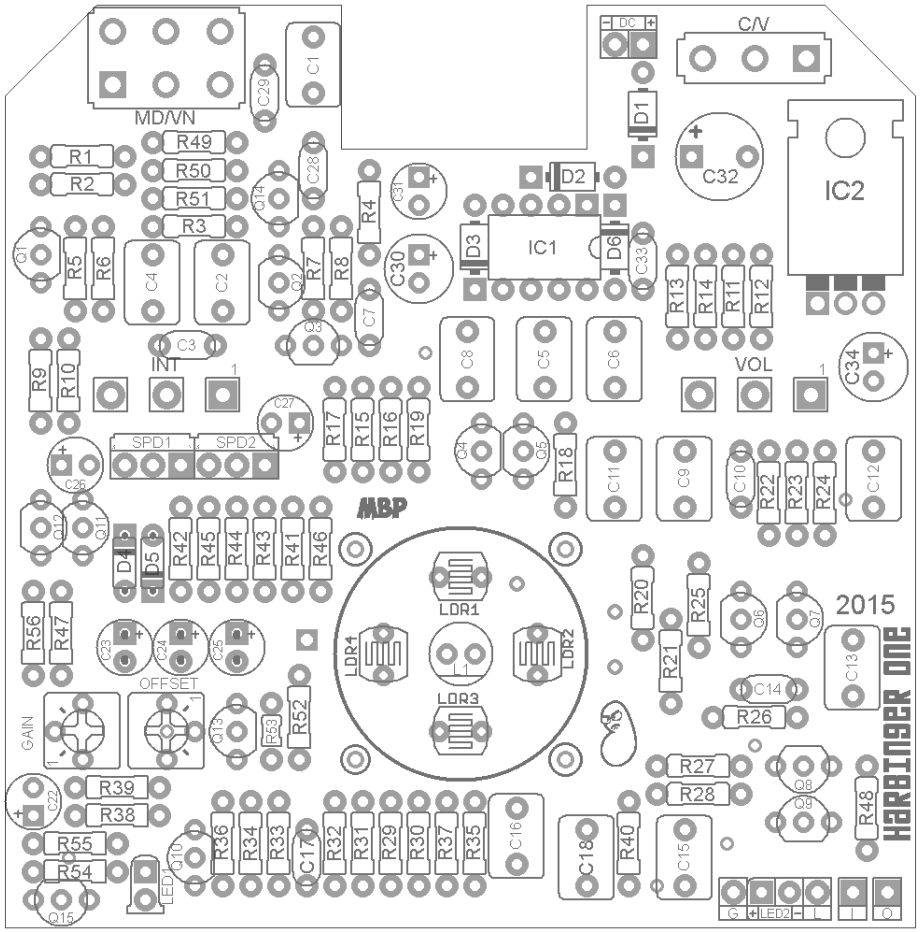
HARBINGER ONE

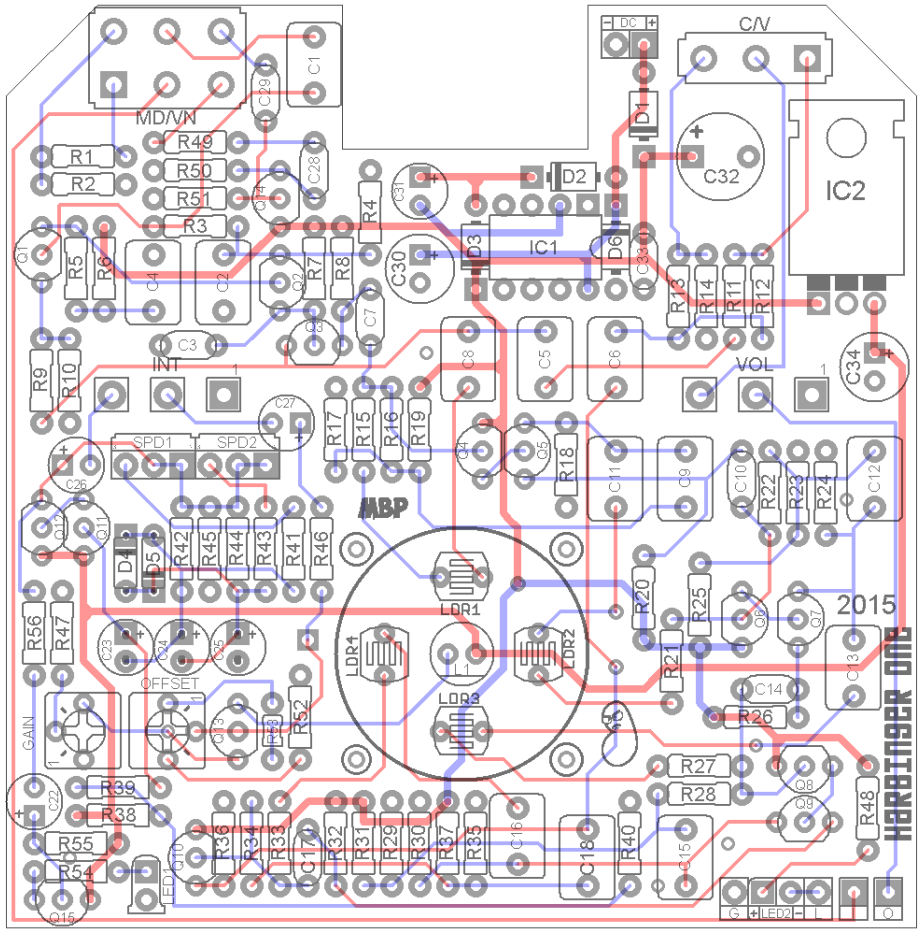
2015 ED.

