HEADTRIP

FX TYPE: FV-1 Multi-FX

The **Headtrip** is an FV-1-based multi-fx project with three unique patches: the Starfield, Choirsaw and Parallax. Starfield is a delay with phaser-like repeats, the Choirsaw combines delay, pitch and tremolo in a very musical way and the Parallax is an approximation of the Function F(x) pedal of the same name which combines phaser and tremolo. In addition, you can access three of the internal FV-1 programs: modulated reverb, pitch shift (-4th to +3rd) and reverb with low/high filtering. This gives the Headtrip six effects in a 1590B format, which is a pretty decent deal!

The Headtrip can also serve as a base-unit if you want to program your own FV-1 patches using SpinCAD or SpinASM. Details on programming an EEPROM with the Headtrip with your own patches will also be provided.

- **P0**, **P1** and **P2** are the standard 3-pot allotment used in every FV-1 build. The functionality of each of these changes on a per patch basis.
- **Dry** and **FX** let you choose your clean and effected signal independently.
- **I/E** is a toggle that selects between the three patches provided on the included EEPROM (external) and the three internal FV-1 patches.
- **Patch** selects between the three patches in both Internal and External modes.
- **VOL** trimmer sets the output of the effect. Set it this way: turn the FX knob all the way down, and the Dry knob to about 2/3rd up. Set the Vol trimmer for unity with the bypass signal

---

If you are new to FV-1 or surface mount soldering, I recommend checking out the build guide included in the Dreamtime Delay zip file. It provides detailed instructions on how to build FV-1 projects.

Additionally, the Headtrip SpinCAD bank used to program the EEPROM included with the Headtrip is provided in the zip for this project. This can be used however you like: to get familiar with SpinCAD, to modify or change patch parameters, etc. Or, even as the basis for your own FV-1 project. However, you cannot sell an EEPROM on its own with the Headtrip bank as part of another DIY project or commercial endeavor. Which is a pretty reasonable restriction IMO since a lot of effort was made to come up with the patches!

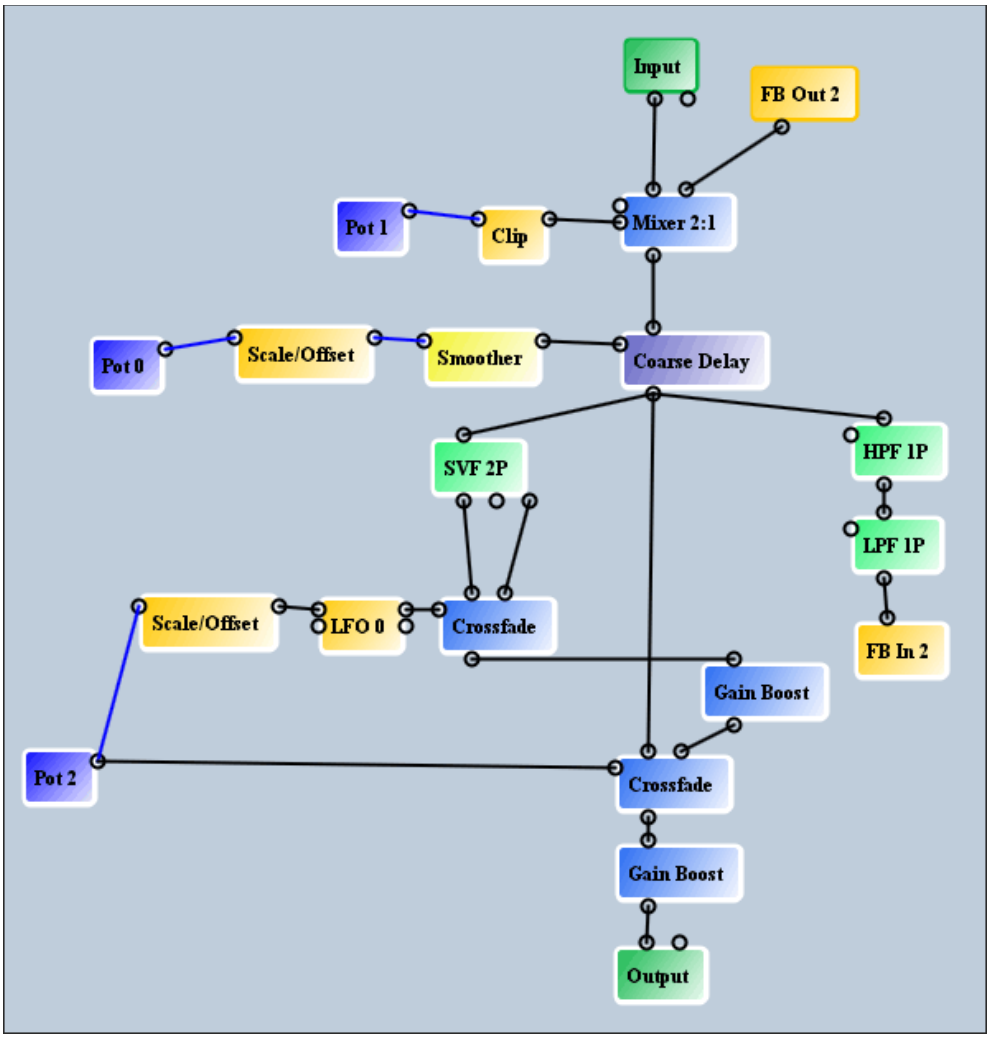
When the I/E switch is set to Internal (right position) the following internal FV-1 patches are available:

Patch1 (left): Chorus-Reverb
P0: Reverb Mix
P1: Chorus Rate
P2: Chorus Mix

Patch 2 (middle): Reverb
P0: Reverb
P1: HF Filter
P2: LF Filter (these filters are pretty subtle, FYI)

Patch 2 (right): Pitch-Echo
P0: Pitch from -4th to +3rd (turn Dry down for pseudo-baritone!)
P1: Does nothing (mono output)
P2: Does nothing (mono output)

Starfield (pos. 1 Headtrip, patch 0 SpinCAD)

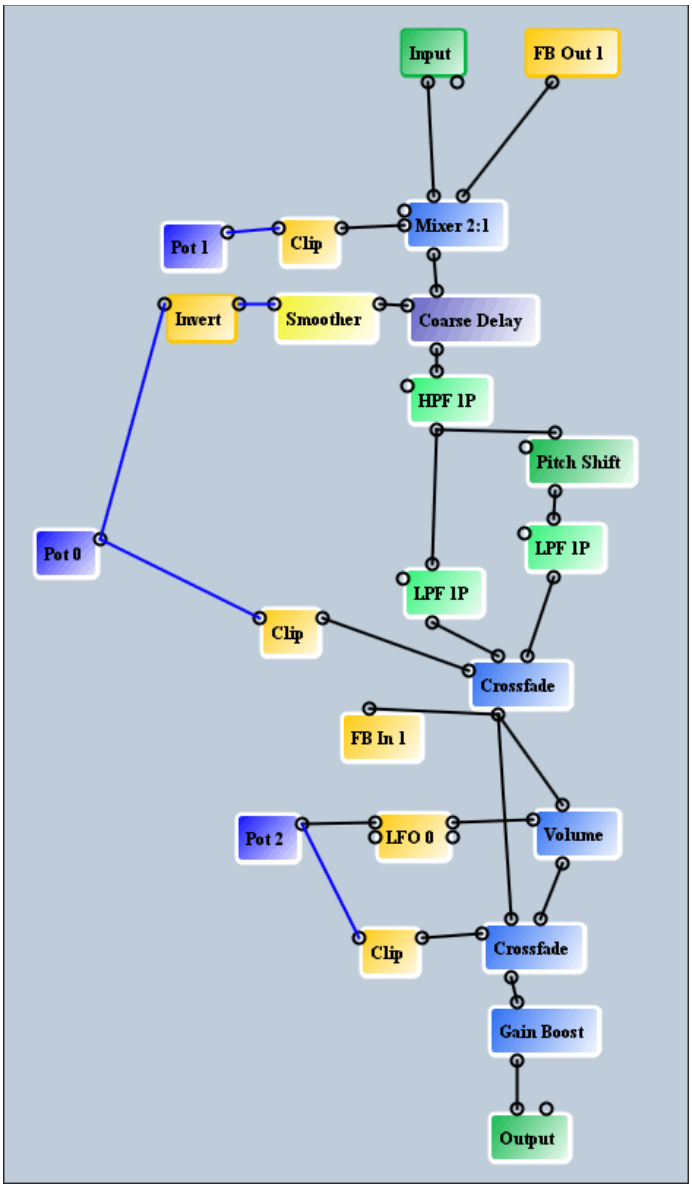


The **Starfield** is a pretty straight-forward FV-1 delay. The controls are as follows:

- P0 sets delay time from a few ms to about 975ms.
- P1 sets the feedback amount from 0 to max. The Feedback path is also has both HP and LP filters (70Hz and 2290Hz resp.) for a bit of bucket-brigade flavor.
- P2 sets the amount of phaser sweep in the feedback path from 0 - slow - fast.

Possible mods:
Change the LPF filter in the Feedback path for brighter or darker delay tones.
Change the Frequency and Resonant peak settings in the SVF 2P block for different phaser tones.

Choirsaw (pos. 2 Headtrip, patch 7 SpinCAD)

