

HEADTRIP2

FX TYPE: MultiFX

Based on the FV-1 DSP

Enclosure Size: 125B

"Softie" compatibility: none

© 2020 [madbeanpedals](#)



Overview

The **Headtrip** was originally released in 2018 and was one of the first forays into the world of FV-1 DSP effects for madbeanpedals. It featured three mbp fx patches, all of which were a bit on the weird side. For the **Headtrip2**, the design has been expanded to a full 8 patches (7 of which are new) and now features Tails bypass for spillover effects.

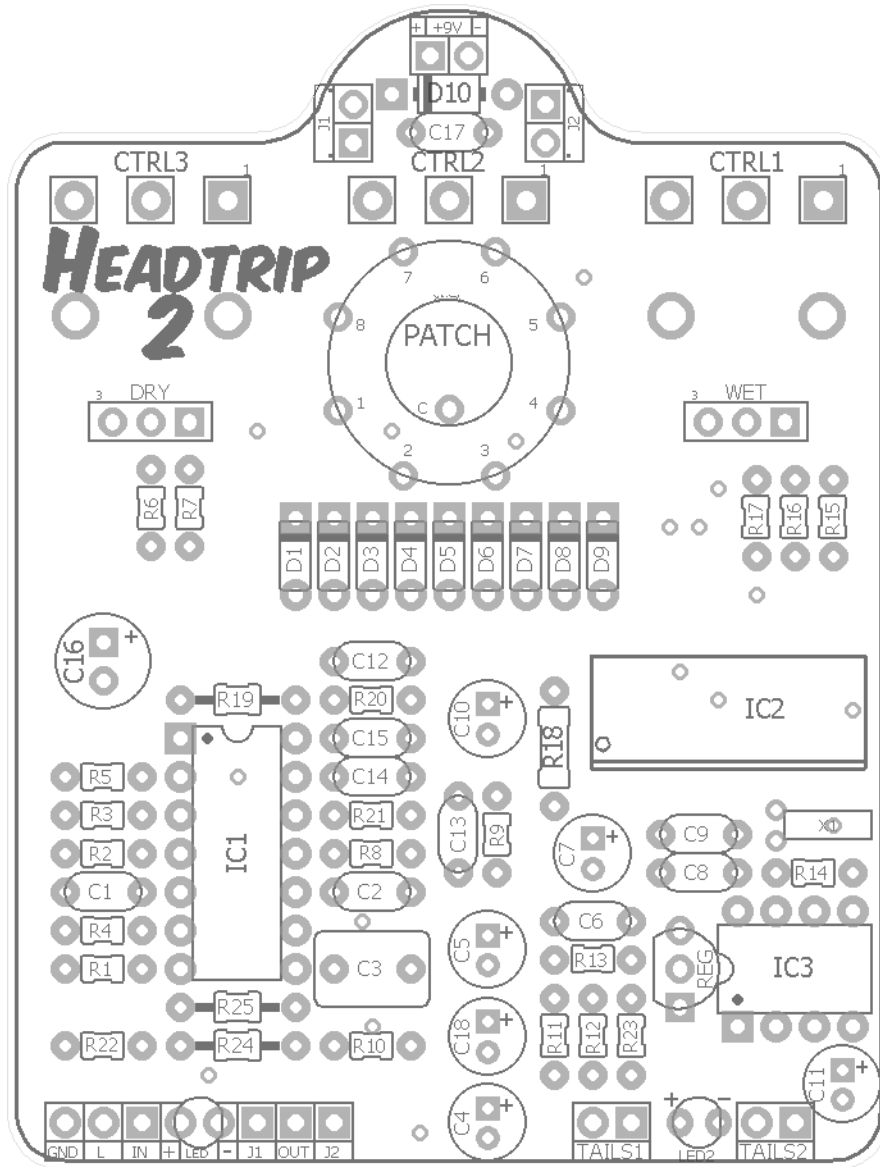
The main idea behind the Headtrip series is to offer FX that have practicality (or at least musicality) with the ability to dial in some strange or unusual sounds. IOW, this is not the project for "This is my phaser sound. Now, here is my chorus sound. Oh, look: it's my boring-a\$\$ sh*tty delay!" Rather I wanted to come up with ideas that hopefully push the envelope just a bit (the limitation being that all these patches were assembled in the wonderful SPINCAD program rather than hand-coded). While there are limitations with SPINCAD, I feel like I've come up with a good set of patches that are fun but also applicable to a variety of musical settings.