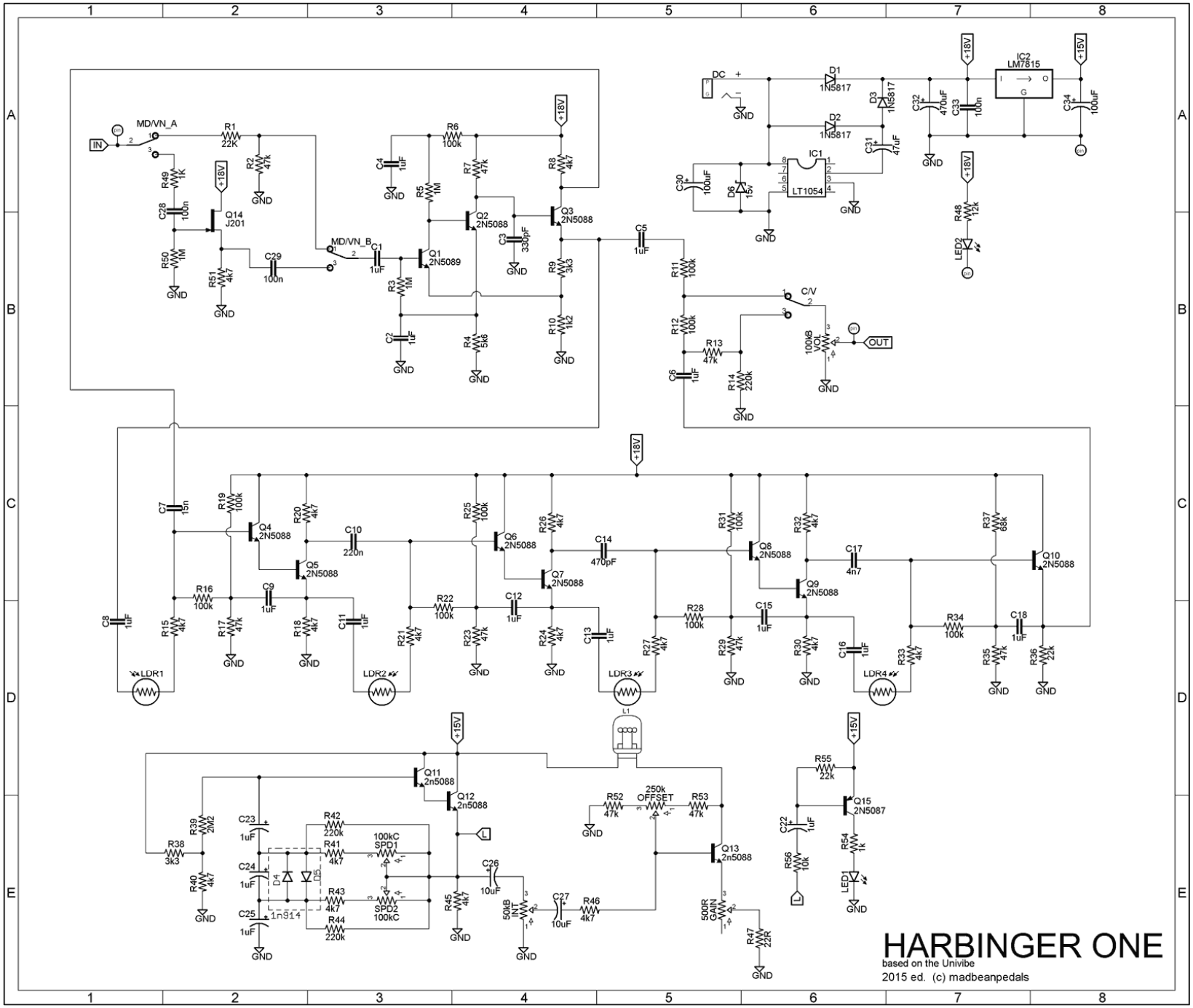
FX Type: Univibe

Download the document for the previous version here: **http://www.madbeanpedals.com/projects/HarbingerOne/HarbingerOne.zip**

3.25” W x 3.29” H






HARBINGER ONE
based on the Univibe
2015 ed. (c) madbeanpedals

B.O.M.