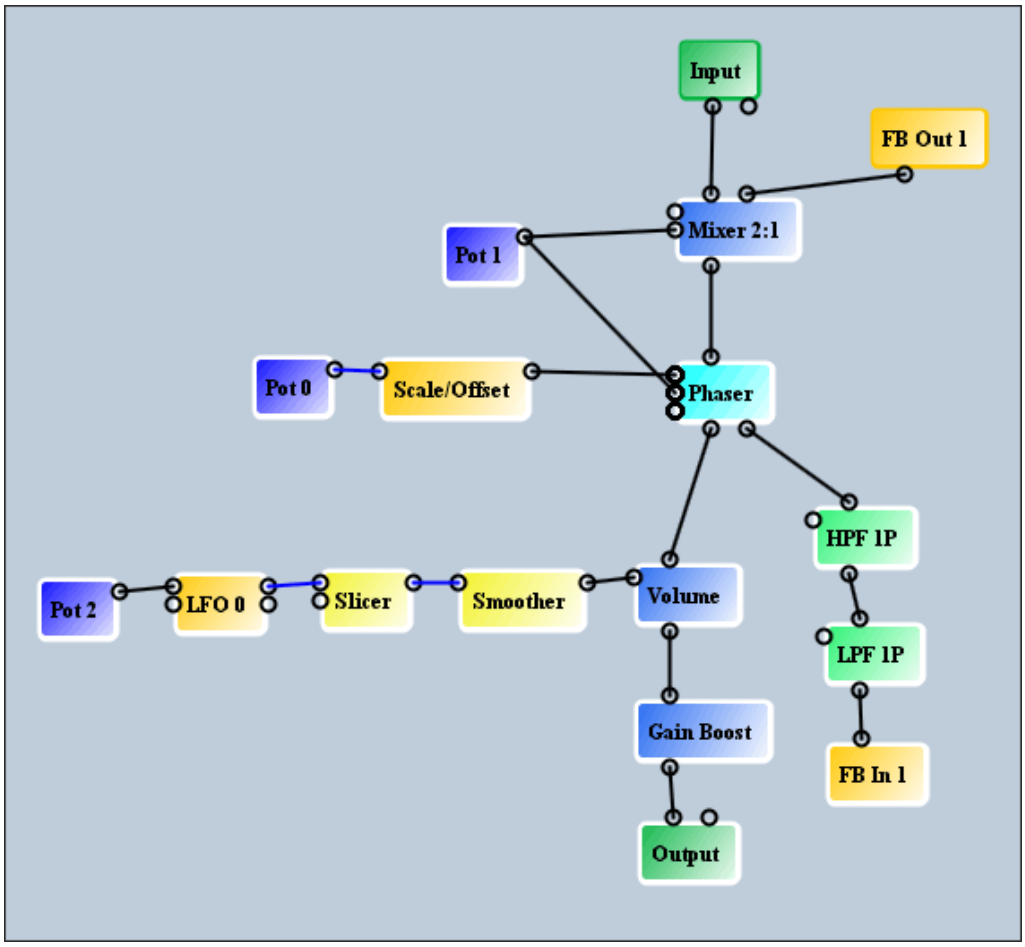


The **Choirsaw** (mono edition) is a bit on the bizarre side. It's a delay at its core but combines pitch shifting and tremolo (again). The result is something pretty unique and also musically interesting.

- P0 sets the delay time from long to short (about 800ms to a few ms). It also cross-fades into the pitch-shift as it is turned up. So, when the delay gets shorter more pitch shift is available in the feedback path.
- P1 sets the feedback amount and pitch shift volume. The key to making this sound good was being pretty aggressive with the filter on the pitch shift. With too little filtering is just sounded like an icepick as the notes continuously jumped octaves. As is, it creates more of a sonic bed as the octaves increase.
- P2 sets the sinewave tremolo speed from 0 - slow - fast. This gets really interesting when you set the delay to slow, feedback high and trem fast. Try it!

Possible mods:
Try a different Pitch Coefficient in the Pitch Shift block.

Parallax (pos. 3 Headtrip, patch 4 SpinCAD)

