NomNom

FX Type: **MODULATION**
Build Level: Intermediate
Based On: MXR® Phase90™

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Overview

The Phase 90™ is the parent and more grandiose version of the Phase45™. It is the quintessential analog guitar phaser sound. The effect is produced by mixing a guitar clean and phase modulated signals. An simple LFO drives four phase stages which are controlled by JFETs used as variable resistors.

The **NomNom** version of the Phase90™ includes a couple of mods to offer additional tonal variations, namely a Voice switch and Color potentiometer.

This project requires four matched JFET transistors. See the Build Notes for more details.

Controls

- **SPEED:** Modulation rate.
- **VOICE:** Selects between the stock phase caps and an alternate set.
- **COLOR:** The control sets the amount of feedback in the phaser circuit. Higher feedback equates to increased intensity in the phase effect. The highest setting has some mild distortion which some players like.
- **T1:** This trimmer is used to calibrate the modulation effect.

Phase 90 analysis by Electro-Smash: https://www.electrosmash.com/mxr-phase90
GEOFEX Technology of Phase Shifters: http://www.geofex.com/Article_Folders/phasers/phase.html

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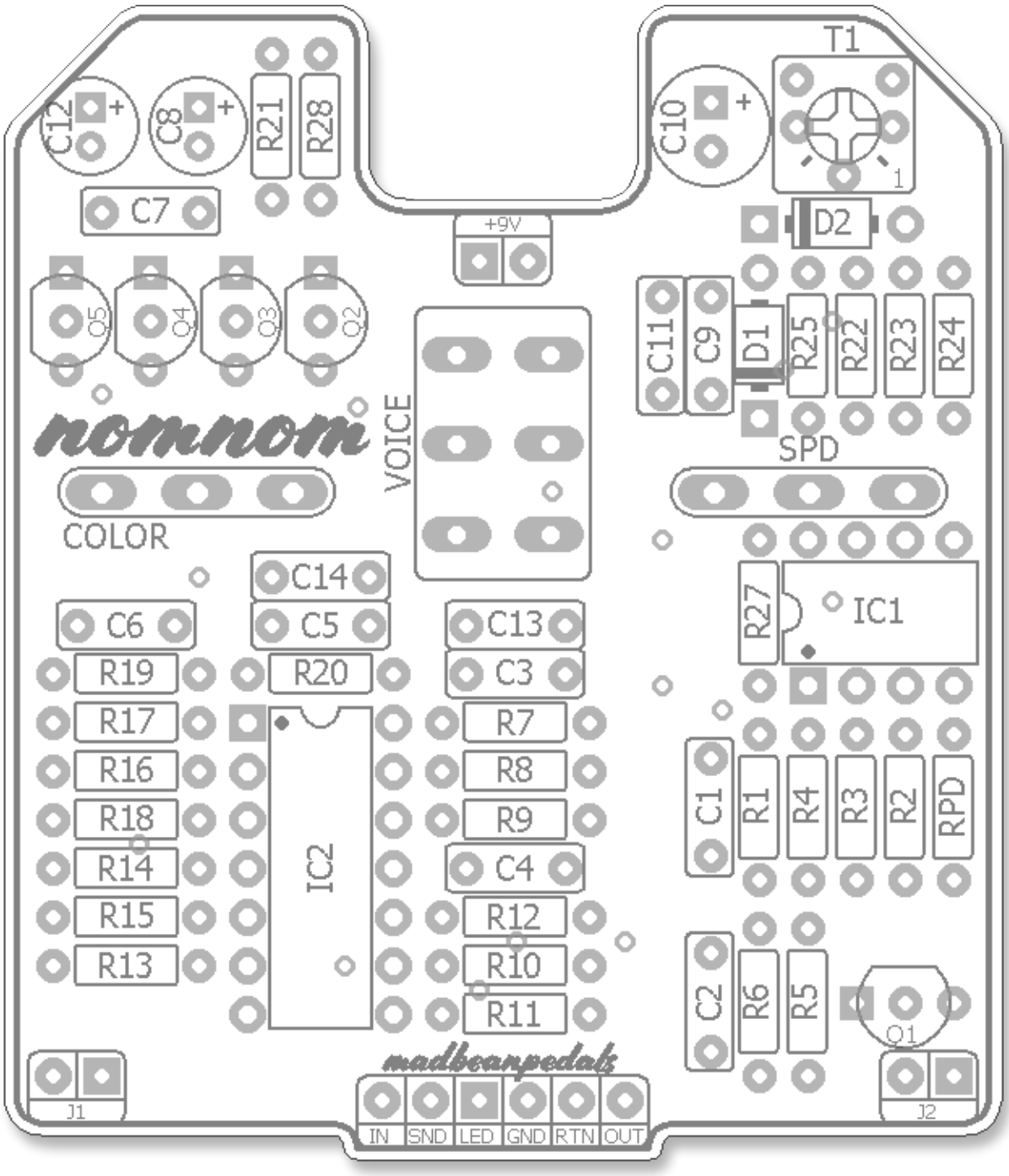
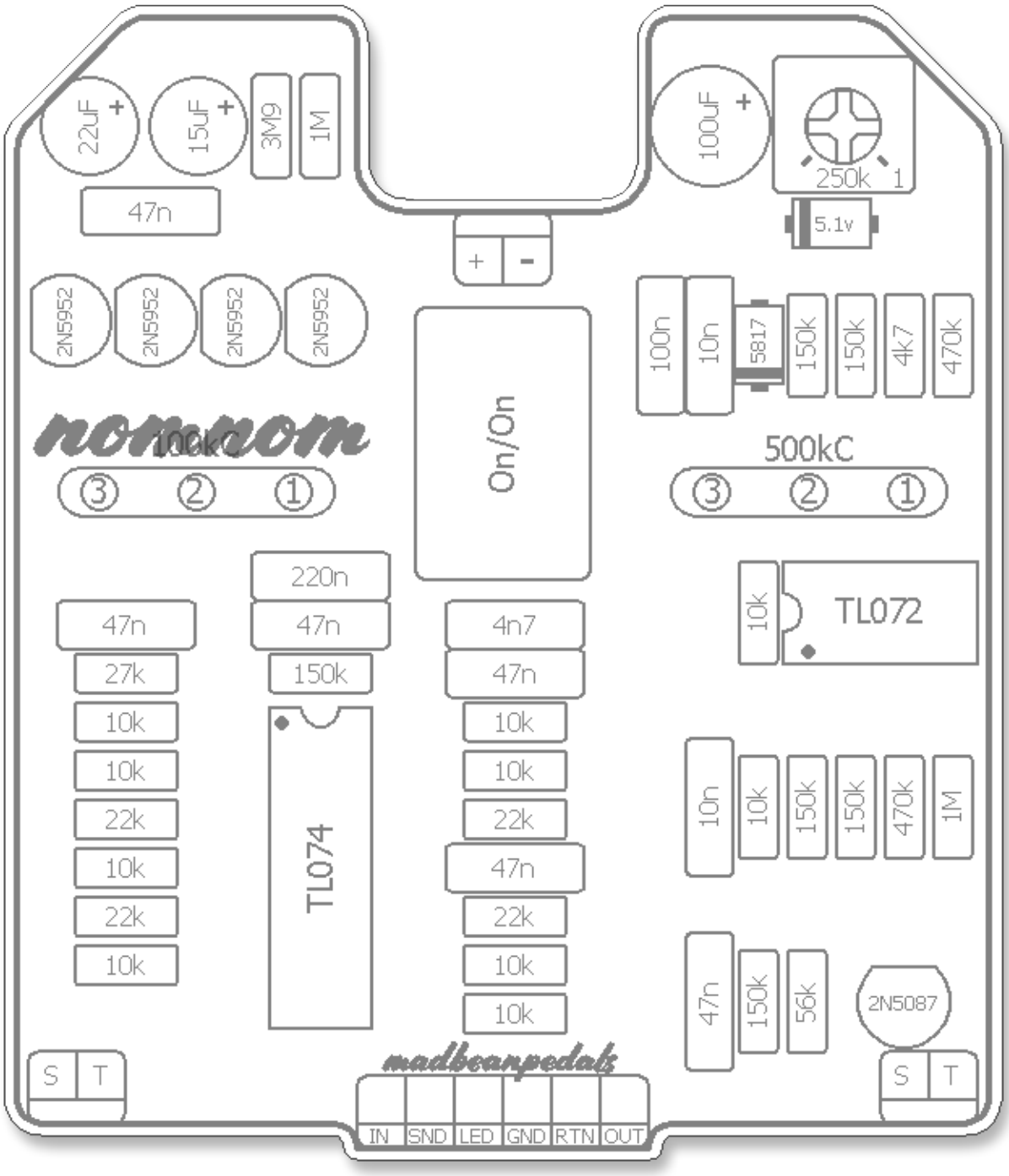
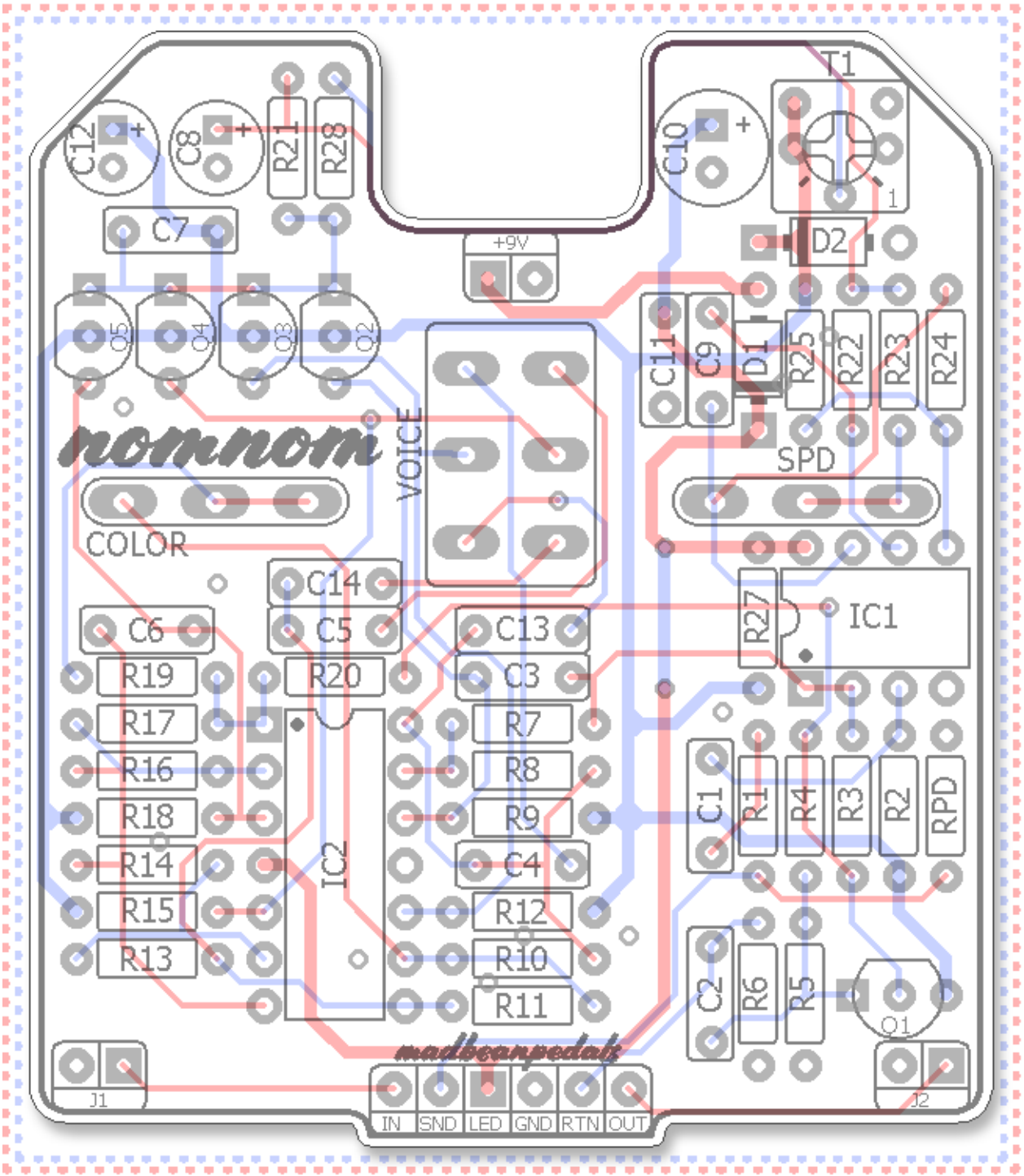
Parts Layout