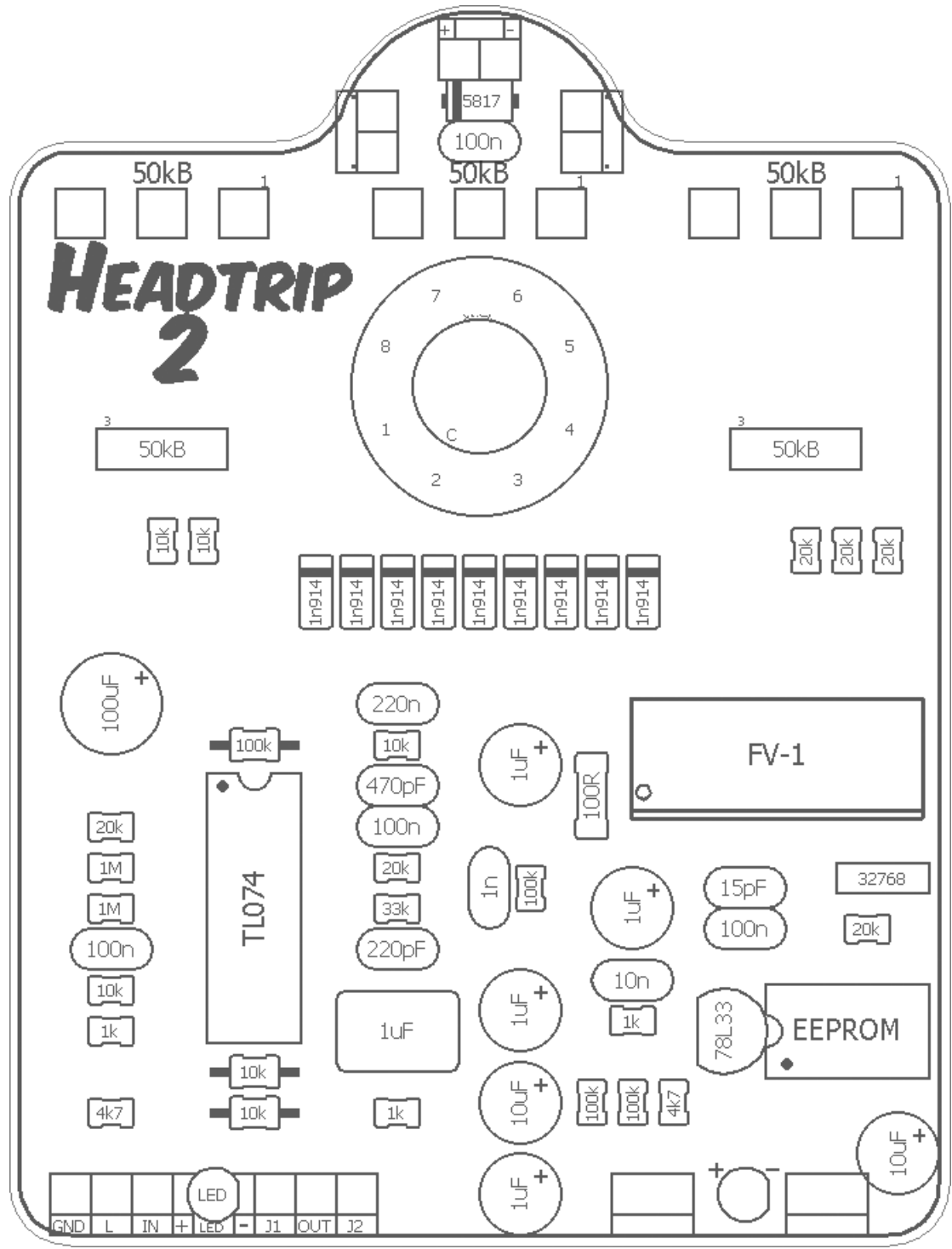
Controls

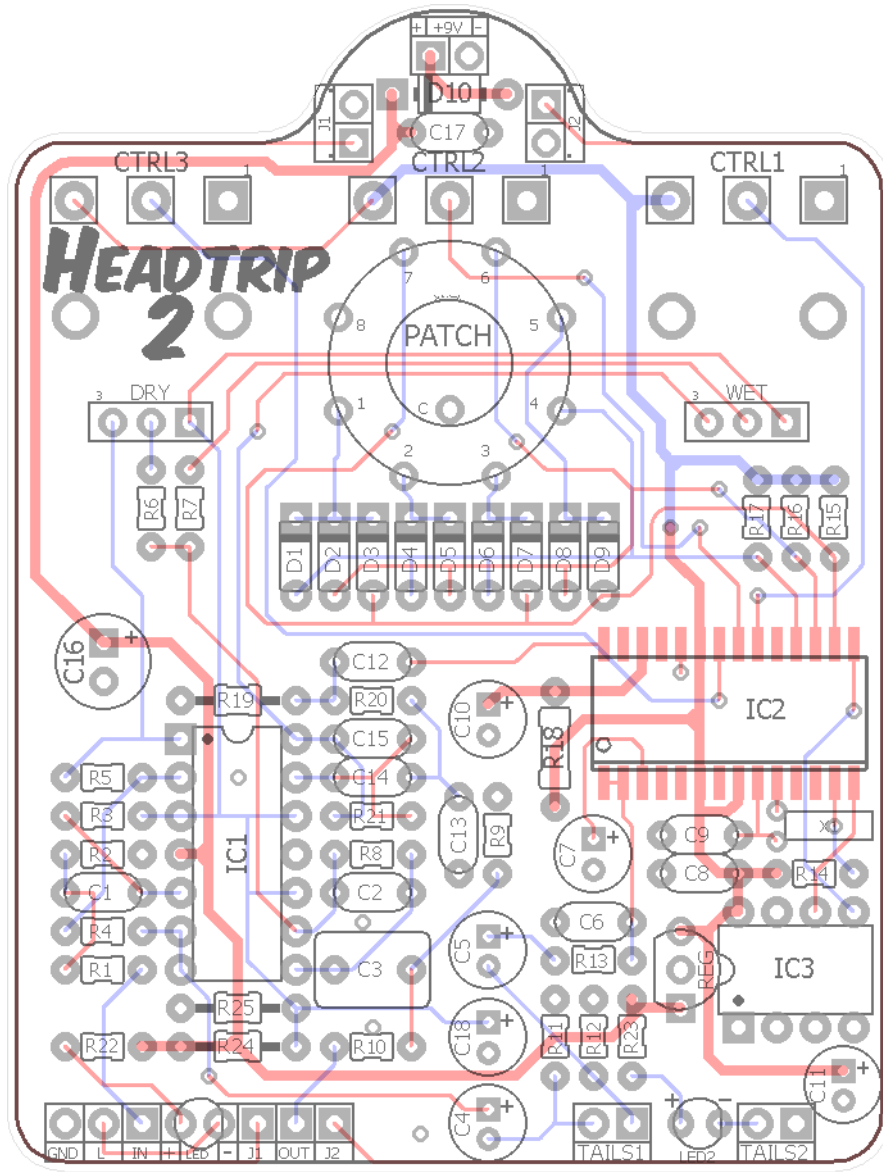
- **CTRL1-3** : These pots control the various parameters of each internal patch. They will do different things depending on which patch is selected. See the list of patches and controls later in the doc.
- **WET** : This pot sets the FX volume at the output. It is independent of the dry signal mix.
- **DRY** : This pot sets the volume of the unaffected signal. It is independent of the FX signal mix.
- **PATCH** : This rotary switch selects which FX program is active. There are 8 to choose from.
- **TAILS** : This footswitch kills the dry signal into the FV-1. It is used primarily for delay or reverb when you want to have either feedback or reverb decay spill over rather than turning off abruptly. IOW, the Tails shuts off the FX while the pedal is still on.