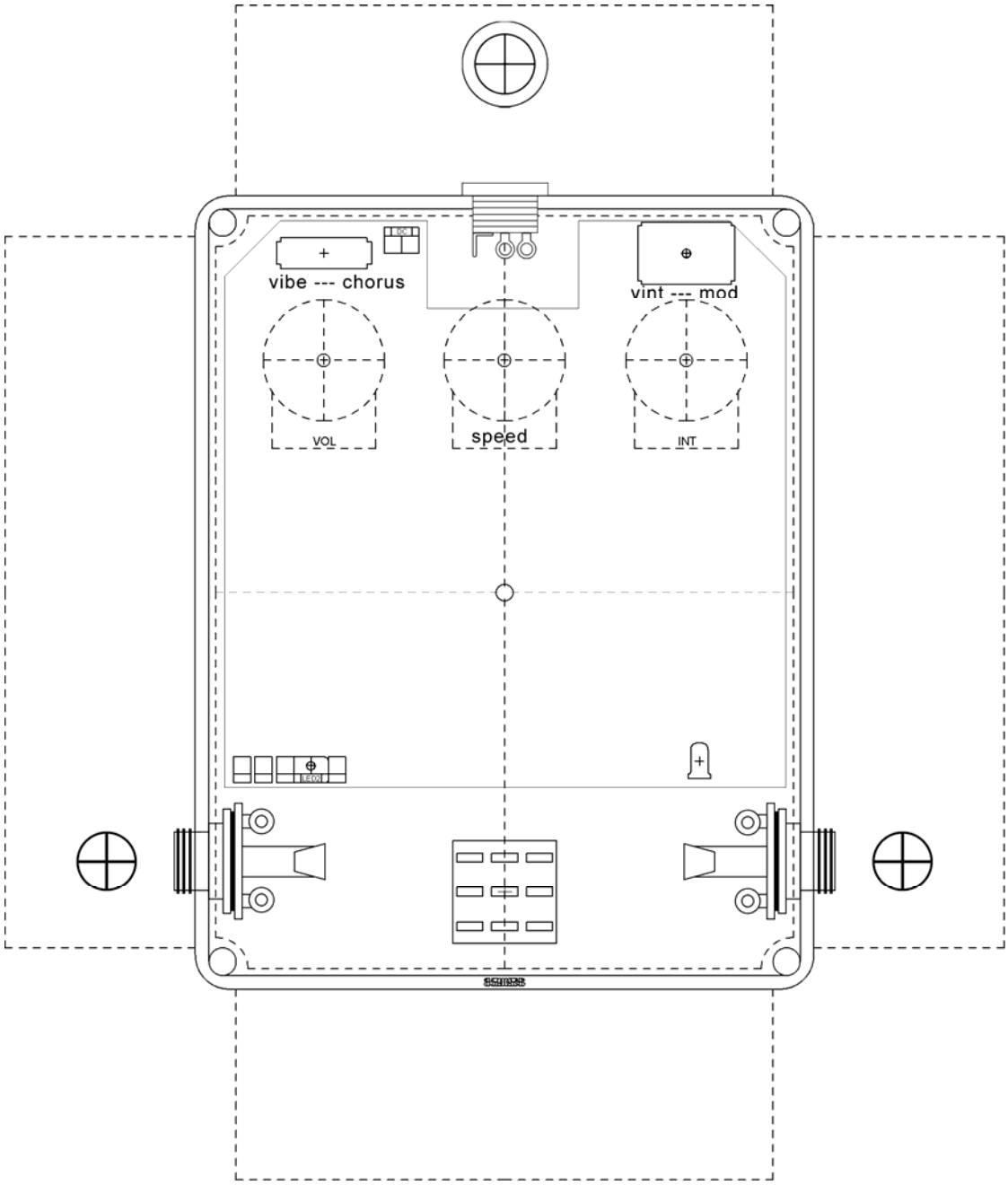
Resistors		Resistors		Caps		Diodes	
R1	22K	R32	4k7	C1	1uF	D1 - D3	1N5817
R2	47k	R33	4k7	C2	1uF	D4, D5	1n914
R3	1M	R34	100k	C3	330pF	D6	15v Zener
R4	5k6	R35	47k	C4	1uF	**Transistors**	
R5	1M	R36	22k	C5	1uF	Q1	2N5089
R6	100k	R37	68k	C6	1uF	Q2 - Q13	2N5088
R7	47k	R38	3k3	C7	15n	Q14	J201
R8	4k7	R39	2M2	C8	1uF	Q15	2N5087
R9	3k3	R40	4k7	C9	1uF	**I.C.**	
R10	1k2	R41	4k7	C10	220n	IC1	LT1054
R11	100k	R42	220k	C11	1uF	IC2	LM7815
R12	100k	R43	4k7	C12	1uF	**Switches**	
R13	47k	R44	220k	C13	1uF	MD/VN	DPDT
R14	220k	R45	4k7	C14	470pF	C/V	SPDT
R15	4k7	R46	4k7	C15	1uF	**Lamp**	
R16	100k	R47	22R	C16	1uF	L1	LM7371
R17	47k	R48	12k	C17	4n7	**Trimmer**	
R18	4k7	R49	1K	C18	1uF	GAIN	500R
R19	100k	R50	1M	C22	1uF	OFFSET	250k
R20	4k7	R51	4k7	C23	1uF	**Pots**	
R21	4k7	R52	47k	C24	1uF	SPD1, 2	100kC Dual
R22	100k	R53	47k	C25	1uF	INT	50kB
R23	47k	R54	1k	C26	10uF	VOL	100kB
R24	4k7	R55	1M	C27	10uF		
R25	100k	R56	10k	C28	100n		
R26	4k7			C29	100n		
R27	4k7			C30	100uF		
R28	100k			C31	47uF		
R29	47k			C32	470uF		
R30	4k7			C33	100n		
R31	100k			C34	100uF		

