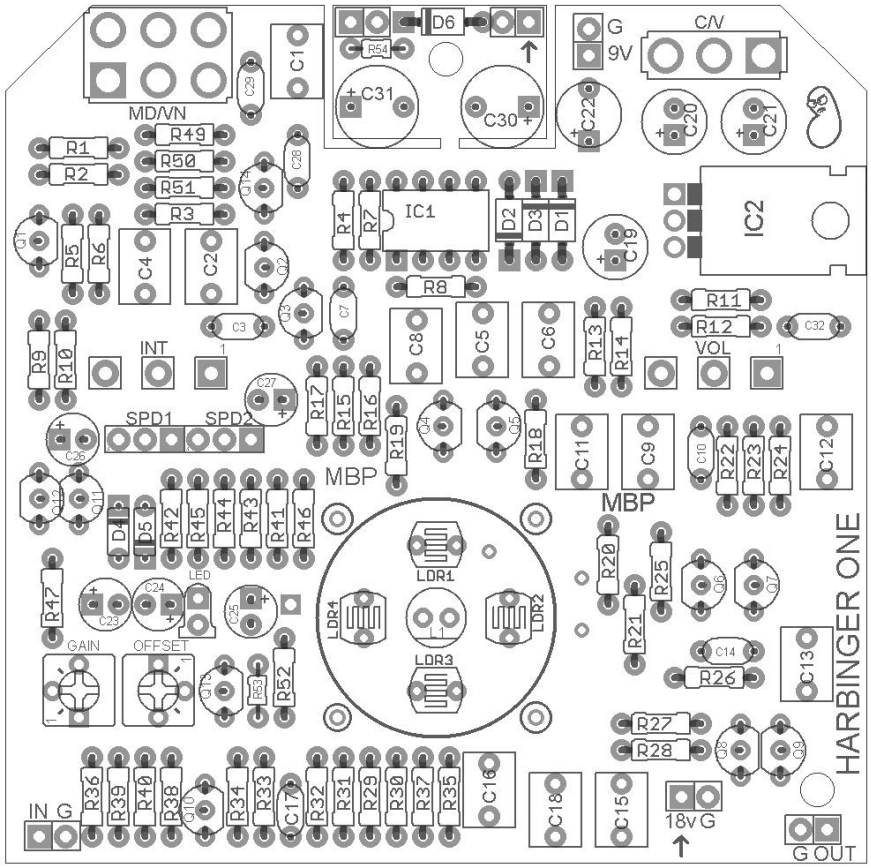
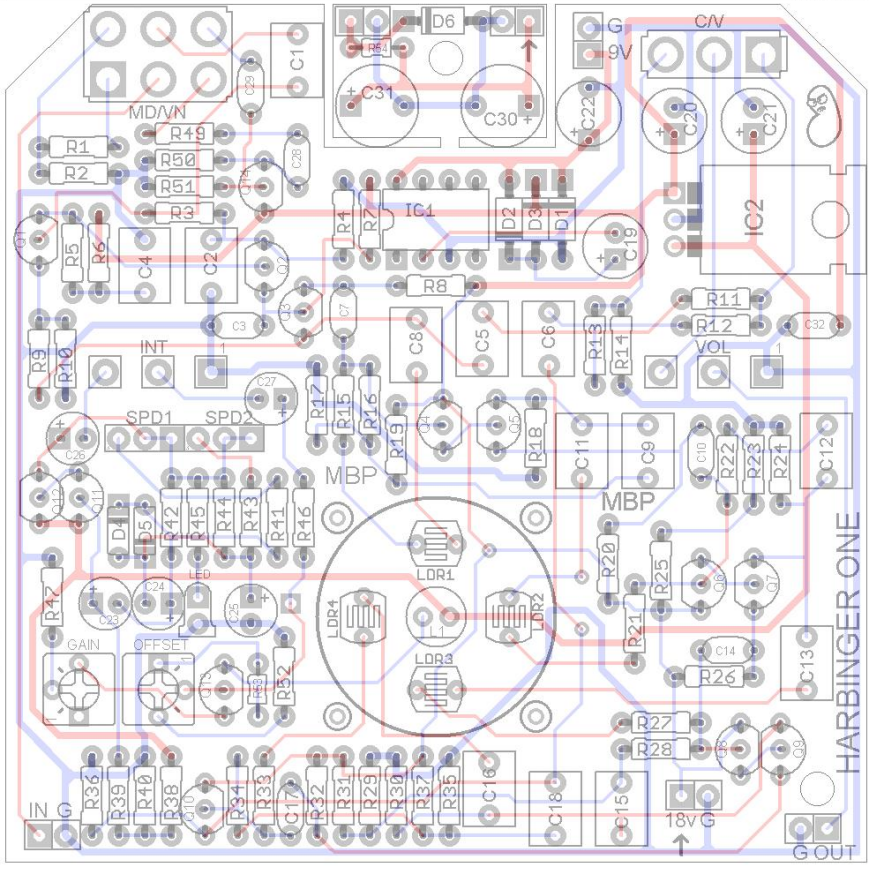
HARBINGER ONE