Terms of Use: You are free to use purchased **Headtrip2** circuit boards for both DIY and small commercial operations. You may not offer **Headtrip2** PCBs for resale or as part of a "kit" in a commercial fashion. Peer to peer re-sale is fine, though.

Technical assistance for your build(s) is available via the [madbeanpedals forum](#). Please go there rather than emailing me for assistance on [builds](#). This is because (1) I'm not always available to respond via email in a timely and continuous manner, and (2) posting technical problems and solutions in the forum creates a record from which other members may benefit.







Resistors		Caps		Diodes	
R1	1k	C1	100n	D1 - D9	1n914
R2	1M	C2	220pF	D10	1N5817
R3	1M	C3	1uF	ICs	
R4	10k	C4	1uF	IC1	TL074
R5	20k	C5	1uF	IC2	FV-1
R6	10k	C6	10n	IC3	EEPROM
R7	10k	C7	1uF	Crystal	
R8	33k	C8	100n	X1	32768Hz
R9	100k	C9	15pF	Regulator	
R10	1k	C10	1uF	REG	L78L33
R11	100k	C11	10uF	Footswitch	
R12	100k	C12	220n	TAILS	3PDT
R13	1k	C13	1n	Rotary	
R14	20k	C14	100n	PATCH	1P8T
R15	20k	C15	470pF	Pots	
R16	20k	C16	100uF	WET	50kB
R17	20k	C17	100n	DRY	50kB
R18	100R	C18	10uF	CTRL1	50kB
R19	100k			CTRL2	50kB
R20	10k			CTRL3	50kB
R21	20k				
R22	4k7				
R23	4k7				
R24	10k				
R25	10k				

Values	QTY	Type	Rating
100R	1	Metal / Carbon Film	1/4W
1k	3	Metal / Carbon Film	1/8W
4k7	2	Metal / Carbon Film	1/8W
10k	5	Metal / Carbon Film	1/8W
20k	6	Metal / Carbon Film	1/8W
33k	1	Metal / Carbon Film	1/8W
100k	4	Metal / Carbon Film	1/8W
1M	2	Metal / Carbon Film	1/8W
15pF	1	MLCC / MICA	16v min.
220pF	1	Ceramic / MLCC	16v min.
470pF	1	Ceramic / MLCC	16v min.
1n	1	Film	16v min.
10n	1	Film	16v min.
100n	4	Film	16v min.
220n	1	Film	16v min.
1uF	1	Film	16v min.
1uF	4	Electrolytic	16v min.
10uF	2	Electrolytic	16v min.
100uF	1	Electrolytic	16v min.
1n914	9		
1N5817	1		
TL074	1		
FV-1	1		
EEPROM	1	*included w/PCB	
32768Hz	1		
L78L33	1		
3PDT	2	For Tails AND Bypass	
1P8T	1		
50kB	2	PCB Right Angle, Plastic Shaft	9mm
50kB	3	PCB Right Angle	16mm

1/8W Resistors:

Since Mouser has changed their MOQ on Xicon resistors to 200, I recommend getting these from Tayda.

<https://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors.html>

15pF:

<https://www.mouser.com/ProductDetail/810-FG28C0G1H150JNT6>

<http://smallbear-electronics.mybigcommerce.com/capacitor-silver-mica-500v-10-pf-150-pf/>

FV-1:

<http://smallbear-electronics.mybigcommerce.com/ic-spin-semi-fv-1/>

32768Hz crystal:

<https://www.mouser.com/ProductDetail/815-AB26T-32.768KHZ>

<http://smallbear-electronics.mybigcommerce.com/32-768-khz-crystal/>

L78L33:

<https://www.mouser.com/ProductDetail/511-L78L33ACZ>

<http://smallbear-electronics.mybigcommerce.com/ic-l78l33acz/>

TLE2074 (TL074 upgrade, if you want to spend the \$\$):

<https://www.mouser.com/ProductDetail/595-TLE2074CN>

1P8T:

<http://smallbear-electronics.mybigcommerce.com/rotary-switch-miniature-1p8t/>

9mm Right Angle, Plastic Shaft Pots (50k Ω):

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

(long shaft): <http://smallbear-electronics.mybigcommerce.com/9mm-pc-mount-plastic-shaft-w-white-index/>

16mm Right Angle Pots (50k Ω):

<http://smallbear-electronics.mybigcommerce.com/alpha-single-gang-16mm-right-angle-pc-mount/>

Thinline DC Jack:

<http://smallbear-electronics.mybigcommerce.com/dc-power-jack-all-plastic-unswitched-2-1-mm/>

Enclosed Mono:

<http://smallbear-electronics.mybigcommerce.com/1-4-in-mono-enclosed-jack/>

<http://smallbear-electronics.mybigcommerce.com/1-4-in-mono-enclosed-switchcraft-111x/>

Lumberg Mono:

<http://smallbear-electronics.mybigcommerce.com/lumberg-1-4-compact-shrouded-mono-jack/>

Patch	Type	Name	Description	Ctrl1	Ctrl2	Ctrl3
1	Pitch	ChoirMouse	Octaver + Choir	Oct Down	Oct Up	Choir
2	Filter	Fourgan	Diphthong + Octaver	Envelope	Formant	Octaver
3	Modulation	Sinkhole	Whammy + Tremolo	Space	Rate	Depth
4	Delay	WhiteHole	Delay + Flanger	Time	Regen	Flange
5	Delay	Dreamtime	Delay + MultiFX	Time	Regen	MultiFX
6	Reverb	Spacebomb	Reverb + Flange	Reverb	Low Cut	FlangeBomb
7	Reverb	These Halls	Reverb + Choir	Reverb	Low Cut	Choir
8	Reverb	These Ruins	Reverb + PitchShift	Reverb	4th Down	5th Up

ChoirMouse: This is my take on the EQD Organizer™. The design of the Organizer and Headtrip2 are different so I've combined certain elements into one control. Ctrl1 is the octave down volume. Ctrl2 is the octave up volume. Ctrl3 does several things at once. As you turn it up, it sends the upper octave into a feedback loop with reverb and a slight delay. This creates some "shimmer" or a choir type effect. This control can be used when Ctrl1 and 2 are off.

