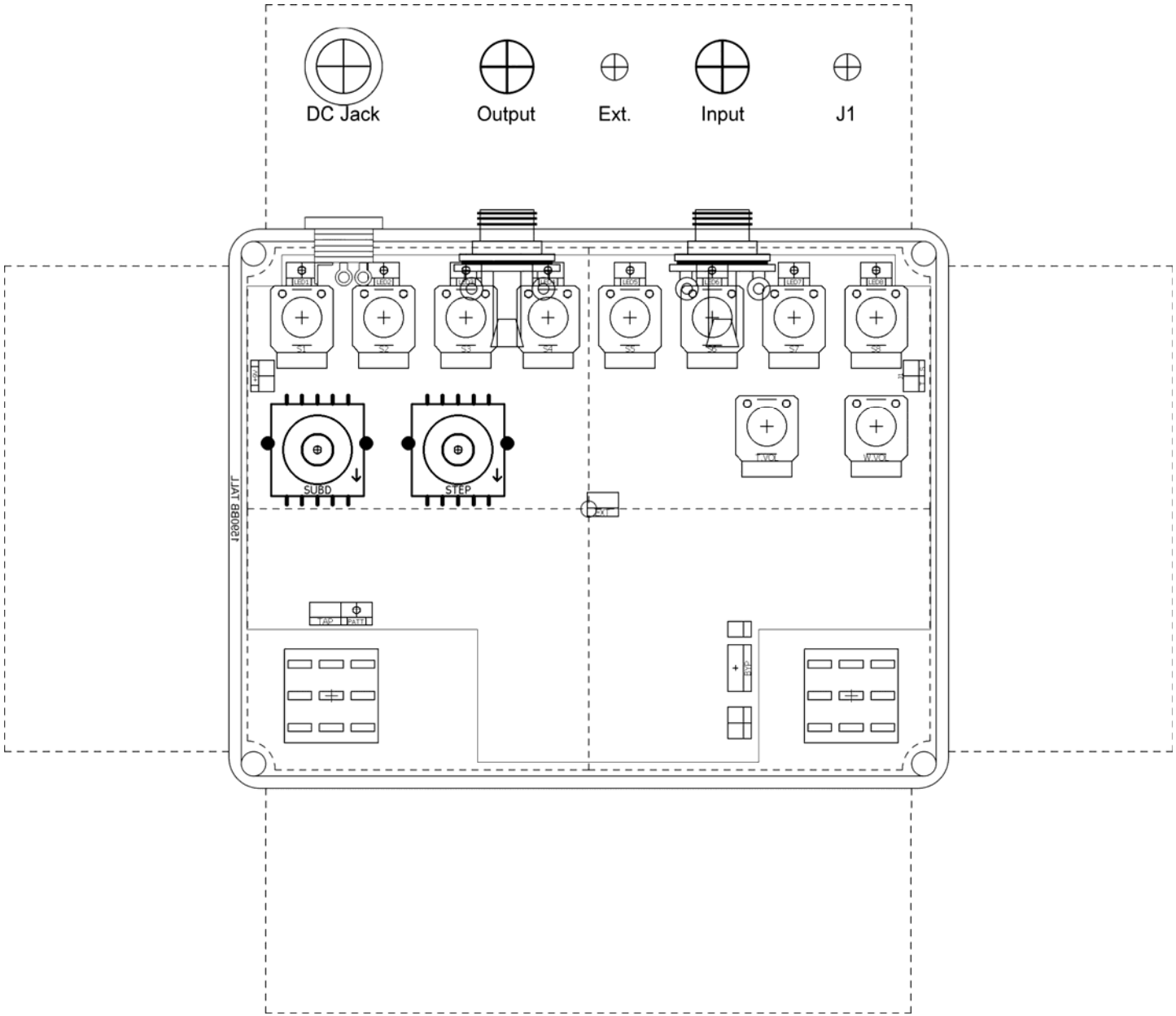
2P4T
http://www.mouser.com/ProductDetail/Alpha-Taiwan/SR1712F-0204-20F0A-N9-N/?qs=sGAEpiMZZMvNbjZ2WlReYqBsoziRjTWUDACTxOT1rRE%3d

If you cannot get a VTL5C9 for VACT_1, use the VTL5C3 in its place.