FX Type: Univibe

3.25” W x 3.24” H





B.O.M

Resistors		Resistors		Caps		Type	Diodes	
R1	22K	R33	4k7	C1	1uF	Film	D1	1N4001
R2	47k	R34	100k	C2	1uF	Film	D2, D3	1N5817
R3	1M	R35	47k	C3	330pF	Ceramic	D4, D5	1n914
R4	5k6	R36	22k	C4	1uF	Film	D6	1N4004
R5	1M	R37	68k	C5	1uF	Film	**Transistors**	
R6	100k	R38	3k3	C6	1uF	Film	Q1	2N5089
R7	47k	R39	2M2	C7	15n	Film	Q2 - Q13	2N5088
R8	4k7	R40	4k7	C8	1uF	Film	Q14	J201
R9	3k3	R41	4k7	C9	1uF	Film	**Photocells**	
R10	1k2	R42	220k	C10	220n	Film	LDR1 - 4	NSL-7532
R11	100k	R43	4k7	C11	1uF	Film	**Lamps**	
R12	100k	R44	220k	C12	1uF	Film	L1	Bi-Pin #7371
R13	47k	R45	4k7	C13	1uF	Film	**IC's**	
R14	220k	R46	47k	C14	470pF	Ceramic	IC1	LT1054
R15	4k7	R47	22R	C15	1uF	Film	IC2	LM7815
R16	100k	R49	1K	C16	1uF	Film	**Switches**	
R17	47k	R50	1M	C17	4n7	Film	C/V	SPDT (On/On)
R18	4k7	R51	4k7	C18	1uF	Film	MD/VN	DPDT (On/On)
R19	100k	R52	47k	C19	100uF	Electrolytic	**Trimmers**	
R20	4k7	R53	47k	C20	100uF	Electrolytic	GAIN	500R
R21	4k7	R54	100R	C21	100uF	Electrolytic	OFFSET	250k
R22	100k			C22	220uF	Electrolytic	**Pots**	
R23	47k			C23	1uF	Electrolytic	SPD1, 2	100kC - Dual Gang
R24	4k7			C24	1uF	Electrolytic	INT	50KB
R25	100k			C25	1uF	Electrolytic	VOL	100kB
R26	4k7			C26	10uF	Electrolytic		
R27	4k7			C27	10uF	Electrolytic		
R28	100k			C28	100n	Film		
R29	47k			C29	100n	Film		
R30	4k7			C30	470uF	Electrolytic		
R31	100k			C31	470uF	Electrolytic		
R32	4k7			C32	100n	Film		

Parts highlighted in green are only needed when using the filter PCB. Parts highlighted in blue are only needed when using a 9vDC adaptor. (see pg.6 for more details)

04.19 Revision: Some reports of problems with excessive voltage drop using R54. If using the filter PCB, you should jumper this resistor, or replace it with a 1N5817. If replacing it with a 1N5817, omit D1. The 1N5817 should be oriented with the anode on the left and cathode (banded side) on the right.

Further reading on the inner workings of the Univibe:
http://www.geofex.com/Article_Folders/univibe/univtech.htm

Shopping List

Resistors		Rating	Type
22K	2	1/4W	Metal/Carbon
100k	10	1/4W	Metal/Carbon
100R	1	1/4W	Metal/Carbon
1K	1	1/4W	Metal/Carbon
1k2	1	1/4W	Metal/Carbon
1M	3	1/4W	Metal/Carbon
220k	3	1/4W	Metal/Carbon
22R	1	1/4W	Metal/Carbon
2M2	1	1/4W	Metal/Carbon
3k3	2	1/4W	Metal/Carbon
47k	10	1/4W	Metal/Carbon
4k7	16	1/4W	Metal/Carbon
5k6	1	1/4W	Metal/Carbon
68k	1	1/4W	Metal/Carbon