Fourgan: Probably my favorite of the new patches. This is a diphthong type envelope filter which exploits low pass filtering to imitate the sound of a human voice. Ctrl1 sets the sensitivity of the envelope and is keyed off your picking dynamics. Ctrl2 pans between two diphthongs. CCW is "ae". CW is "u". In-between is a mix of both. Ctrl3 is where the real fun starts. It dials in upper and lower octaves so as it is turned up the whole effect takes on an organ-like quality. It's reminiscent of some of the EHX B9™ sounds, IMO.

Sinkhole: My take on the very familiar Whammy™ detune setting. It's a faux chorus sound created by pitch-shifting the incoming signal up and down slightly. It does not modulate on its own so it's not a true chorus. Ctrl1 sets the total amount of pitch shift up and down from min to max. Ctrl2 and Ctrl3 are Rate and Depth for a tremolo effect after the pitch shifting.

Whitehole: This patch has a very straight forward delay (850ms) with the ability to dial in some flanger sounds on the repeats. It's not a full-fledged flanger but it definitely gets you in the territory. Ctrl1 sets the delay time (up to 850ms). Ctrl2 is the number of delay repeats. Ctrl3 fades in the flanger sound into the delay repeats as it is turned up.

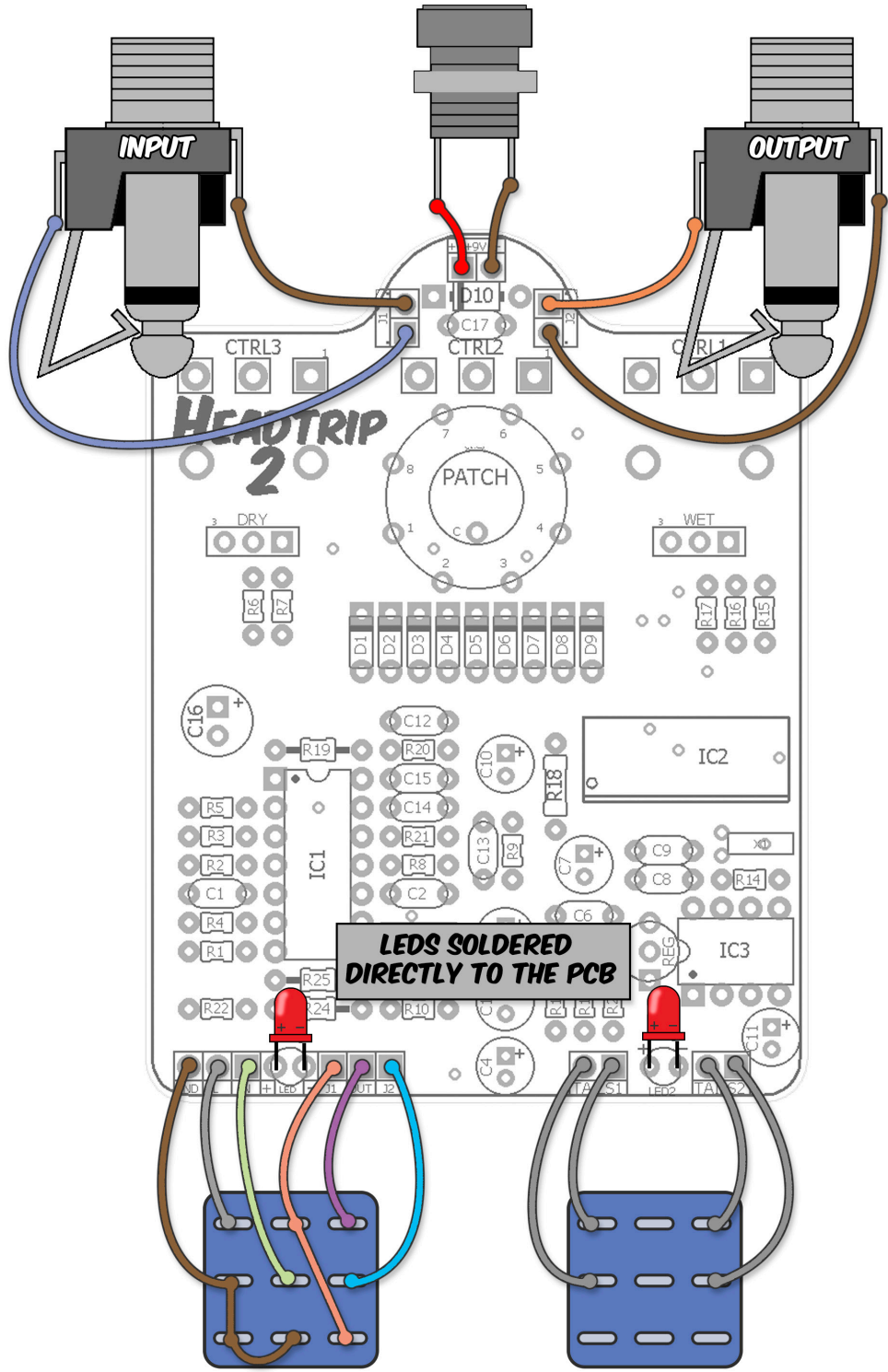
Dreamtime: This is the same patch from the mbp Dreamtime and is the only holdover from previous mbp FV-1 projects. This is another delay with feedback but the repeats are more filtered than the Whitehole. Ctrl1 is delay (up to 975ms) and Ctrl2 is feedback. Ctrl3 is where the magic is. The control pans between a multitude of fx. CCW is no effect. At a quarter turn it introduces a slow modulation. At half up, fast modulation with less depth. At three quarters, the modulation turns into a ring modulator. And in the last 25% that ring modulation turns into tremolo. Neat!

SpaceBomb: This patch is a reverb with a neat little “flange bomb” effect. Ctrl1 sets the reverb room size. Ctrl2 is a high pass filter. So, as you turn it up it reduces the low end of the reverb output (helpful when you want to keep things from getting too muddy). Ctrl3 is the “flange bomb”. This is not a true flanger, rather it uses an envelope that drives a small delay head before the reverb. The harder you pick, the more the delay shifts creating, well, a flange bomb. That’s the only way I can describe it!