Shopping List			
Value	QTY	Type	Rating
22R	1	Metal / Carbon Film	1/4W
1K	2	Metal / Carbon Film	1/4W
1k2	1	Metal / Carbon Film	1/4W
3k3	2	Metal / Carbon Film	1/4W
4k7	17	Metal / Carbon Film	1/4W
5k6	1	Metal / Carbon Film	1/4W
10k	1	Metal / Carbon Film	1/4W
12k	1	Metal / Carbon Film	1/4W
22K	2	Metal / Carbon Film	1/4W
47k	9	Metal / Carbon Film	1/4W
68k	1	Metal / Carbon Film	1/4W
100k	10	Metal / Carbon Film	1/4W
220k	3	Metal / Carbon Film	1/4W
1M	4	Metal / Carbon Film	1/4W
2M2	1	Metal / Carbon Film	1/4W
330pF	1	Ceramic	25v min
470pF	1	Ceramic	25v min
4n7	1	Film	25v min
15n	1	Film	25v min
100n	3	Film	25v min
220n	1	Film	25v min
1uF	13	Film	25v min
1uF	4	Electrolytic	25v min
10uF	2	Electrolytic	25v
47uF	1	Electrolytic	25v
100uF	2	Electrolytic	25v
470uF	1	Electrolytic	25v
1N5817	3		
1n914	2		
15v Zener	1		1W
2N5089	1		
2N5088	12		
J201	1		
2N5087	1		
LT1054	1		
LM7815	1	TO-220	
DPDT	1	On/On	
SPDT	1	On/On	
LM7371	1		
500R	1	Bourns 3362P	
250k	1	Bourns 3362P	
100kC Dual	1	Solder Lug Dual	
50kB	1	PCB Short Pin	
100kB	1	PCB Short Pin	

DPDT On/On: http://smallbear-electronics.mybigcommerce.com/dpdt-on-on-pc-mount/
SPDT On/On: http://smallbear-electronics.mybigcommerce.com/spdt-on-on-0218a/
7371 Lamp: http://smallbear-electronics.mybigcommerce.com/lamp-12-volt-04-amp-bi-pin-7371/
Alternate (smaller): http://smallbear-electronics.mybigcommerce.com/lamp-18-volt-026-amp-bi-pin/
100kC Pot: http://smallbear-electronics.mybigcommerce.com/alpha-dual-gang-16mm-solder-terminals-100k-rev-audio/

1590BB Drilling Guide

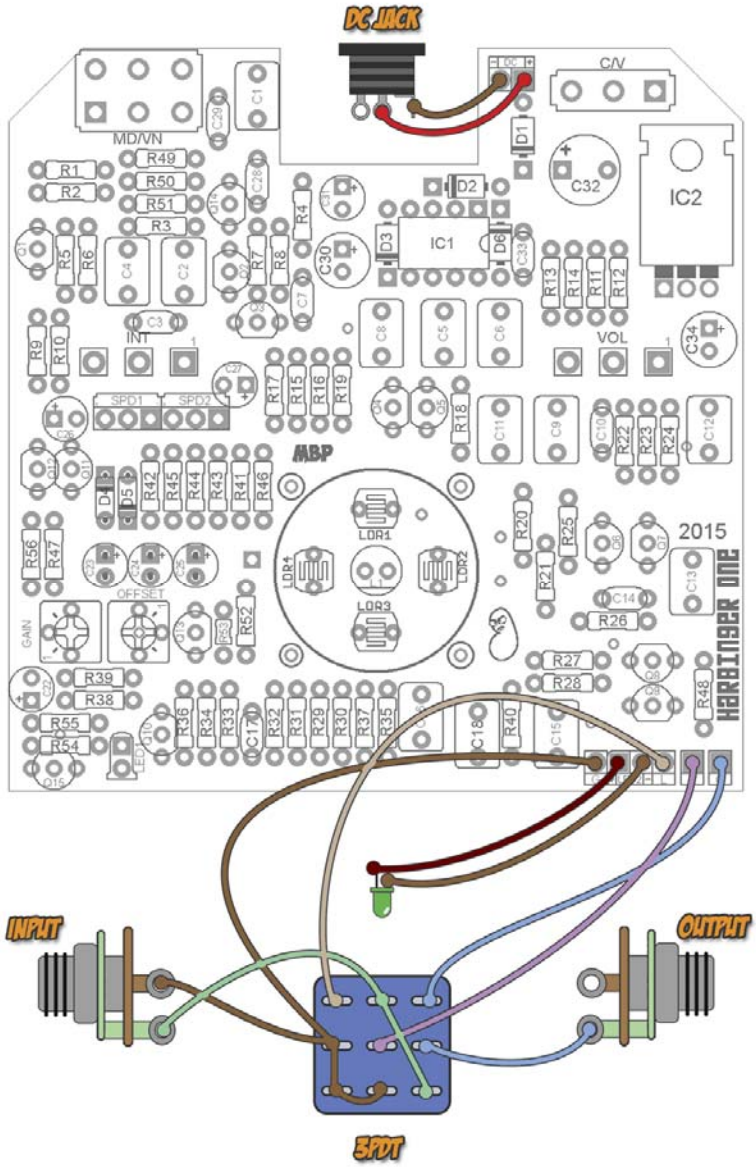
5.8” W x 6.8” H



Download the Photoshop file used to make this template here:
http;//www.madbeanpedals.com/projects/HarbingerOne/HarbingerOne_DRILL.zip