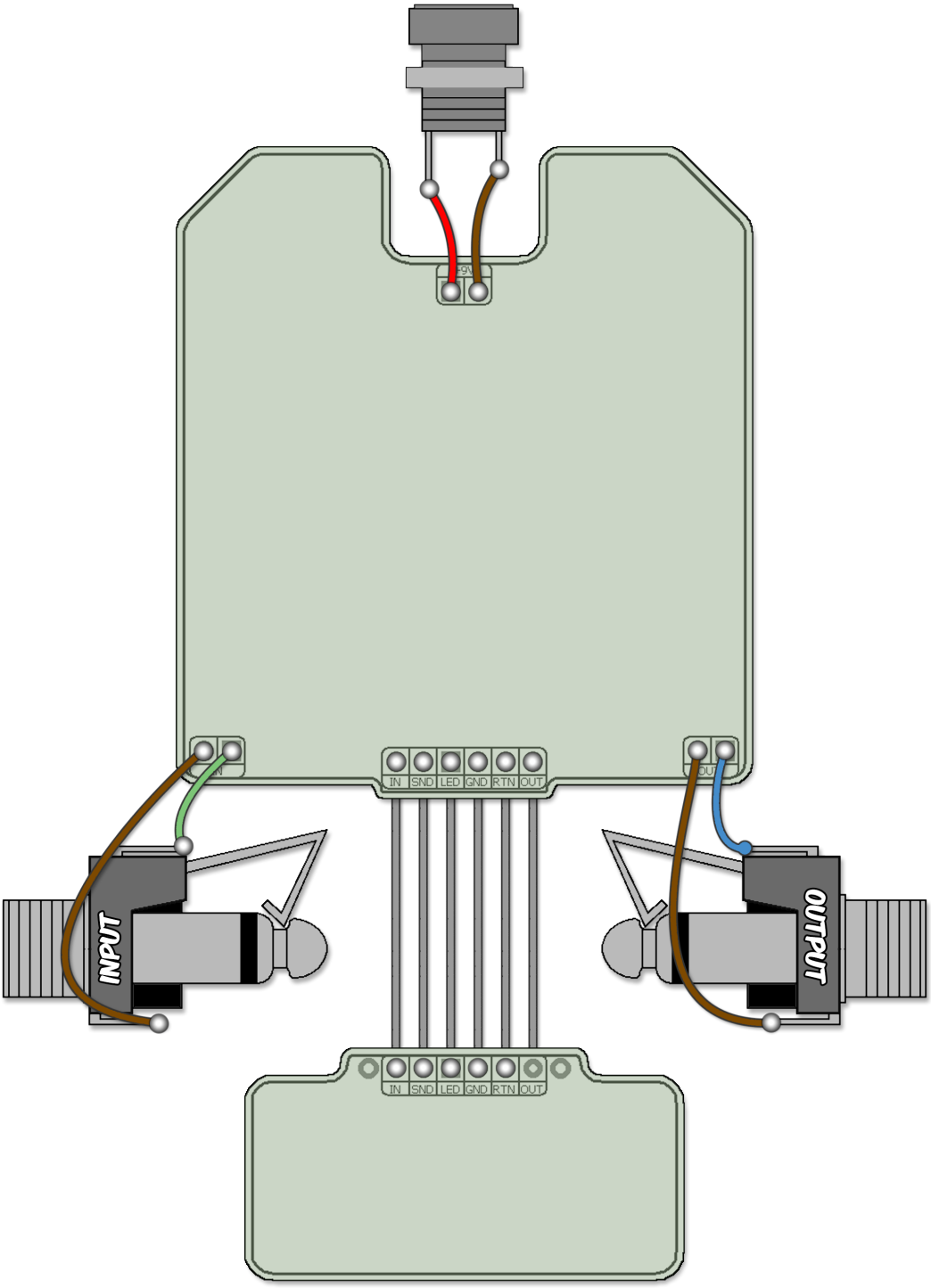
Component Values



Trace Layout



Wiring



Unless otherwise noted, all Standard Series projects have the same wiring regardless of which 3PDT bypass board is used. A 6-pin, 2” ribbon cable is recommended for soldering the connections between the two PCBs.

B.O.M.

Resistors		Caps		Diodes	
R1	10k	C1	10n	D1	1n5817
R2	470k	C2	47n	D2	5.1v Zener
R3	150k	C3	47n	**Transistors**	
R4	150k	C4	47n	Q1	2N5087
R5	56k	C5	47n	Q2	2N5952
R6	150k	C6	47n	Q3	2N5952
R7	10k	C7	47n	Q4	2N5952
R8	10k	C8	15uF	Q5	2N5952
R9	22k	C9	10n	**IC**	
R10	10k	C10	100uF	IC1	TL072
R11	10k	C11	100n	IC2	TL074
R12	22k	C12	22uF	**Switch**	
R13	10k	C13	4n7	VOICE	On/On
R14	10k	C14	220n	**Trimmer**	
R15	22k			T1	250k
R16	10k			**Pots**	
R17	10k			COLOR	100kC
R18	22k			SPD	500kC
R19	27k				
R20	150k				
R21	3M9				
R22	150k				
R23	4k7				
R24	470k				
R25	150k				
R27	10k				
R28	1M				
RPD	1M				