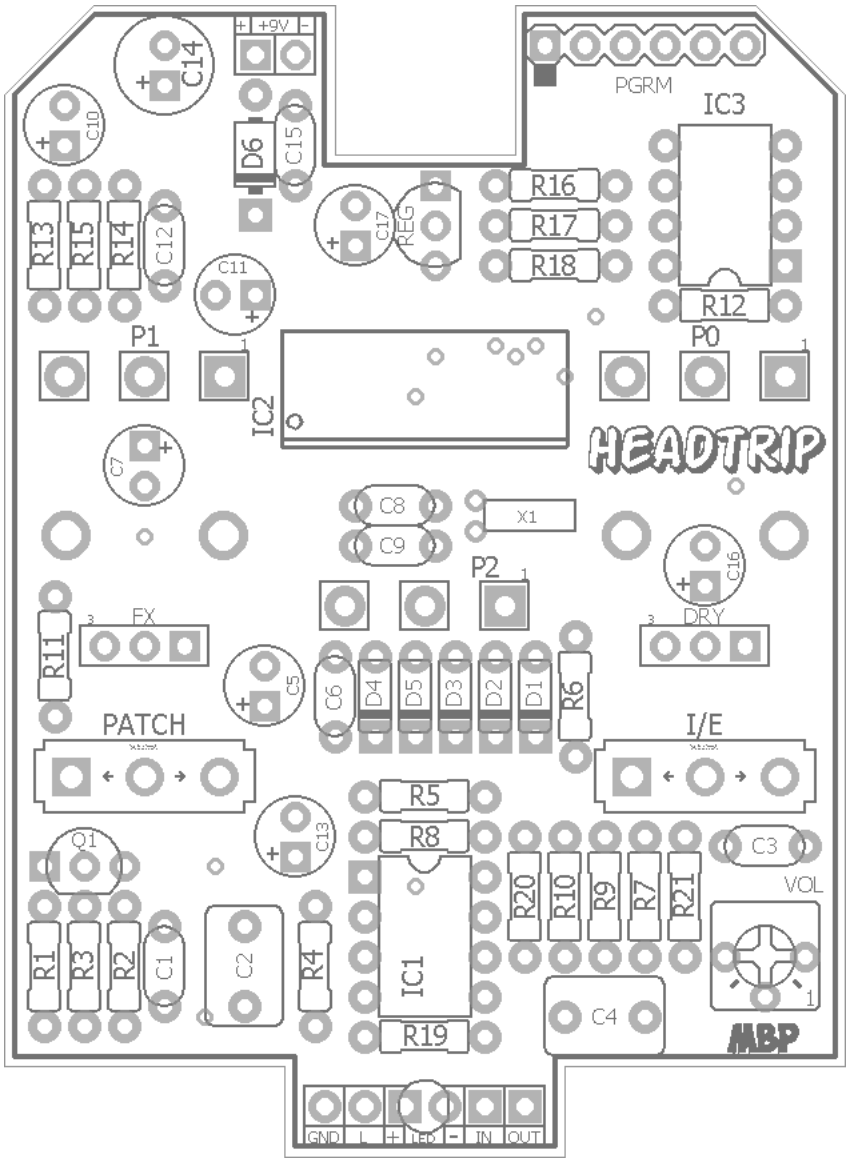


The Parallax is an attempt to get something close to our Function F(x) pedal (with about 1/4 as many parts!) It's a phaser and tremolo, each with its own LFO. This allows you to create really unique rhythmic patterns by juxtaposing fast and slow modulation.

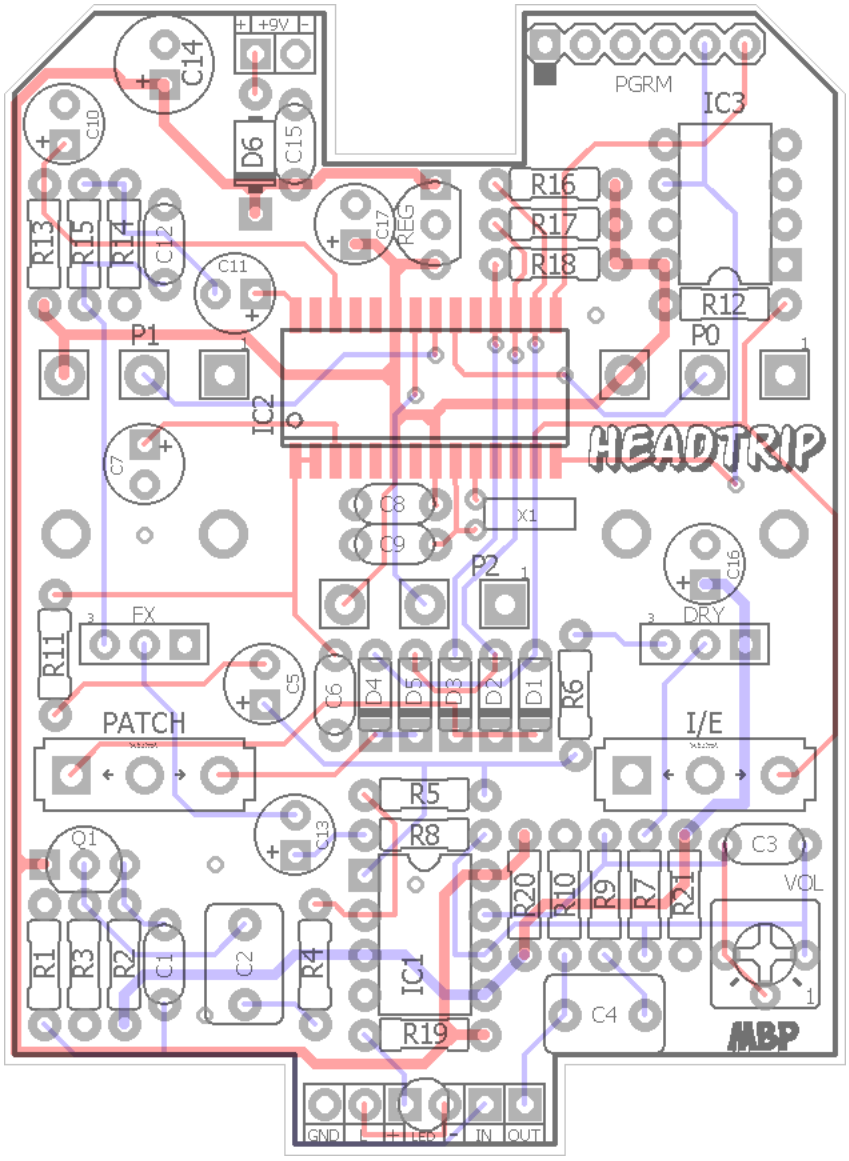
- P0 sets the phaser speed from slow to fast.
- P1 sets the feedback and LFO width of the phaser.
- P2 sets the square-wave tremolo speed from 0 - very slow - very fast.

Possible mods:
Not a whole lot can be added here as it almost runs the rails on the available instruction set. But, you could change the LFO to more of a sinewave if you prefer that or mess with the filtering in the feedback path.

Dimensions: 2.1” W x 2.875” H



Trace Routing



B.O.M.