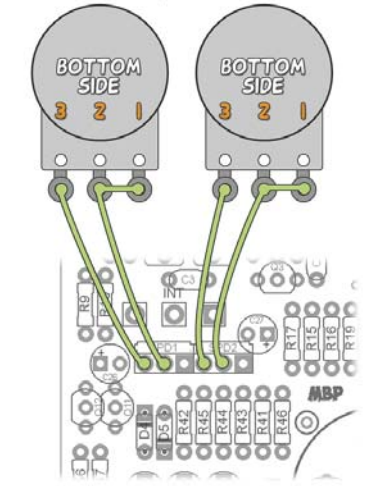
Note: A 125BB will more easily accommodate a larger light shield. You can use this drill guide for the 125BB and simply re-position the jackson the side-wall. You can also use a 1590BB Tall. The difference is the 125BB is the 1590BB with the height of the 125B. The 1590BB Tall is a 1590BB with 2" tall walls (much taller than the 125BB).

Wiring



EXPLODED VIEW OF THE DUAL POT

LEFT SIDE IS THE TOP POT, RIGHT SIDE IS THE BOTTOM POT



2015 Change Log

- Re-worked power supply to eliminate daughter board.
- Re-positioned I/O pads.
- Added new LED flasher circuit.
- ~~Converted switches to PCB pin mount.~~

07.27 Update: Switches can be either PCB mount or solder lug.
01.01.16 Update – Change R55 from 22k to 1M to prevent the Rate LED from stopping at slowest speeds (Thanks Jon!)

Overview

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.

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

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 stock design have been replaced with 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. **However, you may prefer to use a 125BB** for added height. This is the same width and height as the 1590BB but with the added height of a 125B. The extra height will allow a light shield to fit more easily. If using a 125BB utilize the drill guide on page 5 and simply move the drill locations for the jacks to approximately the middle of the enclosure wall.

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.

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 wall-wart which may be inconvenient.

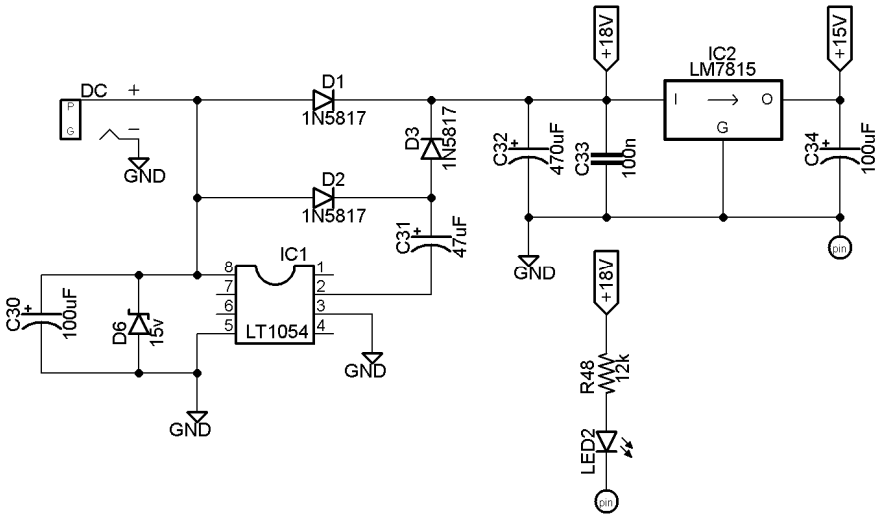
9v wall-wart adaptor OR dedicated power supply
Advantage - More typical of the type of power supply we all use (such as the VoodooLabs PP2).
Disadvantage - Requires the use of a charge pump to drive the effect and is limited to 100mA output.