Shopping List

Values	QTY	Type	Rating
4k7	1	Carbon / Metal Film	1/4W
10k	10	Carbon / Metal Film	1/4W
22k	4	Carbon / Metal Film	1/4W
27k	1	Carbon / Metal Film	1/4W
56k	1	Carbon / Metal Film	1/4W
150k	6	Carbon / Metal Film	1/4W
470k	2	Carbon / Metal Film	1/4W
1M	2	Carbon / Metal Film	1/4W
3M9	1	Carbon / Metal Film	1/4W
4n7	1	Film	16v min.
10n	2	Film	16v min.
47n	6	Film	16v min.
100n	1	Film	16v min.
220n	1	Film	16v min.
15uF	1	Electrolytic	16v min.
22uF	1	Electrolytic	16v min.
100uF	1	Electrolytic	16v min.
1n5817	1		
Zener	1	5.1.	1W
2N5087	1		
2N5952	4	matched	
TL072	1		
TL074	1		
DPDT	1	On/On, Solder Lug	
250k	1	Bourns 3362p or 6mm	
100kC	1	PCB Right Angle	16mm
500kC	1	PCB Right Angle	16mm

Additional Hardware

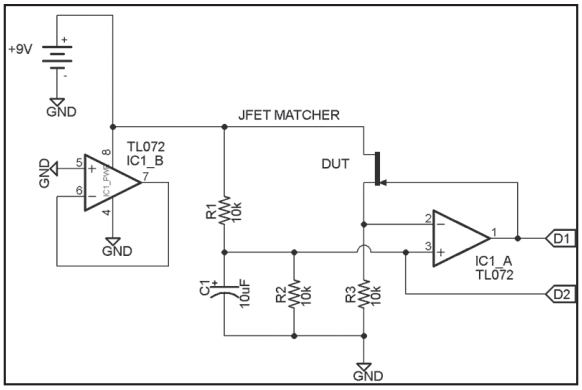
(1) 1590B enclosure
(2) Lumberg 1/4” Compact mono jacks
(1) Slim 2.1mm DC jack
(1) Standard 3PDT footswitch
(1) 5mm LED

Build Notes

Transistors

- The NomNom requires the 2n5952 transistors to be matched for the phaser effect to work properly. While you may be able to stick four random JFETS in there and get lucky, the best result comes from matching the cutoff voltages for the transistors as closely as possible. This is easy to do, provided you have a quantity of transistors available to work with.

- The process involves placing individual transistors in a test circuit on a breadboard. Each device is then measured with a multimeter to read its gate/source cutoff voltage. This is the measurement you want to match with another transistor. The goal is to find four transistors whose VGS are within just a couple of percent of one another. The closer the match, the better response one gets in the phase circuit. For the 2n5952 (or similarly the 2n5457) the best results tend to come from devices with a VGS of -1.5 to -3.0V.



- You can put this testing circuit on a breadboard in about 5 minutes. Use the probes on your multimeter (set for DC voltage) to test the VGS of each JFET at D1 and D2 testing point. VGS values between -1v and -4v are typical. Try to match four transistors to one or two decimal places. Ex. -1.55v, etc). More info about matching JFETs for phase shifters can be found on the DIYStompboxes forum and R.G. Keen's website: http://www.geofex.com/article_folders/fetmatch/fetmatch.htm

- NOTE: You can also use 2n2457 if you can match them with a similar spec as described above. However, their pinouts are reversed from the 2n5952. The J201 has a much more narrow range of VGS where they will work in phasers, so they are not recommended.

Biasing the phaser section

- Set the Speed control about halfway up. Start with the T1 trim full CCW and adjust CW until you hear the phase effect. Adjust the Speed control and fine tune the T1 trim for the most depth of phase attainable. NOTE: this can be a very narrow range on a single turn trimpot, so it may take a couple of tries. Use a multi-turn if you want more precision.

Voice Switch

- This version of the NomNom includes a switch to toggle between different sets of caps for the four phase stages. The primary set are four 47n caps (C3-C6) and the alternate set is a 4n7 and 220n (C13 and C14). This set is used to mimic the Univibe phase stages and is a popular mod. You are free to experiment with alternate sets to get different phase tones. Socket C13 and C14 for experimentation.

Color Pot

- Because of the space limitation with the Standard Series format, I had to make the feedback switch a pot. Using a pot here is fine, you just have to make its value large enough so that when turned CCW there is sufficient resistance in the feedback path so that it is negligible. This comes with a caveat: it means about 3/4 of the turn doesn't really do anything. But, you do get some extra variation in that last 1/4. I chose a reverse audio taper to try and get as much control as possible out of the last bit.