Caps		(min voltage)	Spacing
100n - Film	3	50v	5mm
100uF - Electrolytic	3	25v	2.5mm
10uF - Electrolytic	2	25v	2.5mm
15n - Film	1	50v	5mm
1uF - Film	13	50v	5mm
1uF - Electrolytic	3	25v	2.5mm
220n - Film	1	50v	5mm
220uF - Electrolytic	1	25v	5mm
330pF - Ceramic	1	50v	5mm
470pF - Ceramic	1	50v	5mm
470uF - Electrolytic	2	25v	5mm
4n7 - Film	1	50v	5mm

Diodes	
1N4001	1
1N5817	2
1n914	1
1N4004	1
Transistors	
2N5089	1
2N5088	12
J201	1
Photocells	
NSL-7532	4
Lamps	
Bi-Pin #7371	1
IC's	
LT1054	1
LM7815	1
Switches	
SPDT (On/On)	1
DPDT (On/On)	1
Trimmers	
500R	1
250k	1
Pots	
100kC - Dual Gang	1
50KB	1
100kB	1

Other components/hardware needed

(2) Mono 1/4" jacks
(1) 3PDT
(2) LEDs w/bezels
(1) 2.1mm DC jack
(1) 1590BB enclosure
(3) Knobs

NSL-7532 http://www.smallbearelec.com/servlet/Detail?no=1003
Bi-Pin #7371 http://www.smallbearelec.com/servlet/Detail?no=716
LT1054 http://www.smallbearelec.com/servlet/Detail?no=794
LM7815 http://www.mouser.com/ProductDetail/Fairchild-Semiconductor/LM7815ACT/?qs=sGAEpiMZZMug9GoBKXZ753kztX31u4b%252bWrQ8inILNDE%3d
SPDT (On/On) http://www.smallbearelec.com/servlet/Detail?no=38
DPDT (On/On) http://www.smallbearelec.com/servlet/Detail?no=40
500R http://www.mouser.com/ProductDetail/Bourns/3362P-1-501LF/?qs=sGAEpiMZZMvygUB3GLcD7iDNlz%2fNDKompMEyhqEJhVo%3d
250k http://www.mouser.com/ProductDetail/Bourns/3362P-1-254LF/?qs=sGAEpiMZZMvygUB3GLcD7p0slDtXdCwsKR9Dy6lj2rI%3d
100kC - Dual Gang http://www.smallbearelec.com/servlet/Detail?no=1032
50KB http://www.smallbearelec.com/servlet/Detail?no=692
100kB http://www.smallbearelec.com/servlet/Detail?no=692

The **Harbinger One** is a classic Univibe circuit updated to meet the needs of the modern guitar player. It retains all the essence of the vintage Univibe unit (made popular by Jimi Hendrix and Robin Trower) with added improvements to both the signal path and power supply chains. The Harbinger One will add a dimension to your sound that cannot be obtained through any other type of effect. Richer and lusher than the standard phaser or vibrato, the Harbinger imparts a classic tone that is instantly recognizable.

This is a difficult and complex build and should not be undertaken by the novice. You should feel comfortable with stuffing and soldering a large number of components, the use of standard debugging techniques and the use of a DMM to measure voltages.

Controls

SPD – The rate of the filter sweep from slow to fast.
INT – The intensity of the swept filter.
VOL – The output volume.
C/V – This switch selects a chorus effect (filter mixed with dry signal) or vibrato effect (filter output only).
VN/MD – This switch selects between the traditional input and a JFET buffer input.
GAIN – This trimmer sets the brightness of the LFO-driven bi-pin lamp.
OFFSET – This trimmer lets you adjust the ramping of the lamp's brightness.

Mods

Power options: The Harbinger One can be built to run off either an 18v DC adaptor or a 9v DC adaptor in conjunction with a charge pump to attain the 18v required to operate the effect.

Signal path: All the 1uF electrolytic caps in the signal path of the original design have been changed to accommodate 1uF film caps.

Lamp: The OFFSET trimmer greatly increases tweaking ability on the on/off ramping of the lamp brightness.

Modern mode: The switch-able JFET input buffer adds brightness, more volume and increased intensity to the overall effect.

Layout: The PCB will fit easily in a 1590BB enclosure in a horizontal orientation to save space on your pedalboard (something often overlooked in other Univibe designs).

Power supply: The audio signal path was made to run off 18vDC unregulated for the maximum headroom possible. The LFO section is run off 15v regulated for the maximum stability possible.

The Harbinger One PCB is actually two PCBs connected together by a small tab: the Main board and the Filter board. These should be separated before starting your build.

Power Options

You can build the Harbinger One for use with either a 9v or 18v DC adaptor. There are advantages and disadvantages to both:

18v wall-wart adaptor
Advantage - Offers a larger current supply than can be provided by a charge pump.
Disadvantage - Requires the use of a wallwart and extra filtering (provided on the Filter PCB).