DIG DUG 2
(c) 2015 madbeanpedals
IN
OUT
VC
VB
GND
Q1 2N5088
Q2 2n5457
IC1_A TL072
IC1_B TL072
IC2_A TL072
IC2_B TL072
GAIN1 50k
GAIN2 50k
FILTER 100k
W.VOL 100kB
T.VOL 100kB
VACT_1B
VACT_2B
REG1 LM78L05
IC3 MV-52B
IC4 CD4017
SUBDA
TAP
EXT
BYP
STEP
PATT
LED1
LED2
LED3
LED4
LED5
LED6
LED7
LED8
VACT_2A
VACT_1A
D1 1N5817
D2 1n914
D3 1n914
D4 1n914
J1

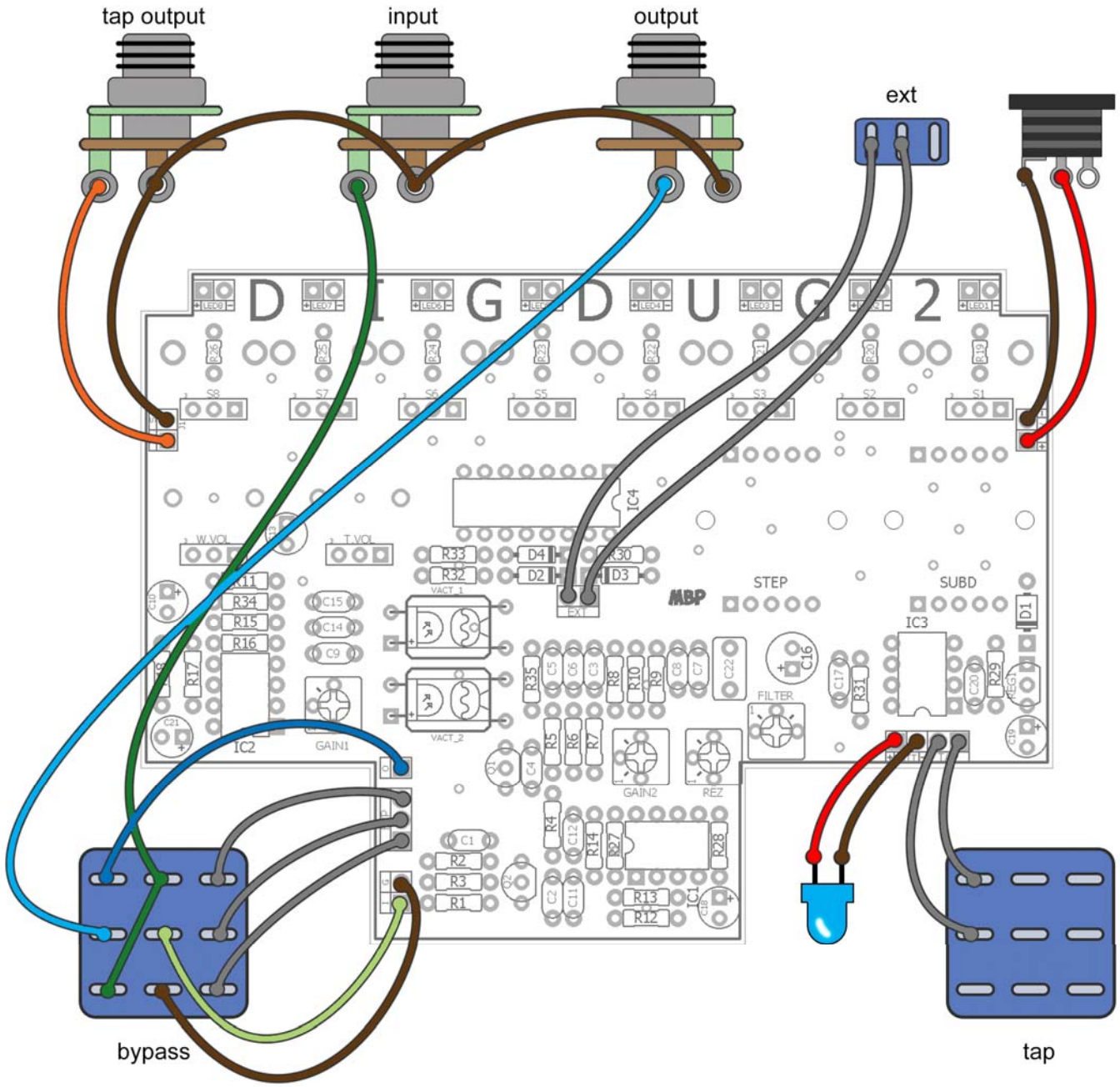
125BB Drilling Guide

7.48” W x 6.47” H



Photoshop template: http://www.madbeanpedals.com/projects/DigDug2/DigDug2_DRILL.zip

Wiring Diagram



What Is It?

The DigDug2 is a multi-function tap-based sequencer. It can be used as a wah and/or tremolo. It can also drive an external optical-based modulation circuit.

How Does It Work?

The DigDug2 utilizes the Molten Voltage MV-52B chip. It converts a tap input into a time-based pulse. This pulse is fed to the CD4017 "counter". The CD4017, in turn, outputs a 5v pulse in a linear sequence which lights up the corresponding LED connected to it. This allows us to use an optical-based effect where each step in the sequence corresponds to an individually controlled LED. The relative brightness of those LEDs creates a sequence, or pattern, of audio effects. Think of the LEDs as individual depth controls for the effects.

How Do I Use It?

The DigDug2 has two on-board effects; a tremolo and a wah. These can be used independent of one another or in parallel. The tremolo and wah have only one external control each: a volume control. However, there are several internal trimmers that allow you to shape these effects further. Each sequence step has its own knob, S1 – S8. The knobs control the brightness of the LED driven by that particular step.