Resistors		Caps		Diodes	
R1	1M	C1	100n	D1 - D5	1n914
R2	1M	C2	1uF	D6	1N5817
R3	10k	C3	100pF	**Transistors**	
R4	10k	C4	1uF	Q1	MPF102
R5	10k	C5	1uF	**Crystal**	
R6	10k	C6	1n	X1	32768Hz
R7	10k	C7	1uF	**Regulator**	
R8	10k	C8	100n	REG	L78L33
R9	470R	C9	15pF	**ICs**	
R10	100k	C10	1uF	IC1	TL072
R11	8k2	C11	1uF	IC2	FV-1
R12	20k	C12	8n2	IC3	24LC32A
R13	100R	C13	1uF	**Switches**	
R14	10k	C14	100uF	PATCH	On/Off/On
R15	1k	C15	100n	I/E	On/On
R16	20k	C16	10uF	**Trimmer**	
R17	20k	C17	10uF	VOL	50k
R18	20k			**Pots**	
R19	4k7			DRY	50kB
R20	10k			FX	50kB
R21	10k			P0	50kB
				P1	50kB
				P2	50kB

Shopping List

Value	QTY	Type	Rating
100R	1	Metal / Carbon Film	1/4W
470R	1	Metal / Carbon Film	1/4W
1k	1	Metal / Carbon Film	1/4W
4k7	1	Metal / Carbon Film	1/4W
8k2	1	Metal / Carbon Film	1/4W
10k	9	Metal / Carbon Film	1/4W
20k	4	Metal / Carbon Film	1/4W
100k	1	Metal / Carbon Film	1/4W
1M	2	Metal / Carbon Film	1/4W
15pF	1	MLCC / Mica	16v min.
100pF	1	MLCC / Ceramic	16v min.
1n	1	Film	16v min.
8n2	1	Film	16v min.
100n	3	Film	16v min.
1uF	2	Film	16v min.
1uF	5	Electrolytic	16v min.
10uF	2	Electrolytic	16v min.
100uF	1	Electrolytic	16v min.
1n914	5		
1N5817	1		
MPF102	1	or, 2n5457, J201	
32768Hz	1		
L78L33	1		
TL072	1		
FV-1	1		
24LC32A	1	***included**	
On/Off/On	1	PCB Pin Mount	
On/On	1	PCB Pin Mount	
50k	1	Bourns 3362p	
50kB	2	Plastic Shaft	9mm
50kB	3	Metal Shaft	16mm

The EEPROM included with the Headtrip is color-coded with gold Sharpie (in case you remove it or lose it).

BOM Notes

MPF102: http://www.smallbear-electronics.mybigcommerce.com/transistor-fet-mpf102/

FV-1 w/ Crystal: http://www.smallbear-electronics.mybigcommerce.com/spin-semi-fv-1-with-crystal/

L78L33: http://www.smallbear-electronics.mybigcommerce.com/ic-l78l33acz/

15pF Mica: http://www.smallbear-electronics.mybigcommerce.com/capacitor-silver-mica-500v-10-pf-150-pf/

On/On: http://www.smallbear-electronics.mybigcommerce.com/spdt-on-on-pc-mount/

On/Off/On: http://www.smallbear-electronics.mybigcommerce.com/spdt-center-off-pc-mount/

50kB Plastic Shaft: http://www.smallbear-electronics.mybigcommerce.com/alpha-single-gang-9mm-right-angle-pc-mount-w-knurled-plastic-shaft/

50kB Metal Shaft: http://www.smallbear-electronics.mybigcommerce.com/alpha-single-gang-9mm-right-angle-pc-mount/

3362p Trimpot: https://www.mouser.com/ProductDetail/Bourns/3362P-1-503LF?qs=sGAEpiMZZM-vygUB3GLcD7vRbQqL9uMLMZgtO2Ks3Q%2f4%3d

or, https://www.taydaelectronics.com/potentiometer-variable-resistors/cermet-potentiometers/3362p/50k-ohm-trimmer-potentiometer-cermet-1-turn-3362p.html

---

If you plan on using a different EEPROM in the Headtrip, I recommend using in-line sockets for the programming pins on the PCB. You'll see later on in my build pic that I used a male header but this turned out to be a bad choice: there's not quite enough room to get a Pickit2 in there! But, a socket will be just fine.

http://www.smallbear-electronics.mybigcommerce.com/single-in-line-mill-max/

https://www.taydaelectronics.com/connectors-sockets/sockets/sip-sockets/30-pin-dip-sip-ic-sockets-adaptor-solder-type.html