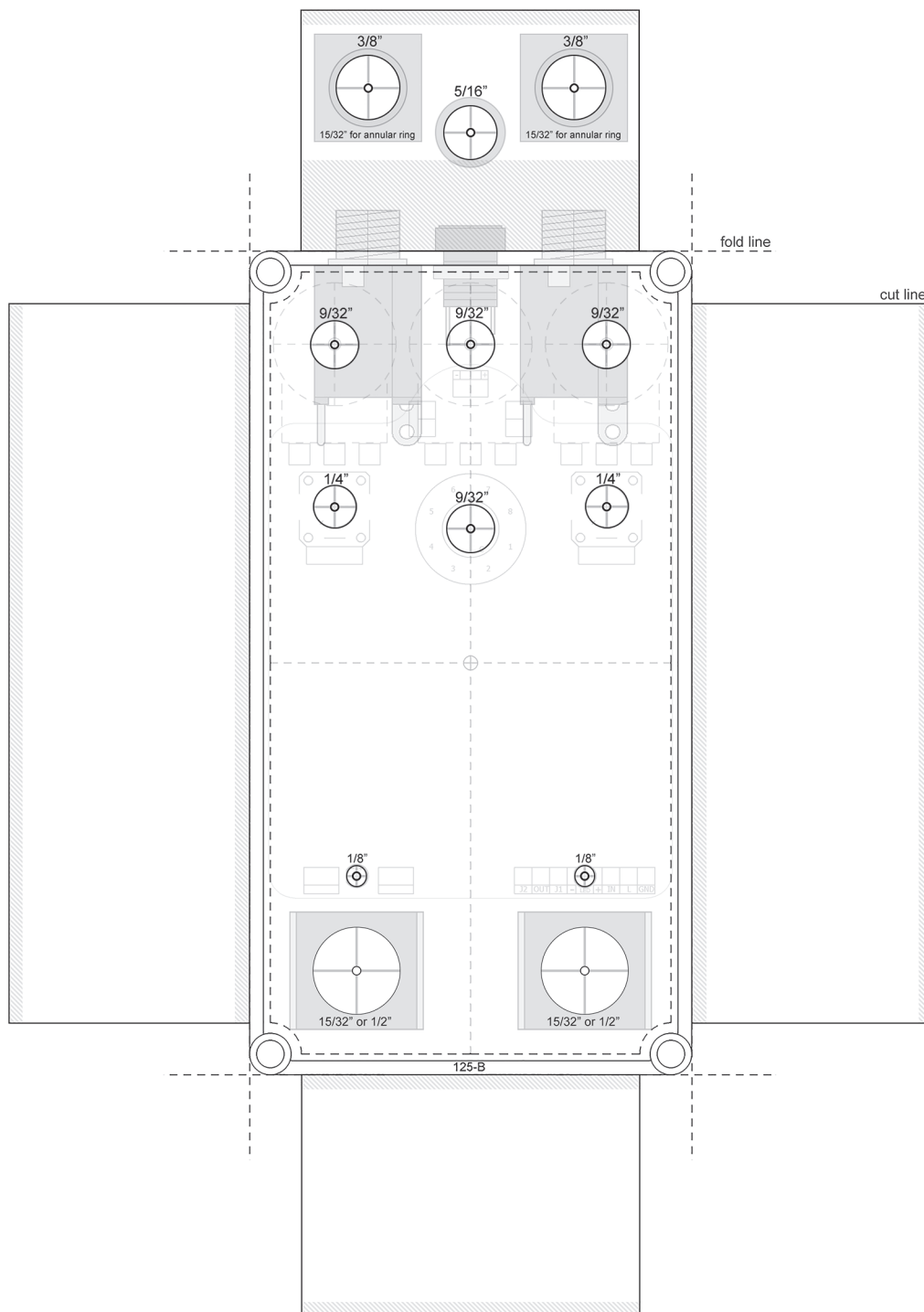
These Halls: Of course, there was going to be a shimmer reverb. Everyone wants one even though lots of people think it’s overused. Shimmer in FV-1 is okay. Not the best sounding effect due to the lack of fidelity in octave up sounds. So, These Halls makes a good compromise in filtering the upper octave choir into more of a pad rather than distinct octaves. It actually sounds pretty good this way, IMO. Ctrl1 and 2 are the same as the Spacebomb (reverb amount and low cut) and Ctrl3 dials in the shimmer/choir effect.

These Ruins: This one is probably the least versatile of the 8 patches, but it’s a sound I like and can inspire some new ideas. It’s a reverb at its core, but with a pitch shifter. Unlike the shimmer effect, this one dials in a 4th below and 5th above (all the pitch effects are polyphonic, BTW). Ctrl1 sets the reverb amount. Ctrl2 sets the 4th down volume and Ctrl3 sets the 5th up volume.

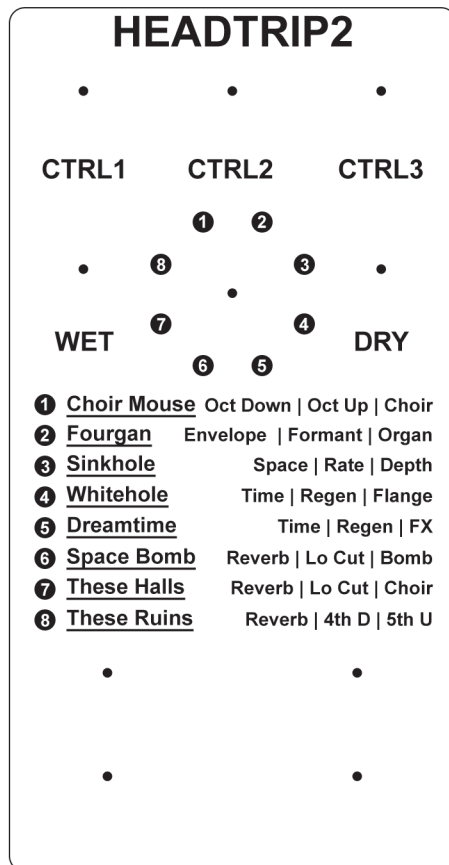
-
- Some of these patches will take on a new dimension when you turn the DRY signal all the way down, so keep that in mind when you are exploring all the sounds available to you.
 - When you are using either a delay or reverb patch, the Tails footswitch allows you to disengage the input of the effect while the output is still going, creating spillover.
 - Note: The Tails switch is set up so that when the LED is lit, the effect is fully active. When the tails switch is bypassed, the FV-1 input is disconnected and that engages the spillover. It may seem a little counter-intuitive on paper, but the thinking here was having both the bypass LED and Tails LED indicate things are all the way on seemed the least confusing.
-