9v wall-wart adaptor OR dedicated power supply
Advantage - More typical of the type of power supply we all use (such as the VoodooLabs PP2).
Disadvantage - Requires the use of a charge pump to drive the effect and is limited to 100mA output.

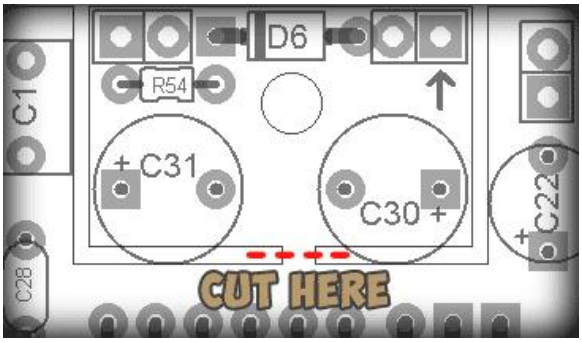
In the case of the 9v power supply option, *I've found that 100mA is sufficient to operate the Harbinger*. Keep in mind this is not the adaptor limit---it's the limit of the LT1054 charge pump. You should be able to use the VoodooLabs power supply or a One Spot to power the Harbinger without problems. If you decide to go with the 18v adaptor option, I suggest using the Dunlop one. It has 200mA capability and worked fine in the prototype builds.

Note: some of the newer power supplies out there offer isolated/regulated 18v taps. If you have this, then you can safely omit the Filter PCB and connect the DC jack to the 18v/G pads on the main PCB).

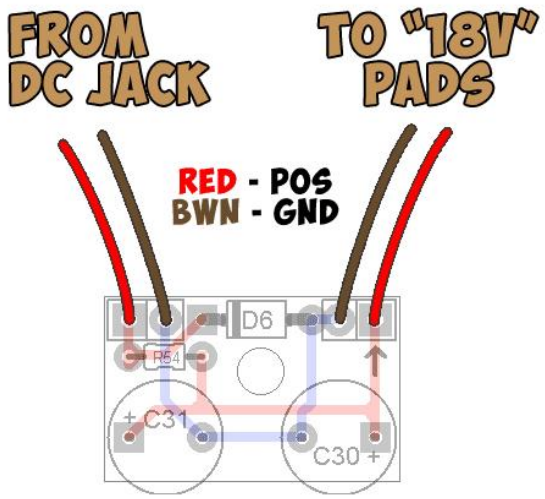
You can obtain the virtually identical tones between the different power options, as far as I can tell. I did find that the maximum brightness of the lamp was a bit lower when using the 9v/charge pump option. For this reason **I suggest socketing Q13** and subbing a Darlington transistor there if you have trouble getting the intensity you want from the lamp. An MPSA13 will work fine (this is not listed on the BOM). I did not find this to be necessary, but it is an option.

Building the 18v Adaptor option

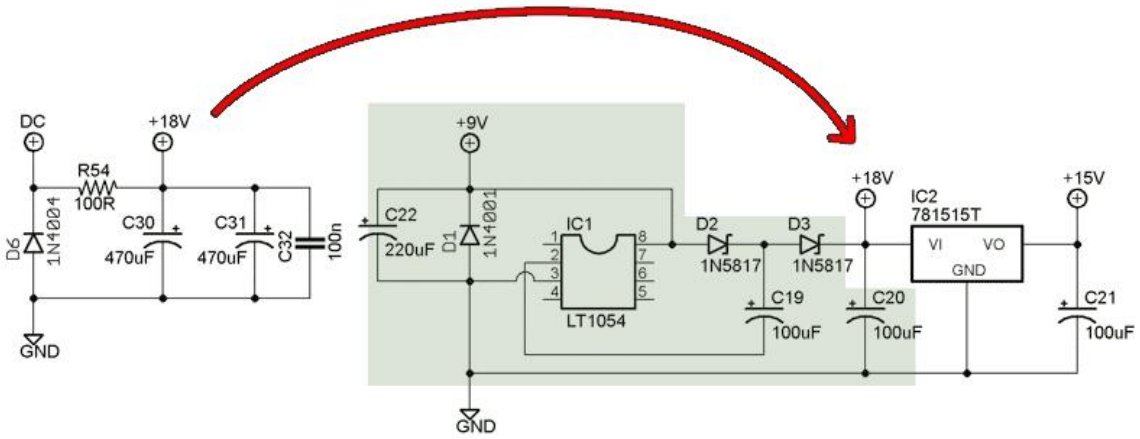
Before you begin stuffing the PCB, be sure to clip the tab between the Main and Filter PCB using some wire clippers.