Voltages

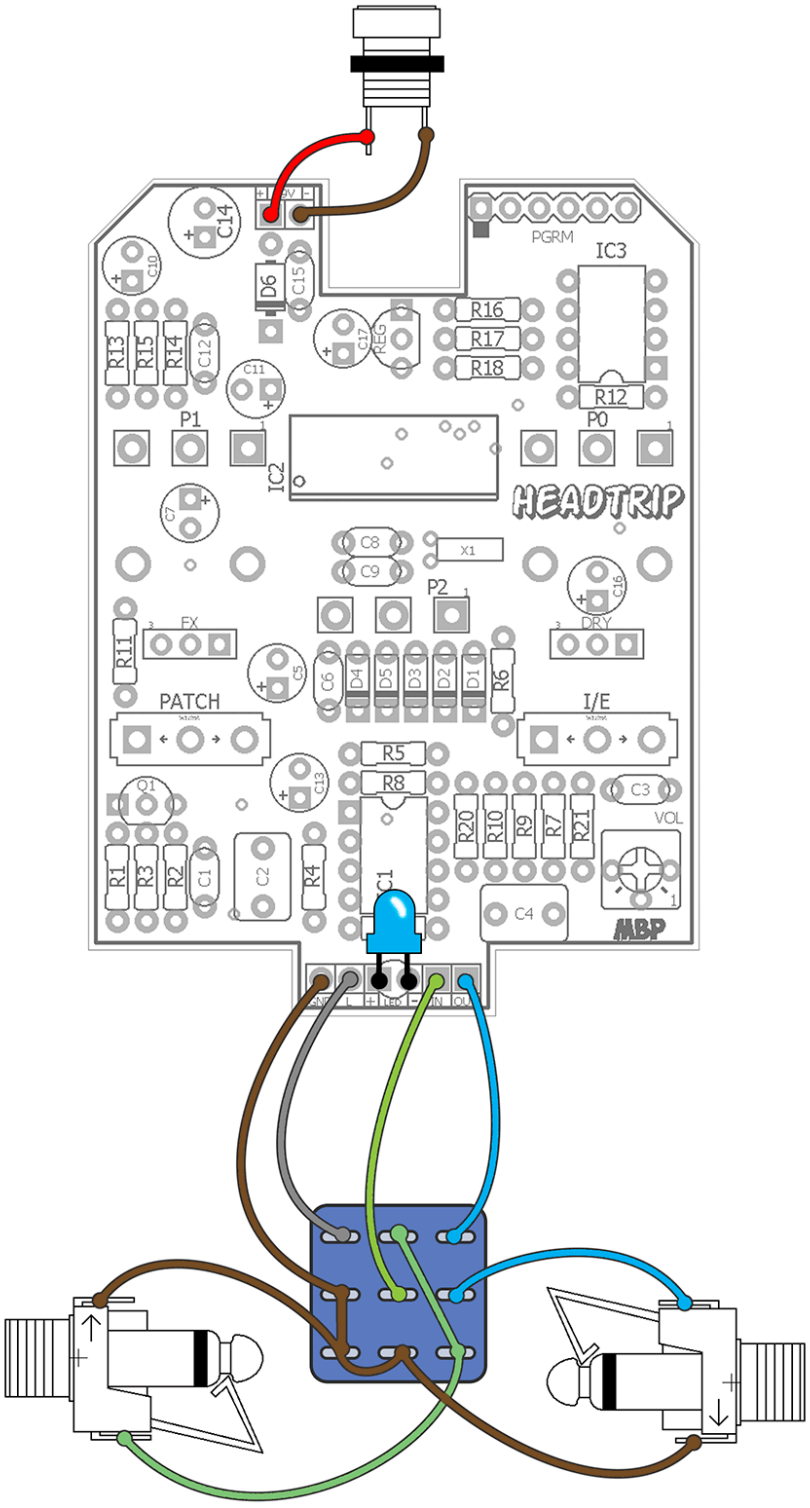
IC1	TL072
1	4.55
2	4.55
3	4.55
4	0
5	4.55
6	4.55
7	4.55
8	9.09

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

IC2	FV-1
1	1.6
2	1.6
3	1.6
4	0
5	3.22
6	3.22
7	0
8	3.22
9	1.5
10	1.16
11	0
12	0
13	3.22
14	3.22
15	3.22
16	3.22
17	3.22
18	3.22
19	0
20	0
21	0
22	0
23	3.22
24	0
25	0
26	3.2
27	1.65
28	1.65

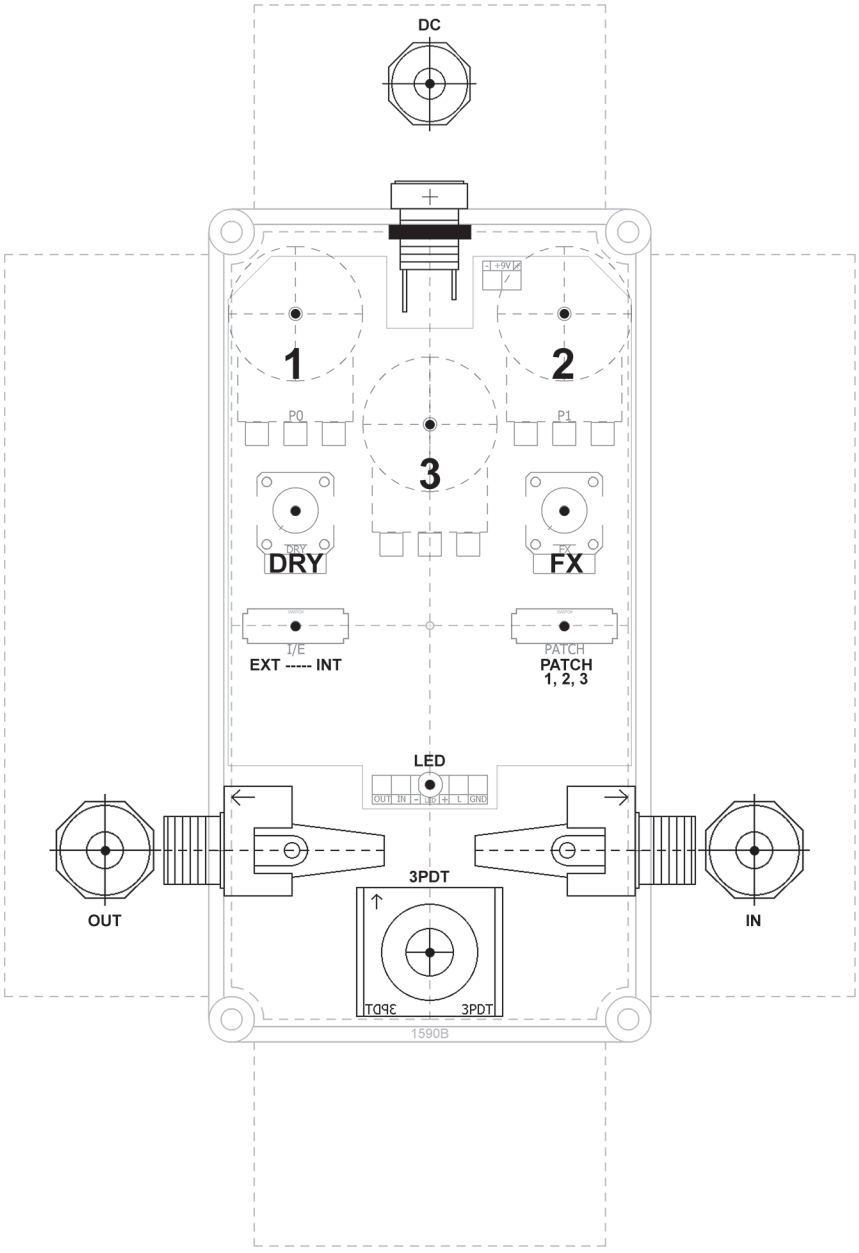
Test conditions: 9.42vDC power supply, all knobs set to 0, I/E to external mode and Patch switch in the middle position.