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



- You may need to angle the two 3PDT switches slightly inward to clear the insides of the 125B enclosure. Not to worry - it will all fit.
- Tip: if you'd rather have actual knobs for the DRY and WET controls instead of the plastic shaft ones, use 9mm, 12mm or 16mm pots *wired* to the PCB. You'll need to move the WET and DRY drill spots downward in proportion to which sized pot you use. Measure carefully if you decide to do this!

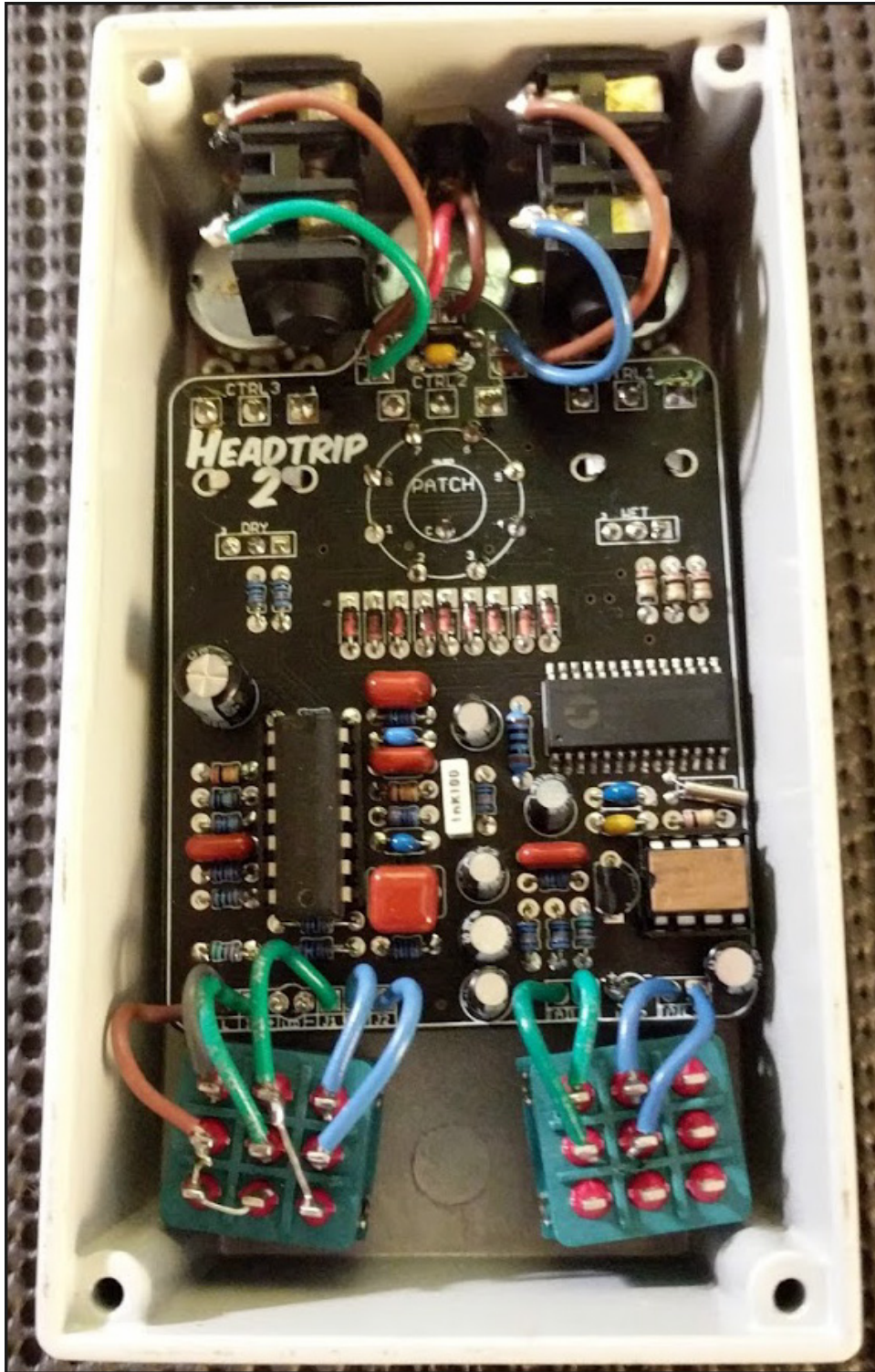


- Because the Headtrip2 has so much going on, I've made a simple label available to you that has descriptions of the patch controls. You can print directly from this page (do not use any page scaling). Trim your print just inside the outer border. [smallbear has clear decal stock for ink and laser printers.](#)
- I've included this artwork in the .PSD file located in the Headtrip2.zip. So, if you have a compatible gfx program you can use this artwork as a starting point to add your own graphics, choose your own fonts, etc.
- Because the rotary is continuous you'll need to figure out where to attach your knob. The easiest way to do this is first dial in the #1 patch then affix your knob with the pointer in the right direction. You can use either a knurled press fit or set screw knob.