To operate the DigDug2, first you set the subdivision and step rotary switches to the desired setting. The Step switch can be set anywhere from 1 to 8 steps. The Subdivision switch has four settings based on the tap-tempo input; ½, 1x, 2x, and 4x. So, a ½ settings will set the sequence speed to ½ the tapped input, and 4x will change it to four times the tapped input. Next you manipulate the corresponding pots for the number of steps chosen to change the brightness of their LEDs. The relative brightness of each LED defines the rhythmic pattern one creates once the steps are played in sequence.

TIP: *Think of each step as a subdivision of a note. If we think of the 8 steps as two whole notes, then each LED corresponds to a 16th note. The brightness of each LED in the two whole note sequence allows us to create a 16th note pattern where each subdivision can be on, off, or somewhere in-between. Or, if using 6 steps, you could consider each step a triplet in a pair of two whole notes. It sounds a lot more complicated than it is…trust me.*

After the switch and pattern settings are chosen, simply engage the Tap footswitch two or more times to set the tempo (rate) of the sequence. Finally, set the desired volume level for the Tremolo or Wah effects.

Tip: *You need at least two steps for the tremolo effect. For the wah, you can set it to Step 1 for a "stuck wah" setting.*

There is secondary output for the sequencer that can be used to drive an external optical effect. Connect a 1/8" mono plug from the DigDug2 to an external LED used in another effect. This assumes that you have another DIY project where this can be done, of course. While this document will not go into detail on how to construct a project based around that, I will provide enough info to get you started. Additionally, there will be a couple of future releases with the upcoming "Tapanatorator" project which will work with the DigDug2 (a vibrato and a phaser).

Tip: *The secondary output will not work with a PT2399 to control delay settings. At least not in the traditional sense of tap-based delay.*

Controls

W.Vol, T.Vol: External volume controls for the wah and tremolo, resp.