Wiring

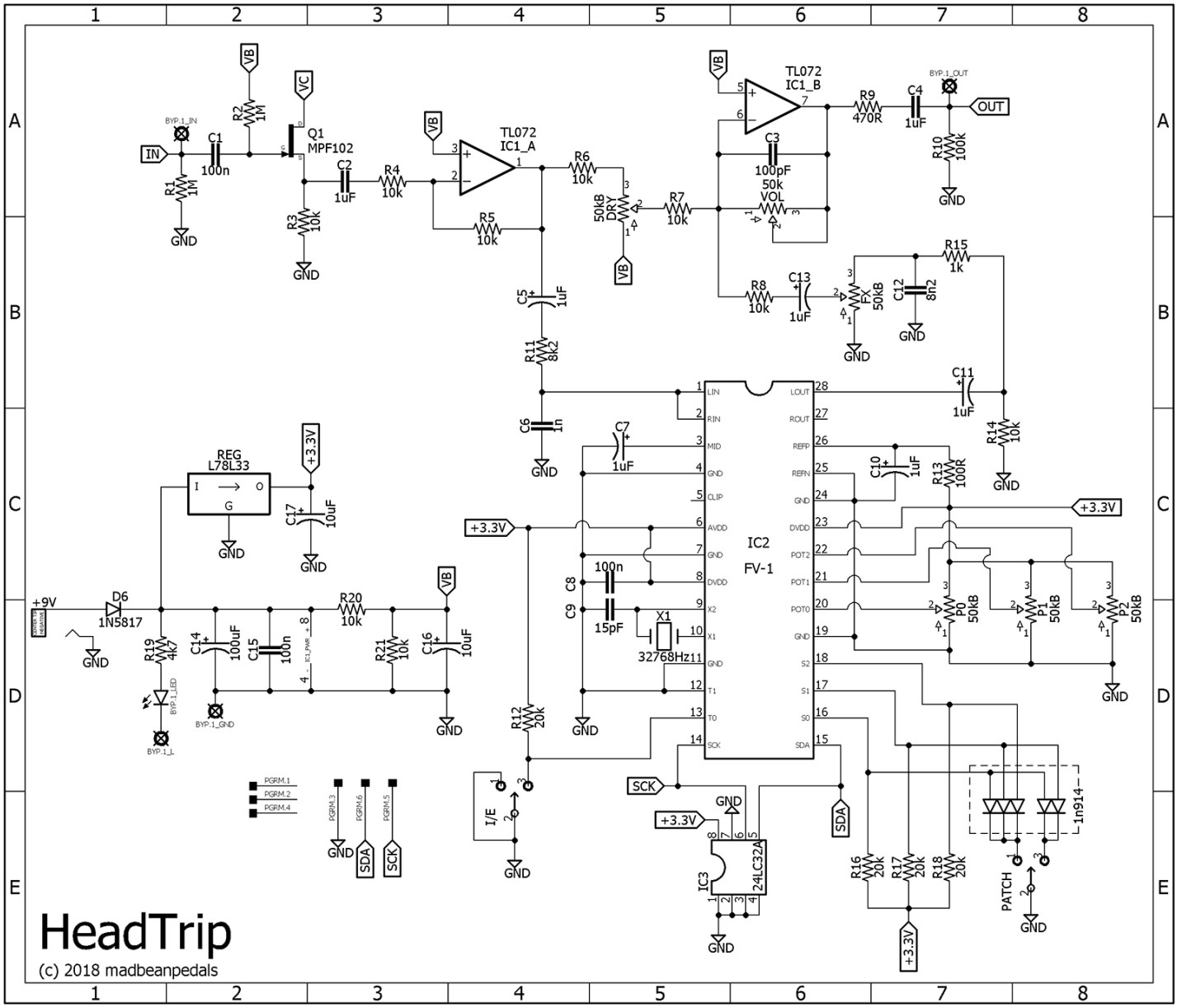


You'll want to solder your +/- wires for the DC jack before soldering the pot underneath!