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 multi-power supplies out there offer isolated/regulated 18v taps. If you have this, then you can use that instead of an 18v wall-wart.

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 power



The power section for the 2015 edition has been simplified. Here are the steps to use the two power options.

- **18v Dunlop Wall Wart** – Populate D1, C32, C33, IC2 and C34. Do not populate C30, D6, IC1, D2, D3 or C31.

- **9v Power** – Populate everything **except** D1.

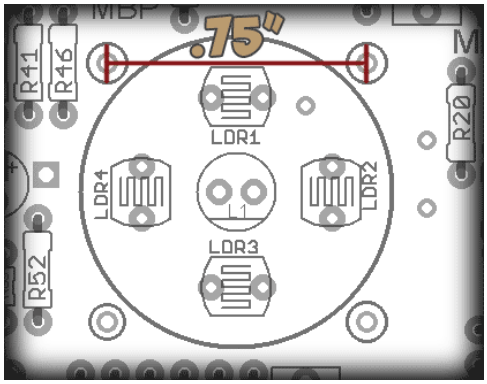
In either case, R48 and LED2 are populated (this is your indicator LED)

Note about the indicator LED: This LED is powered by the 18v output. This is not ideal when using a charge pump due to the extra current draw it requires (it was necessary to do to fit on the PCB layout). If you are using a charge pump, you can omit R48 and wire your LED/resistor combo directly to the DC jack to power it from the 9v tap instead. It may not be necessary, but there is no downside to it either. FWIW.

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.

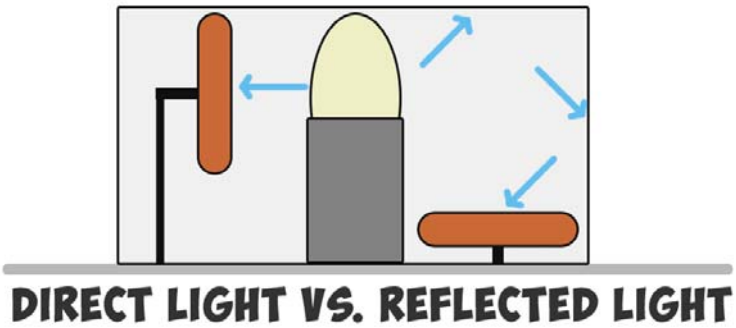
There are four solder pads (denoted by the circles) arranged in a square which comprise the limits of the lightshield dimensions. These are space 0.75” apart.



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/unknown 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://smallbear-electronics.mybigcommerce.com/lamp-18-volt-026-amp-bi-pin/ (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 regular 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.

Note: Change R55 to 1M for better operation.

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)

BEND THIS ROW FLAT

Voltages - 9.42v supply							
Q1	**2N5089**	**Q2**	**2N5088**	**Q3**	**2N5088**	**Q4**	**2N5088**
C	2.14	C	4.4	C	13.8	C	17.8
B	1.45	B	2.14	B	4.4	B	5.6
E	1.03	E	1.57	E	3.8	E	5.3

Q5	**2N5088**	**Q6**	**2N5088**	**Q7**	**2N5088**	**Q8**	**2N5088**
C	13.2	C	17.8	C	13.2	C	17.8
B	5.4	B	5.6	B	5.7	B	5.6
E	4.7	E	5.3	E	4.7	E	5.2

Q9	**2N5088**	**Q10**	**2N5088**	**Q11**	**2N5088**	**Q12**	**2N5088**
C	13.2	C	17.8	C	15.1	C	15.1
B	5.2	B	7.1	B	varies	B	varies
E	4.6	E	6.7	E	varies	E	varies

Q13	**2N5088**	**Q14**	**J201**	**IC1**	**LT1054**	**REG**	**LM7815**
C	varies	D	17.8	1	1.43	I	17.8
B	varies	S	0.74	2	4.98	G	0
E	vaires	G	4mV	3	2mV	O	15.1
				4	7mV		
				5	175mV		
				6	2.52		
				7	1.4		
				8	9.4		

These readings were taken off the prototype PCB which did not include the Rate LED circuitry. You should read 15v on the Q15 Collector, with some varying voltage on the Base and Emitter.