SubD: Rotary switch that acts as a time multiplier. Use it to set the tapped input to ½, 1x, 2x or 4x speed.

Step: Rotary switch that sets the number of steps desired in the sequence. You can have anything between 1 and 8 steps in a sequence.

S1 – S8: These pots control the brightness of the LED in each step. Counter-clockwise is full brightness. As each knob is turned up, the corresponding LED will dim in until fully off in the clockwise position. Most of the brightness manipulation will occur in the first ½ of the turn. After that the LED will go very dim and then off.

Gain1, Gain2: The internal trimmers are for gain recovery for the tremolo and wah effects. This allows you to match the individual outputs to the external volume controls. In other words, when the W.Vol and T.Vol are set half-way up, the Gain1 and Gain2 trimmers are used so that the output volume of each effect is about the same. Matching the volume outputs will make the wah and tremolo effects much easier to control when used in parallel.

Rez: This trimmer sets the resonant peak of the wah filter. Turning it up creates a sharper peak.

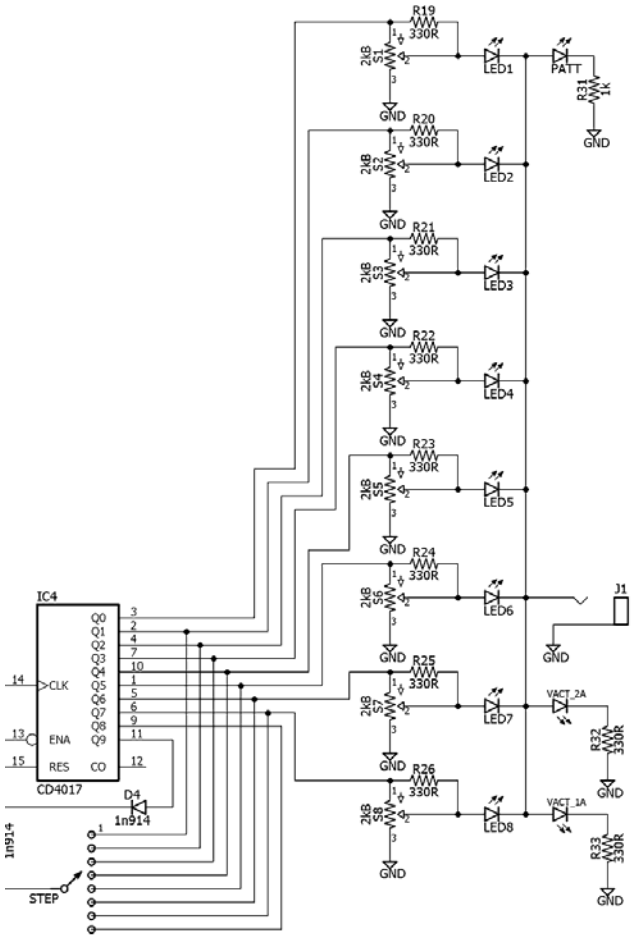
Filter: This trimmer sets the center frequency of the wah filter. Counter-clockwise is a high filter. As the trimmer is turned up, the center frequency shifts downward for a darker filter.

Ext: This switch selects between “rest” and “run” mode. Rest mode is the normal operation. In this mode, when the DigDug2 is put in bypass, the sequence is reset and stopped in the S1 position. When the effect is toggle on, the sequence begins again from the first step. In Run mode, the sequence keeps going whether or not the DigDug2 is in bypass. This mode allows you to use the sequencer to control an external modulation effect with the DigDug2 in bypass. You can still use the DigDug2 in run mode but 1) the pattern will continue from whichever step the sequence is in when you turn it on and 2) there is no indicator LED for the DigDug2 to tell you it's on when in Run mode. In rest mode, the running sequence indicates that the effect is on.