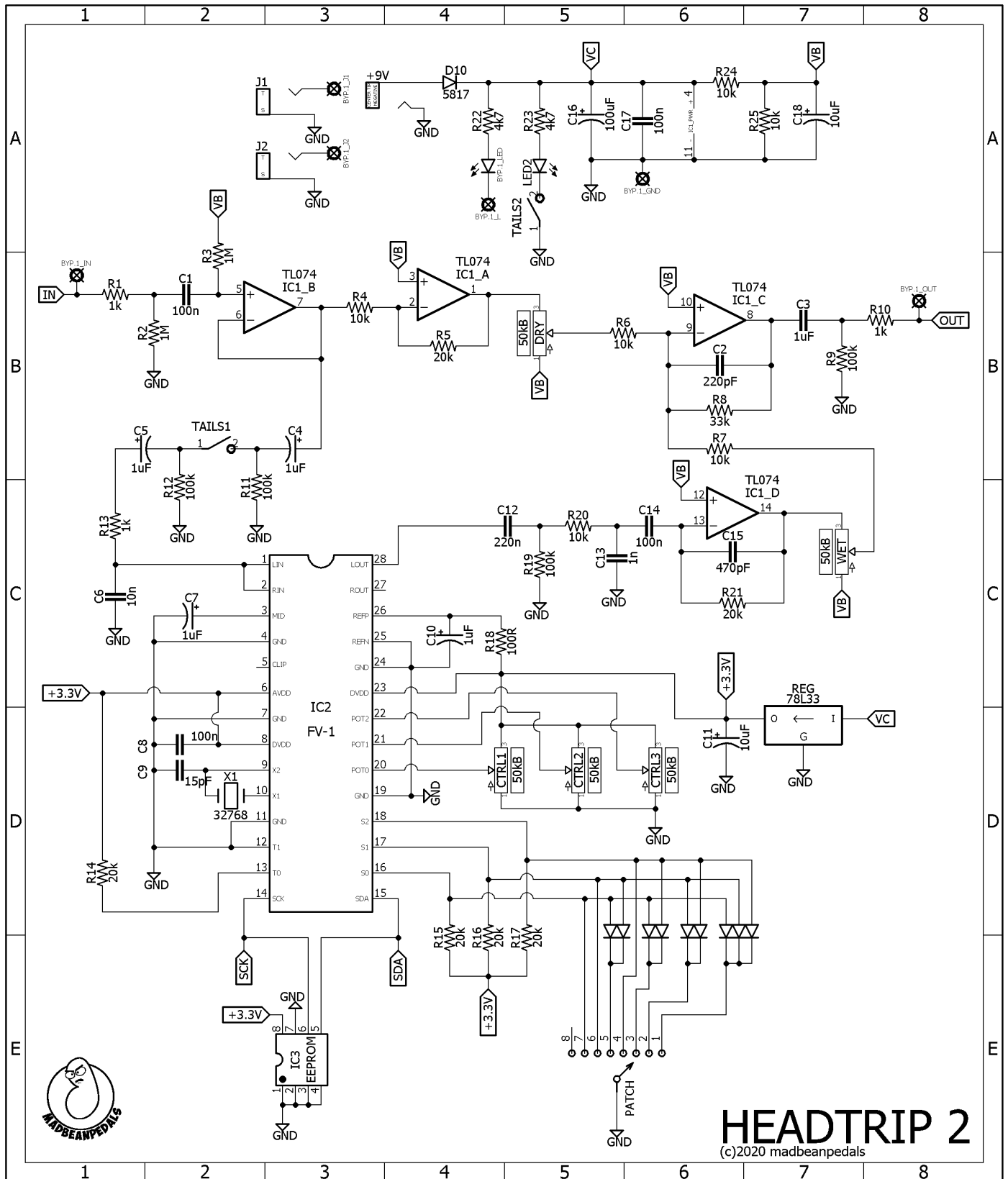
IC1	TL074	IC2	FV-1
1	4.55	1	1.64
2	4.55	2	1.64
3	4.55	3	1.64
4	9.1	4	0
5	4.16	5	3.22
6	4.55	6	3.22
7	4.55	7	0
8	4.55	8	3.23
9	4.55	9	1.51
10	4.54	10	1.52
11	0	11	0
12	4.54	12	0
13	4.55	13	3.23
14	4.55	14	3.23
		15	3.23
		16	0.5
		17	0.5
		18	3.22
		19	0
		20	3.22
		21	3.22
		22	3.17
		23	3.22
		24	0
		25	0
		26	3.19
		27	1.65
		28	1.64

IC3	24LC32a
1	0
2	0
3	0
4	0
5	3.22
6	3.22
7	0
8	3.22

- 9.42vDC One Spot
- Current Draw ~ 62mA
- Some voltages on the FV-1 will vary depending on where the controls and rotary switch are set.



On the wiring diagram, I have the Tails switch wired to columns 1 and 3 on the 3PDT. Here it's wired to columns 1 and 2. Either way works exactly the same.



Of course, you love the Headtrip2 patches I've included with this project but maybe you want to explore some other effects without having to build/buy a whole 'nother PCB, right? Well, you can do this with the Headtrip2! You can actually program your own EEPROMS with the patches of your choosing, burn them and install them right into the Headtrip2. Just replace the included pre-programmed chip with your own and you are ready to go.

Unfortunately, showing you how to do all the steps required is far beyond the scope of this document. But I can at least tell you what you need to get started. Perhaps I will be able to make a comprehensive tutorial on the whole process at some point.

Things you need

A Pickit2 programmer

These are no longer made but there are clones out there (usually from China on eBay). I cannot attest to their reliability or functionality so realize there may be a risk here should you purchase one. It may be possible to do the programming with a Pickit3 but I've never used one, so I cannot offer advice here.

Pickit2 v.2.61 software

This can still be downloaded from the Microchip website: <https://www.microchip.com/DevelopmentTools/ProductDetails/pg164120>

You may need the version that installs the .NET Framework A with it depending on your operating system and/or system configuration.

EEPROMs

You'll need one or more 24LC32A EEPROMs to program banks of patches.

<https://www.mouser.com/ProductDetail/579-24LC32A-I-P>

Free patches you can get right now without coding anything!

<https://mstratman.github.io/fv1-programs/>

<https://github.com/HolyCityAudio/SpinCAD-Designer/tree/master/patches>

<http://www.spinsemi.com/programs.php>

Optional

SPIN Assembler

http://www.spinsemi.com/Products/software/spn1001-dev/SpinSetup_1_1_31.exe

You can use this to program your own .spn files (these are the individual effects patches) and that's fine if you want to explore that. But, you can also use the Spin software to create the HEX files needed to program the EEPROMS via the Pickit2 programmer and software. Luckily, there are lots of .spn files available for free already!