The Filter PCB should be mounted in whatever available space you have in the 1590BB enclosure and wired to the 18v/G pads on the lower right of the main PCB.



The PCB gets connected to the 18v and ground pads as illustrated above. The connection being made is shown below. The parts in the green block below should be omitted.



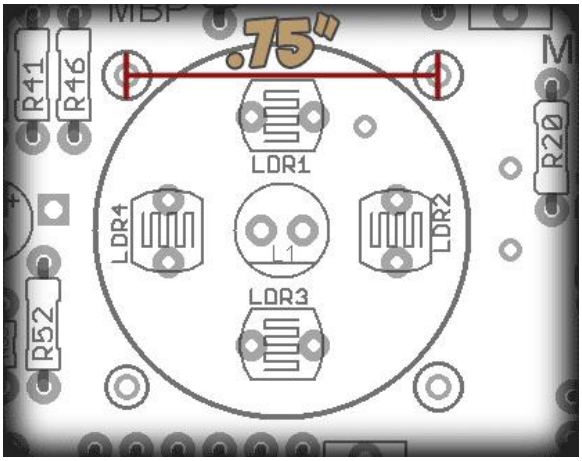
This chart summarizes exactly what is appropriate to all the possible ways you can power the Harbinger One.

Power Options	
Supply Type	**Build notes**
9v DC Wall Wart (One Spot, etc.)	Populate the filter PCB and connect it to the 9v/G pads on the main PCB. Omit C22, D1.
9v DC Regulated (VoodooLabs, etc.)	Do not populate the filter board. Connect DC jack to the 9v/G pads on the main PCB. Use IC1, C22, D1, D2, D3, C19 and C20.
18v DC Wall Wart (Dunlop, etc)	Populate the filter PCB and connect it to the 18v/G pads on the main PCB. Omit IC1, C22, D1, D2, D3, C19 and C20.
18v DC Regulated (Voodoolabs, etc).	Do not populate the filter PCB. Connect the DC jack to the 18v/G pads on the main PCB. Omit IC1, C22, D1, D2, D3 and C19, but use C20.

Light Shield

The Harbinger One provides space for a lightshield. This is a cover that traps the light emitted from the bulb to provide the cleanest source of illumination possible to the four photocells. This is an essential part of building a Univibe effect as the quality of light, lamp and photocells has a direct impact on the overall tone.

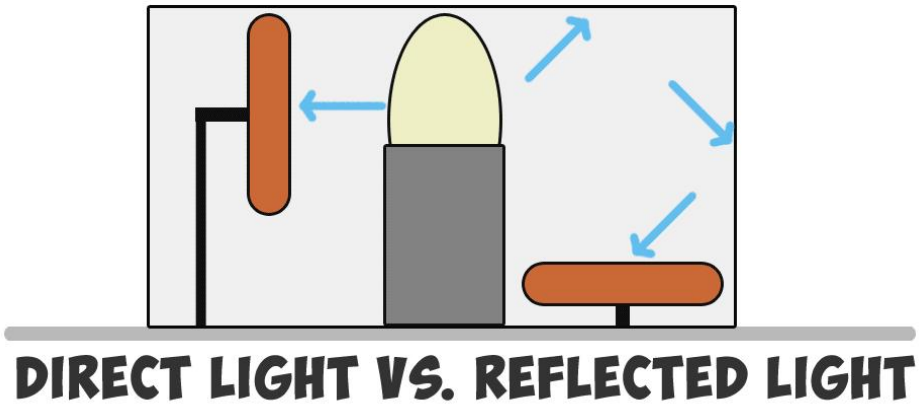
There are four solder pads (denoted by the circles) arranged in a square which comprise the limits of the lightshield dimensions. These are space 0.75” apart.



You can construct the lightshield any way you like. Here’s a cheap way to do it:

This is a tiny drain cap from a hardware store. The cap is a perfect size, but has drain holes that would let light leak out. I used some reflective roof tape on the inside of the cap and electrical tape on the outside and bottom edges. This completed shield fits snugly into place over the lamp and photocells and can be further secured by wires soldered to the four solder pads shown above. The roofing tape was useful because it reflected all the light coming from the top and sides of the lamp around inside, thus ensuring that each photocell got the same amount of illumination.

Not all light shields are made to be reflective inside. I've seen at least one popular Univibe clone that had a shield that was flat black. Different builders solder the photocells in different ways, too. Some like to put them in flat against the PCB, and some like to use the leads from the photocells as stand-offs, then angle the photocells directly at the lamp (thus requiring less need for reflected light). There is no one "correct" way to do it…all these methods will work. But, if you want to build a "true to vintage" specs Univibe, put the photocells in flat against the PCB and use a reflective lightshield.