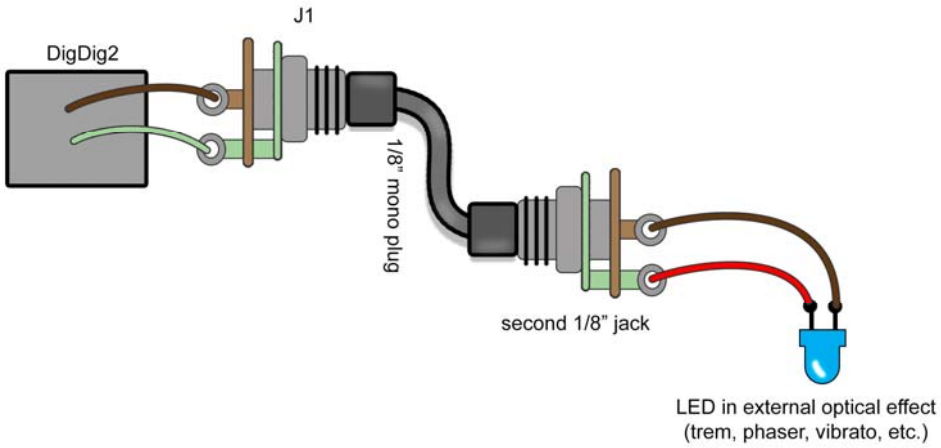
Patt: This is a visual indicator that sums all the sequence steps into one LED. It’s helpful to see your sequence in one spot rather than trying to follow up to eight LEDs at the same time.

Using the Secondary Output

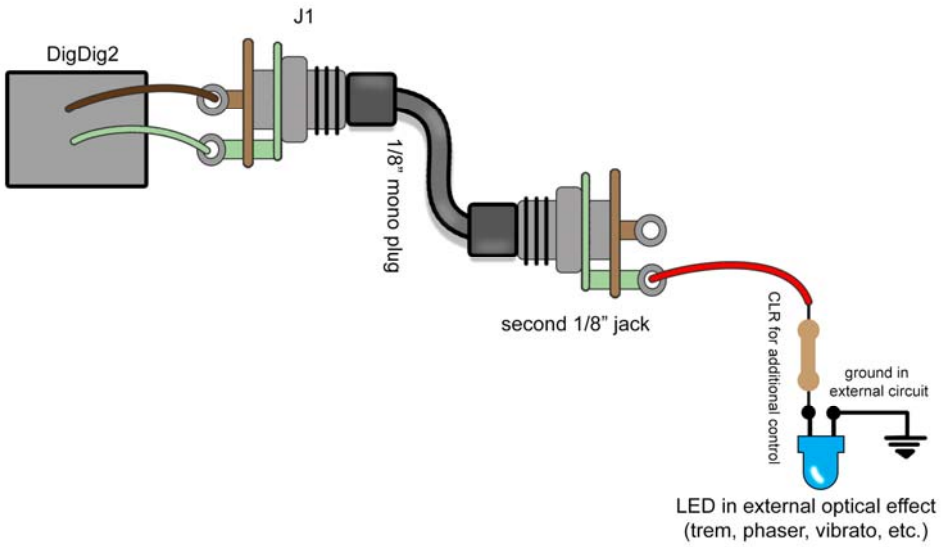
The 1/8” jack, J1, can send the sequence to an external effect. This allows the DigDug2 to control additional modulation effects that use optical drivers (such as vactrols or LED/LDR combos). Let’s look at the schematic:



J1 is connected in series with LED1-8 and in parallel with the PATT LED and the LEDs from the two vactrols that drive the tremolo and wah effects in the DigDug2. So, J1 is simply a place-holder for adding another LED as if we had three vactrols instead of two. This means we can use a 1/8” mono plug to carry the pulse outputs from the sequence to drive an external LED in another effect. How to do this? Very simple. Here are two possible ways:



The first way is a straight connection from J1 to another 1/8” jack on our external effect. Here the LED in the second effect is connected directly to the jack. This LED lights up whatever vactrol or LED/LDR combo you are using in the external modulation pedal. You’ll notice that there is no current limiting resistor attached to the LED. That’s okay because it is in series with LED1-8 on the DigDug2 and those act as current limiters for the new LED.