Circuit Voltages

IC1	TL072
1	4.32
2	4.32
3	4.15
4	0
5	varies
6	varies
7	varies
8	9.24

IC2	TL074
1	4.32
2	4.32
3	4.32
4	9.24
5	4.32
6	4.32
7	4.32
8	4.32
9	4.32
10	4.32
11	4.32
12	4.32
13	4.32
14	4.32

Q1	2n5087
C	2.65
B	3.77
E	4.32

Q2	2n5952
D	4.32
S	4.32
G	varies

Q3	2n5952
D	4.32
S	4.32
G	varies

Q4	2n5952
D	4.32
S	4.32
G	varies

Q5	2n5952
D	4.32
S	4.32
G	varies

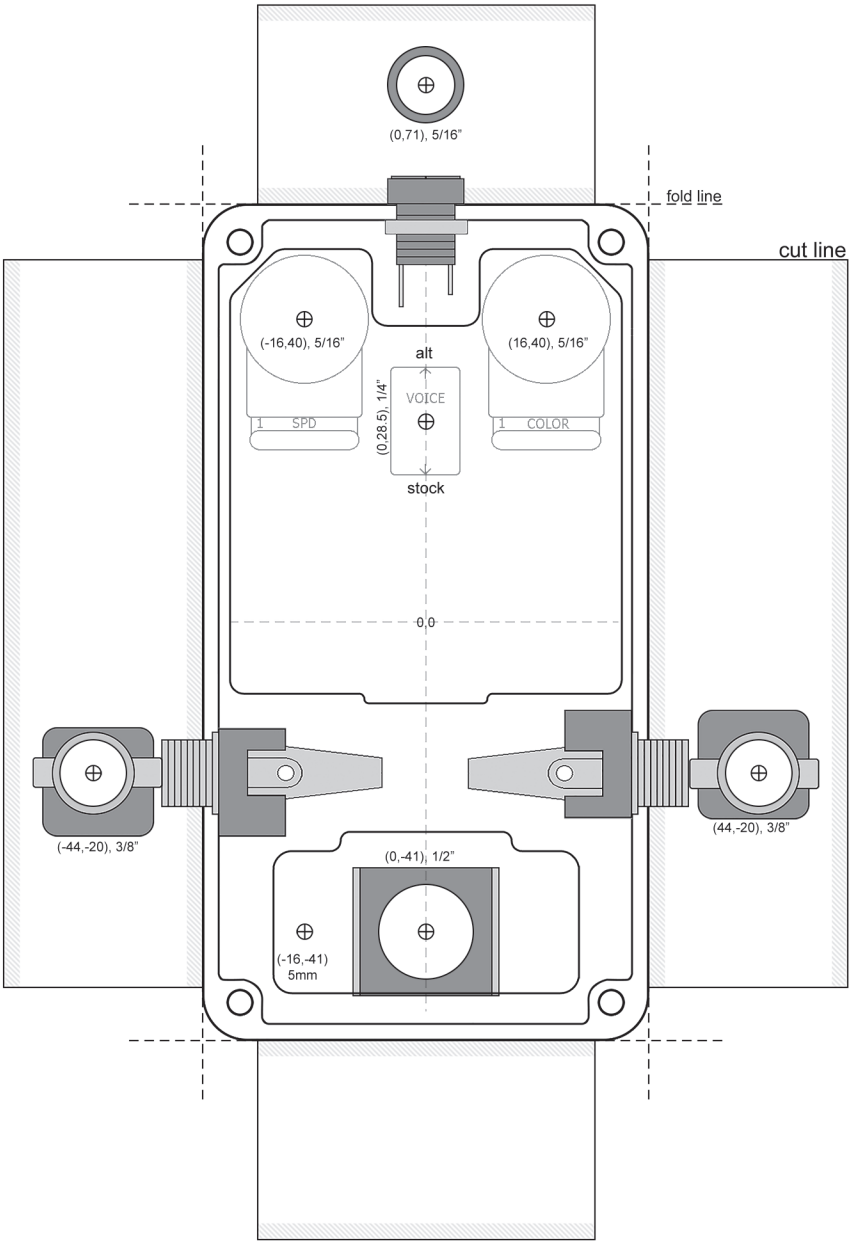
9.44vDC One Spot supply
Current Draw: 11mA

- Pots @ 0, Switch down.

1590B Drill Template

Coordinates are denoted in (X,Y), drill size format starting from the center (0,0) location of the enclosure.