Of course, each method will get a mix of direct and reflected light. And, I'm sure there is someone out there willing to take on the task of explaining the possible advantages of incidence angles, reflective indexes, diffusion patterns and their history in the construction of Univibes and their many clones. Fortunately for me, I am not that person.

Photocells and Lamps

I've suggested Silonex 7532 photocells because I've used them with good results and they are popular for Univibe clones. But, they are by no means the ONLY ones you can use. Garden variety Tayda photocells may work. If you are using random/unkown photocells, I suggest trying to match their light resistance. You can do this by mounting photocells on a breadboard with a light shining directly at their face, then measuring the resistance across the leads. Pick the four cells that match closest in resistance. If you want to go an extra step, cover the faces with some Blutac and match their dark resistance, too. I used this matching method with an optical phaser build and it worked great.

The 7371 lamp is also suggested because, again, I've used it with good result and it is very common. If you are ordering from Smallbear and don't mind spending an extra $1, get one of these, too, for experimenting: http://www.smallbearelec.com/servlet/Detail?no=1141 (Mouser also has them). This is the lamp used in the MBP "Quadrovibe" project. It also works in Univibe setups AND has the advantage of being smaller than the 7371 (which means your lightshield does not have to be very tall ((which means it will fit very easily in the 1590BB enclosure))).

Calibrating the Lamp

The **GAIN** and **OFFSET** controls are interactive. Use this procedure to calibrate the lamp

1) Turn **Intensity** and **Volume** controls all the way up. Set the **Speed** control at about half-way.
2) Turn the **GAIN** control up until you get moderate, but not overly bright lighting of the lamp.
3) Now adjust the **OFFSET** control to find the sweet spot for the vibe where you get the most lush and swirly sounds.

The **OFFSET** will set the lower floor for the lamp brightness. High amounts of offset result in a lamp that goes fully off at the bottom of its sweep. Moderate and light offset means the lamp will pulse but never go fully dark. You will probably find yourself adjusting the **GAIN** and **OFSET** a few times until you get the precise sound you want.

Be careful when adjusting the trimmers so that the lamp does not blow. I have yet to do this in any build no matter where I set the trimmers, but it is possible to do. Lastly, you should consider turning off your power supply or disconnecting the DC jack when not in use. This will preserve the life of the lamp considerably.

Rate LED

The LED pads directly above the OFFSET trimmer are for an optional enclosure-mounted rate indicator. This LED will pulse approximately to the rate of the Speed control. Low speeds will pulse very narrow and fast speeds will pulse very widely. If you do not wish to use this LED, be sure to jumper the two pads together so that R45 is connected to ground, otherwise the LFO will not work.

The LED will pulse constantly even when the effect is in bypass.