The second way is basically the same, except here we have included a CLR on the LED for a bit more control. This CLR allows for more manipulation on the LED brightness in case it needs fine-tuning for the external effect. You could just as easily make this a trimmer, if you like.

You’ll notice I did the grounds differently in both examples. Either way is acceptable. Whether you use the ground connection from J1 or the ground in your external effect should not matter because we are simply controlling LED brightness here. There should be no interaction with the audio or power portions of either effect so a common ground is not required.

Voltages

IC1	TL072
1	4.57
2	4.57
3	4.57
4	0
5	4.56
6	4.57
7	4.57
8	9.15

IC2	TL072
1	4.57
2	4.57
3	4.57
4	0
5	4.56
6	4.57
7	4.57
8	9.15

IC3	MV-52B
1	5.02
2	varies
3	varies
4	5.02
5	varies
6	varies
7	varies
8	0

IC4	CD4017
1	0
2	0
3	4.77
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	5.02
13	0
14	varies
15	4.56
16	5.02

REG1	LM78L05
I	9.15
G	0
O	5.02

Q1	2N5087
C	4.77
B	0.59
E	0

Q2	2N5457
D	9.15
S	2.7
G	0

Power Supply: One Spot measuring 9.41vDC

These readings were taken in bypass mode for a baseline. When the effect is on, the voltage readings on the CD4017 pins will fluctuate between 0 and about 4.77v as it goes through the sequence.

Build Guide

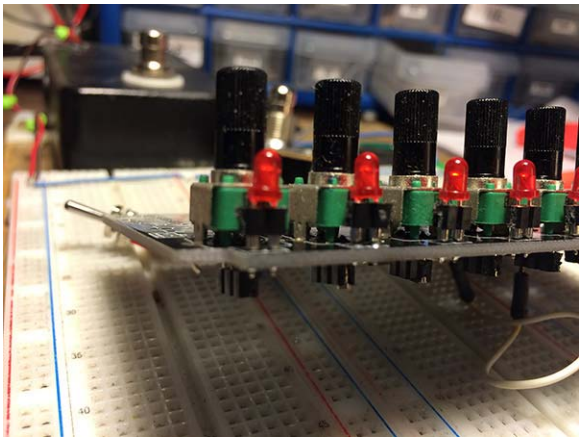
This is a complicated build and requires patience and thoroughness to complete. Take your time, and above all test your build before you box it. Trust me, once this is boxed and wired you will never want to remove it.

The Ext. switch must be mounted on the top wall with the other jacks. Normally I do not like switches on top but this is the only place for it to go. Use the mini-switch listed in the links under the BOM, if possible. You might be able to use a full sized SPDT but I haven't tried it.