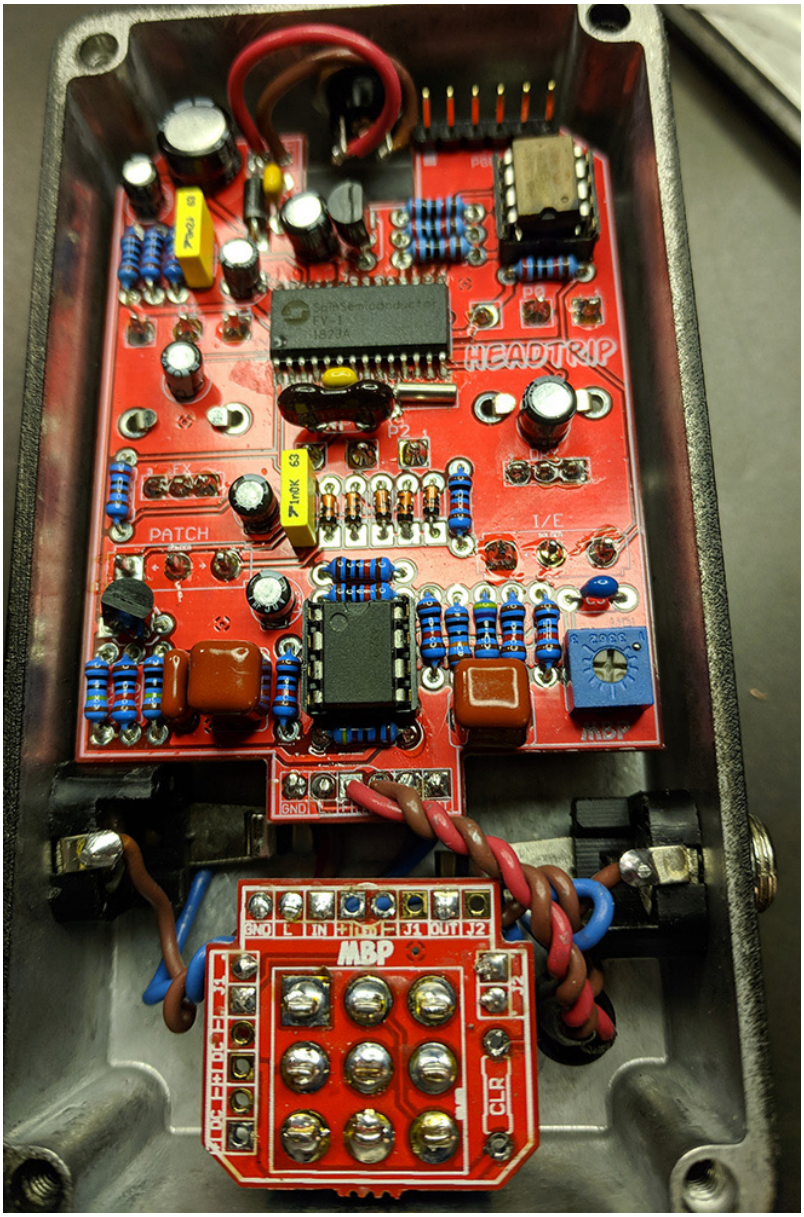
1590B Drill Guide



Schematic


HeadTrip
(c) 2018 madbeanpedals
IC2
FV-1
TL072
IC1_A
TL072
IC1_B
Q1
MPF102
REG
L78L33
IC3
24LC32A
X1
32768Hz
D6
1N5817
1n914
IN
OUT
VB
VC
+3.3V
+9V
GND
SCK
SDA
PATCH
I/E
50k
VOL
50kB
DRY
FX
50kB
P0
50kB
P1
50kB
P2
50kB

Build Pic



Some comments on my build here:

- As I mentioned earlier, I'd advise using a single in-line socket instead of the male headers I used for the PRGM pins. It's in kind of a bad spot in the enclosure and the Pickit2 doesn't quit fit.
- I'd also advise not using a 3PDT pcb like I did here. It's pretty tight with the jacks.
- The input jack drill location was moved after I built this. It was a bit too close the PCB and I think I missed my drill spot by a couple mm to boot.

Programming

If you want to load your own FV-1 programs into the Headtrip it's easy. I suggest using a new EEPROM rather than overwriting the one provided with the project. They only cost about $.030.

1. Load in a new EEPROM. Make sure you are using a 24LC32a.
2. Connect your Pickit2 to the PGRM header on the Headtrip with some wire leads. You only need to connect pins 3, 5 and 6. All other pins on the Pickit2 should be empty.
3. Connect the Headtrip to your 9v supply.
4. Connect the Pickit2 to the USB port on your computer.
5. Launch the Pickit2 software.
6. You will likely need to select the appropriate device. Under "Device Family" in the software, navigate until you can select "24LC32a".
7. With the device selected, load your .hex file under the "File - Import HEX" option.
8. Leave the "VDD Pickit2" box unchecked! You do not need to supply power to the EEPROM to program it. The Headtrip board takes care of this for you.

Click Write and wait a few seconds until the software confirms a success. If it doesn't work, re-check your steps and try again. Make sure your EEPROM is loaded in the Dreamtime the correct way!