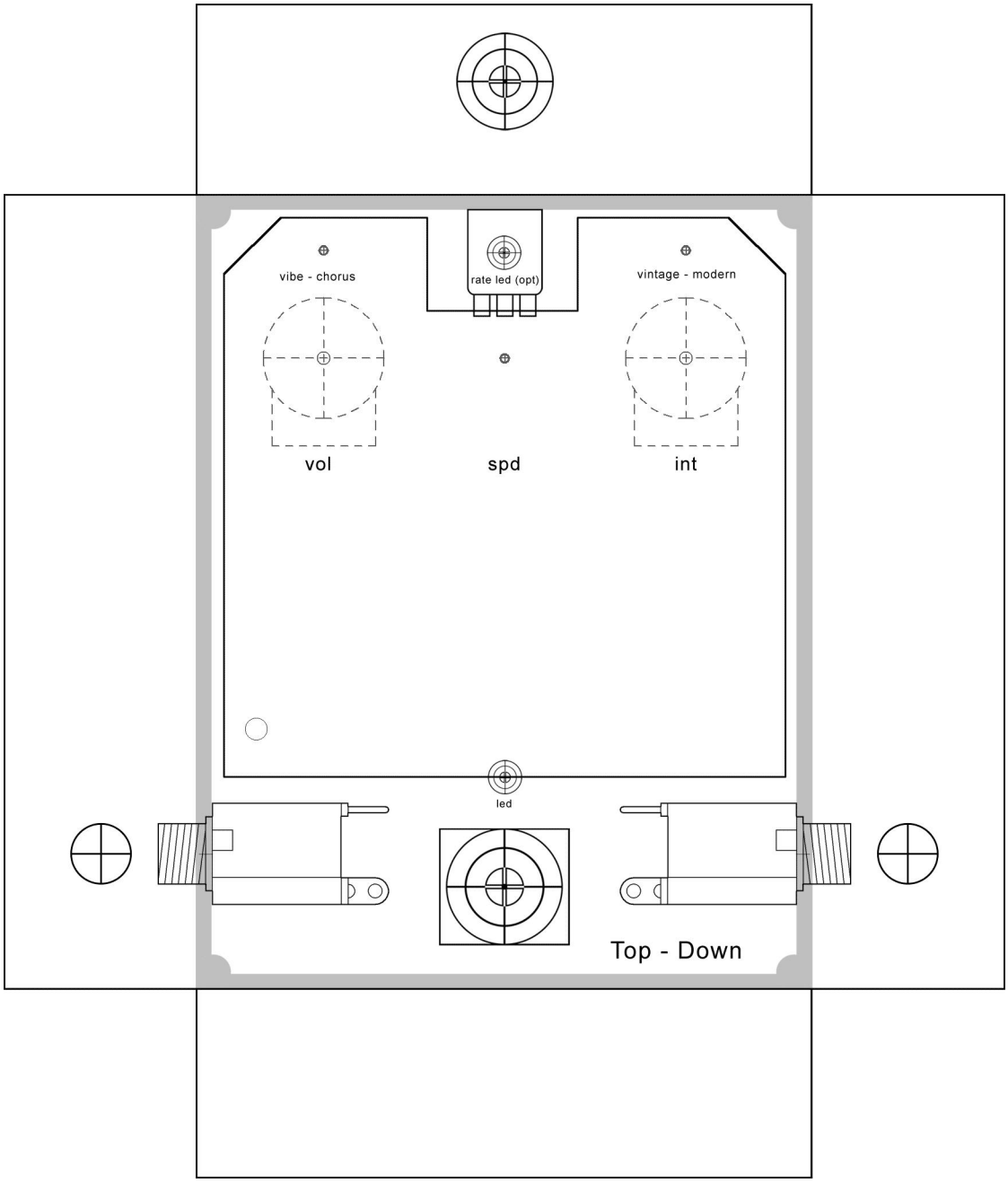
Speed Pot

The SPD pot on the Harbinger must be wired, unlike the INT and VOL pots, which can be PCB mounted. The best way to do this is run the wires under the PCB. This keeps the top free for trimmer adjustment (plus it looks cleaner this way). The dual-gang 100kC (the “C” stands for reverse audio) has two rows of solder lugs. The bottom lugs are bent at a 90 degree angle. This may cause a problem when placing the pot under the PCB—the lugs could come into contact with solder joints on the board. You should GENTLY bend these pins flat with a pair of pliers before soldering the wires. This will ensure adequate space between the pot and PCB. BTW: It does not matter which row of lugs is wired to SPD1 or SPD2 on the PCB (just that both sets are actually wired).