Link to Tayda Standard Series master drill template

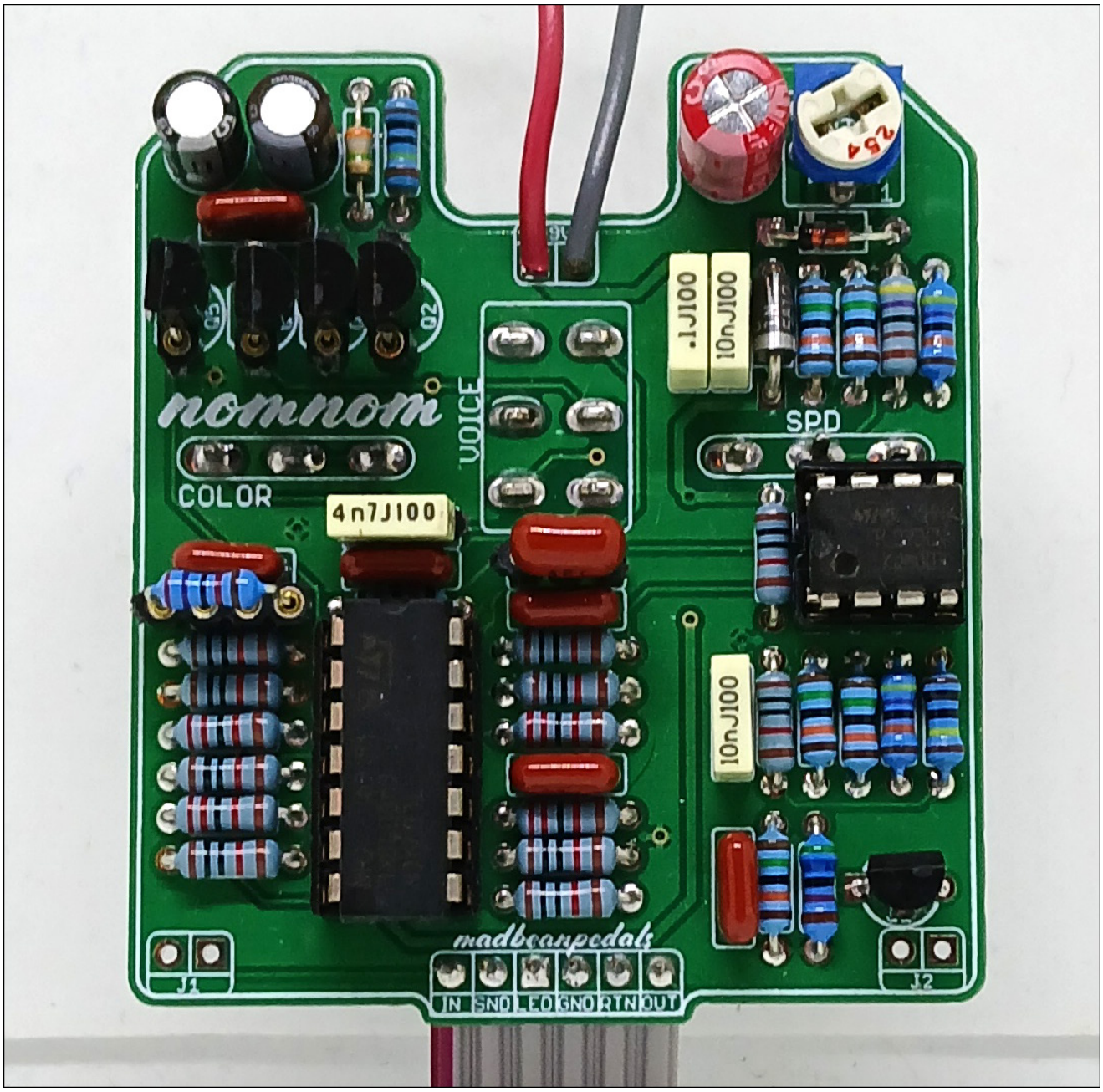


Hardware

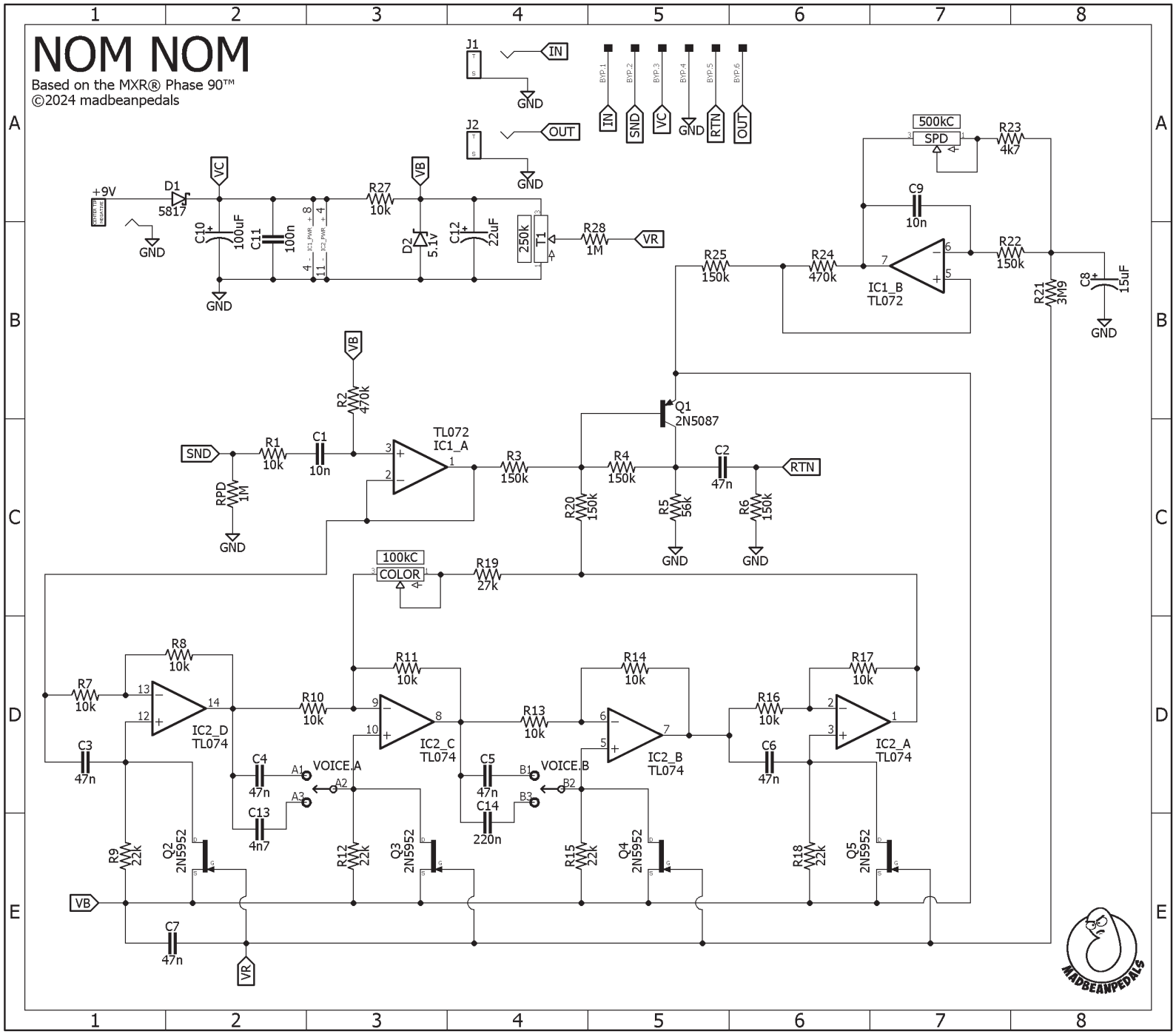
1590B enclosure
Lumberg 1/4” Compact mono jacks
Slim 2.1mm DC jack
Standard 3PDT footswitch
5mm LED

NOTE: Different 1/4” and DC jack styles may require different sized drill holes.

Build Pic


nomnom
COLOR
VOICE
SPD
4n7J100
.1J100
10nJ100
10nJ100
madboxpedals
J1
J2
IN
SND
LED
GND
RTN
OUT

Schematic


NOM NOM
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J1
IN
GND
J2
OUT
GND
BYP 1
BYP 2
BYP 3
BYP 4
BYP 5
BYP 6
IN
SND
VC
GND
RTN
OUT
+9V
D1
5817
VC
C10
100uF
C11
100n
GND
R27
10k
VB
D2
5.1V
C12
22uF
250k
T1
R28
1M
VR
500kC
SPD
R23
4k7
C9
10n
R25
150k
R24
470k
IC1_B
TL072
R22
150k
R21
3M9
C8
15uF
GND
VB
R2
470k
Q1
2N5087
SND
R1
10k
C1
10n
TL072
IC1_A
R3
150k
R4
150k
C2
47n
RTN
RPD
1M
GND
R20
150k
R5
56k
GND
R6
150k
GND
100kC
COLOR
R19
27k
R8
10k
R7
10k
IC2_D
TL074
R11
10k
R10
10k
IC2_C
TL074
R14
10k
R13
10k
IC2_B
TL074
R17
10k
R16
10k
IC2_A
TL074
C3
47n
C4
47n
VOICE.A
A1
A2
A3
C13
4n7
C5
47n
VOICE.B
B1
B2
B3
C14
220n
C6
47n
R9
22k
Q2
2N5952
R12
22k
Q3
2N5952
R15
22k
Q4
2N5952
R18
22k
Q5
2N5952
VB
C7
47n
VR
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