SpinCAD development software

<https://github.com/HolyCityAudio/SpinCAD-Designer>

An alternative to coding your own patches is to use SpinCAD. This software is GUI based rather than code based and it allows you to construct algorithms using a node architecture using the JAVA platform (you need to install Java Runtime to use SpinCAD). What this means is you can make your effects by simply connecting blocks of programming together without needing to understand the actual coding required to make it all work. This is what I used to develop all my FV-1 patches so far. If you download the entire file from GITHUB you'll also find some SpinCAD files you can use as a guide to get started!

Support Forums

<http://www.spinsemi.com/forum/index.php>

<https://www.madbeanpedals.com/forum/index.php?board=81.0>

<https://www.diytompboxes.com/smfforum/index.php?board=19.0>

For the inquisitive, here are some basics on how FV-1 development occurs.

Idea

You have an idea for an effect. This effect must be limited to the three control pots available with the FV-1 chip, but luckily there are many things you can do with three pots. For example, let's say you want to have a delay with time, regen and tone controls.

Algorithm

This idea must be translated into an algorithm that includes all the blocks necessary to execute the program. For our example, these would include input and output for the FV-1, a delay block, a feedback block and either a low pass, high pass or combination of the two into a tone control.

Code

There are two ways you can translate your algorithm into a working set of instructions that the FV-1 can execute. One is to use the assembler program created by SpinSemi specifically for the FV-1. This obviously involves coding and if you have experience with that it will probably be an easy transition to make. If you don't want to spend time learning to code, you can use the SpinCAD program created by DigitalLarry for the DIY community. This is a GUI-based program that lets you skip all the coding parts and simply connect pre-coded blocks together in many ways. For our delay example, you'll have a "delay" block that you can connect a pot to control the delay time. For feedback, you can use a "loop" block connected to a mixer whose volume is controlled by a pot to set the delay feedback level. There are several ways to utilize filters in SpinCAD controlled by a single pot, as well.

Assemble

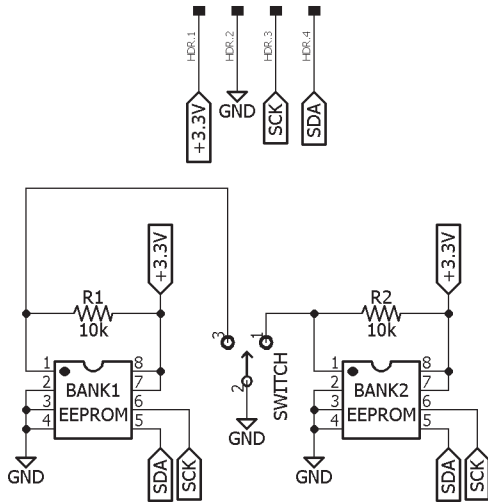
Once your program is coded with either of the two methods above you need to get it into a form that the FV-1 can read. With the SpinASM you can save .spn files for programs you have created. These are collected into a single bank of 8 patches (you can use less than 8, of course). For SpinCAD, you can collect your different patch files in much the same way, which is then saved to a "bank" file. These files are then exported to .hex files which is what we use to program the EEPROMs - the device that stores the programs that the FV-1 reads and executes in real time.

Program

Whether you use the SpinASM or SpinCAD, once you have exported your bank to a .hex file the process is the same from there onward. This file is loaded into the Pickit2 software, then the Pickit2 hardware is connected to the EEPROM and the software burns the .hex file to the chip. The chip is installed in the circuit board and off you go!

Wait...more??? Sure, why not? Let's say you LOVE the Headtrip2 patches. And, you've invested time into burning your own EEPROM with other patches which you also love. But, switching the chips out all the time is a real PITA. What you would really like it to have BOTH the Headtrip2 and your own favorite 8 patches all in one pedal. You are in luck. It's actually easy!

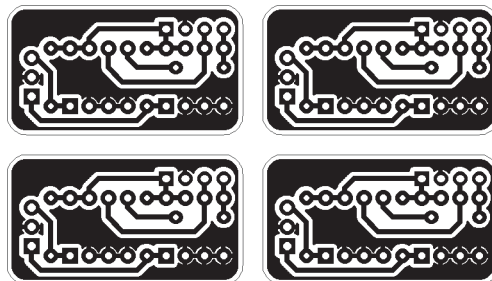
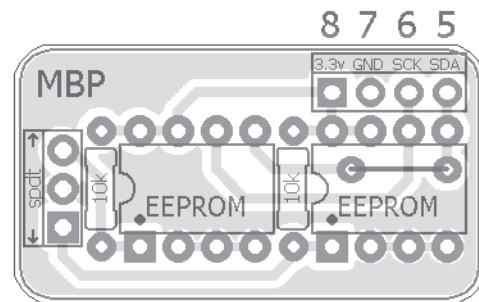
You'll need to make a separate PCB that has both EEPROMS, use two resistors and a single switch. Here's how it works (this idea came from Jack Orman on the [Muzique website](#)):



You have two EEPROMS, each with 8 patches. Each ROM is activated by grounding pin1. So, by switching b/w high and low on pin1 of each bank you can activate/deactivate them. The only caveat is you have to temporarily turn the Rotary switch (on the Headtrip2) one step before the patch in the new EEPROM is loaded.

Here's a little PCB that can do all that. Connect an SPDT On/On to the left. Wire the header on the top right to the pins on IC3 of the Headtrip2 PCB as indicated (obviously, you will not install anything in IC3 on the HT2 PCB if you do this mod). Note the jumper under the right side EEPROM.

Note: The header connections (8,7,6,5) are only for connecting this board to the HT2 PCB. Other PCBs may have different EEPROM pin configurations!



Here's the etching artwork for the PCB above.

Can you fit all this in the HT2? Maybe...? I haven't tried. If you mount this PCB on the bottom wall of the 125B and use a mini SPDT switch I think you can do it. I'll leave that to you to figure out :)