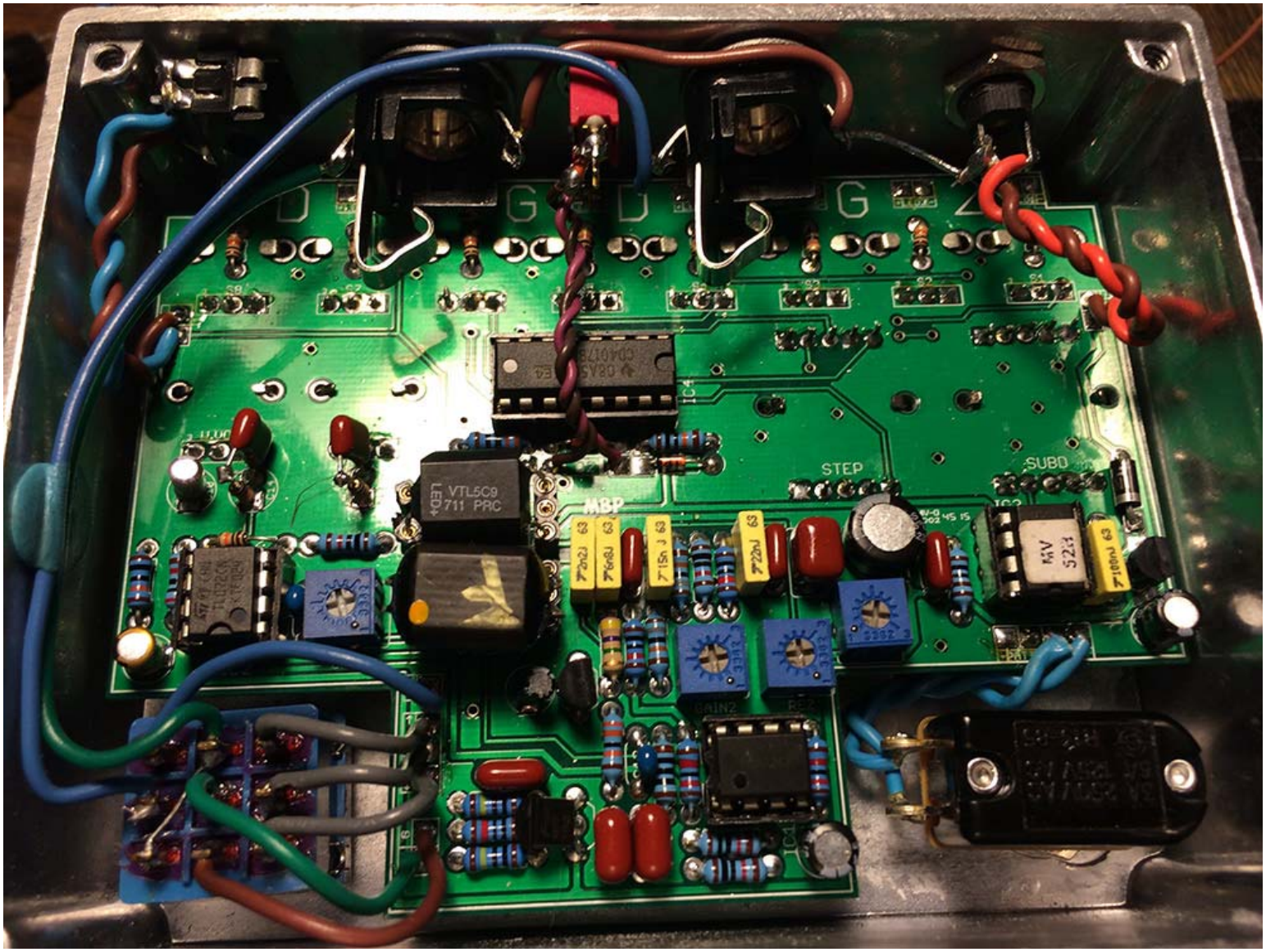
If possible, use 1/8W resistors for R19 – R26. You can use 1/4W, but try to lay them flat as you can so the do not interfere with the input and output jacks.

If you are like me and pretty well suck at drilling I suggest over-drilling the spots for the pots and rotary switches by one stop on a step drill bit (do not overdrill the LEDs, though). This will give you a bit of "wiggle room" when loading the PCB into your enclosure. The plastic shaft knobs are very unforgiving and if there is any contact between the enclosure and the pot shaft they will be difficult to turn. So, keep everything as centered as possible and drill slightly above what is required.

The LEDs for S1-S8 are going to be a bit of a pain. In order to test the circuit, you need the LEDs soldered onto the PCB. But, it is pretty hard to get the exact length of leads needed on the LEDs for them to fit flush to the enclosure without testing them first! So, there are a few ways you can tackle this. 1) Populate the entire PCB except for the footswitches, wires and LEDs. Load LED1-8 loose into their spots on the PCB and then mount the PCB temporarily in the enclosure. Then you can move the LEDs into position so they are flush with the enclosure and solder them in place. Remove the PCB and finish your build. 2) Use sockets for LED1-8. This will let you trim the LED leads to exact lengths to ensure they fit flush to the enclosure.



The shafts on the two rotary switches are manufactured longer than we need. This is easy to fix. Simply cut off a small portion of the plastic shaft with a wire cutter or scissors.



DigDug2 prototype