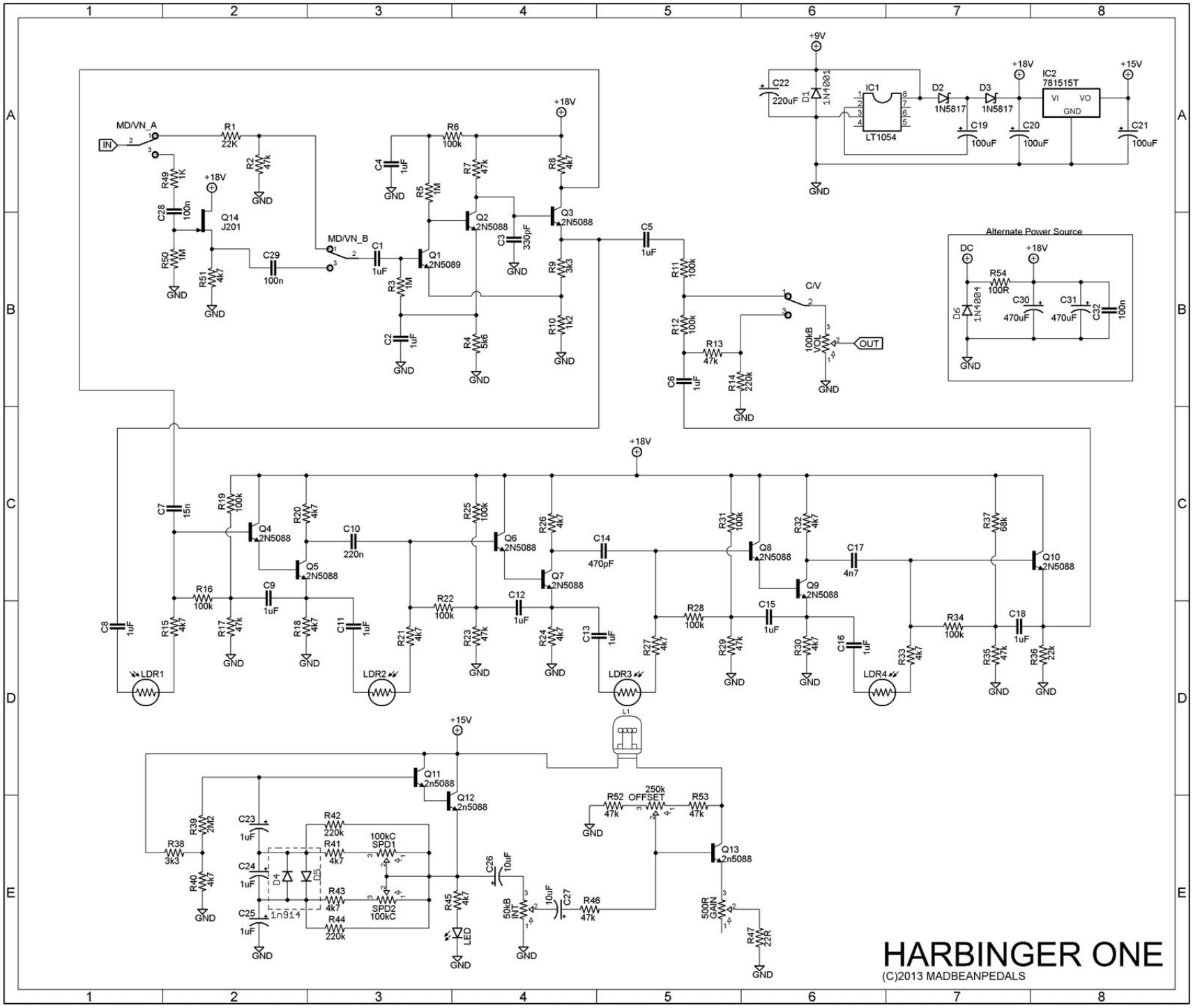
(This photo courtesy of Smallbear)

1590BB Drill Guide

6.8” H x 5.8” W



Hint: you do not have to drill the Speed pot in line with the Volume and Intensity controls. You could put it more toward the middle of the enclosure then use a large knob that can be controlled with your foot for expression control.


+9V
C22
220uF
D1
1N4001
IC1
LT1054
D2
1N5817
D3
1N5817
+18V
IC2
781515T
VI
VO
GND
+15V
C19
100uF
C20
100uF
C21
100uF
MD/VN_A
IN
R1
22K
R2
47k
R49
1K
C28
100n
Q14
J201
R50
1M
R51
4k7
C29
100n
MD/VN_B
C1
1uF
Q1
2N5089
R3
1M
C2
1uF
R4
5k6
C4
1uF
R5
1M
R6
100k
R7
47k
Q2
2N5088
C3
330pF
R8
4k7
Q3
2N5088
R9
3k3
R10
1k2
C5
1uF
R11
100k
R12
100k
R13
47k
C6
1uF
R14
220k
C/V
100kB
OUT
Alternate Power Source
DC
D6
1N4001
R54
100R
C30
470uF
C31
470uF
C32
100n
C7
15n
R19
100k
Q4
2N5088
Q5
2N5088
R20
4k7
C10
220n
C9
1uF
R16
100k
R15
4k7
R17
47k
R18
4k7
C11
1uF
C8
1uF
LDR1
R21
4k7
R22
100k
R23
47k
C12
1uF
R24
4k7
C13
1uF
LDR2
R25
100k
Q6
2N5088
Q7
2N5088
R26
4k7
C14
470pF
R27
4k7
LDR3
R31
100k
Q8
2N5088
Q9
2N5088
R32
4k7
C17
4n7
R28
100k
R29
47k
C15
1uF
R30
4k7
C16
1uF
LDR4
R33
4k7
R37
68k
Q10
2N5088
R34
100k
C18
1uF
R35
47k
R36
22k
L1
Q11
2n5088
Q12
2n5088
R39
2M2
R38
3k3
R40
4k7
C23
1uF
C24
1uF
C25
1uF
D4
D5
1n914
R42
220k
R41
4k7
100kC
SPD1
R43
4k7
SPD2
100kC
R44
220k
R45
4k7
LED
C26
10uF
50kB
R46
47k
C27
10uF
R52
47k
OFFSET
250k
R53
47k
Q13
2n5088
500R
GAIN
R47
22R
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