

Synare3+ Percussive Synthesizer

w/ optional MIDI

(For Board Assembly # 030816 only)

Thank you for your purchase of the Synare3+ Percussive Synthesizer kit. This vintage style synth board will give you all the great sonic possibilities of a true analog system. Although this circuit is vintage technology compared to the digital synth world, it is still preferred by seasoned professionals for tone versatility, ease of use, and responsiveness to "on the fly" patch changes. Direct control parameters are completely step-less giving you infinite control combinations. Whether its melodic tones, or the sounds of sweeps, pops, blips, you name it..... this Percussive Synthesizer kit will provide you with an endless variety of sounds.

Triggered by drum pad, piezo, or optional midi, the unit is dynamic and level dependent. There are three oscillators. Oscillator one and two produce an adjustable pitch, also oscillator two can generate an LFO (called SLO on the unit) or an adjustable pitch. Either oscillator can be turned off if single oscillator operation is desired. Also provided is a white noise generator and a four pole filter on the unit, with the following controls: Tune (filter frequency), Oscillator 2 level, Sweep, Resonance, and Decay. The final amplifier section has Volume and Decay time controls. The resonance in the filter section can be turned up to produce self-oscillation.

Construction notes:

All parts should be mounted on the side of the PCB indicated by the silk screen.

Some components must be mounted in a particular orientation on the PCB. Follow the mounting instructions carefully and read each step completely before mounting the component.

If the unit is to be built without the midi option, the following parts will not be used, and are not included:

U5, U6, U7 (and sockets)

D3, D4, D5

C20, C21, C22 , C17

R76-R79

X1

Q17

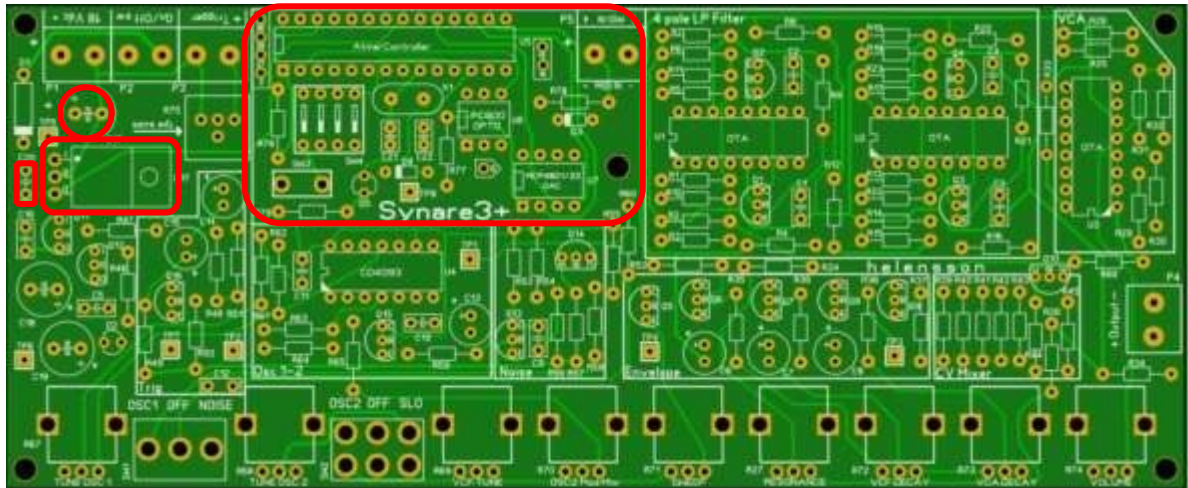
SW3, SW4

P5

If you purchased the kit without the midi option then these optional components were not included and will not be soldered to the board.

For board #030816 only.

Optional Midi Components



Synare3+
full Parts List with midi

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Board Designation	Component Value	Qty
C1-C4	0.001 ceramic	4
C5, C12, C16, C20	0.1 ceramic	4
C6, C7, C13-C15	1uf electrolytic	5
C8	2.2uf electrolytic	1
C9 -C11	0.047 ceramic	3
C17-C19	330uf electrolytic	3
C21, C22	22pf ceramic	2
D1	1N4007 Diode	1
D2	Yellow LED 3mm	1
D3	1N914 Small Signal Diode	1
D4	1N5817 Schottky Diode	1
D5	Red LED 3mm	1
P1 - P5	2 position wire screw Terminal	5
Q1-Q4, Q15	MPSA14	5
Q5-Q10, Q14, Q16	2N3904	8
Q13	BC546B	1
Q11	78112 Regulator	1
Q12	78106 Regulator	1
Q17	7805 Regulator	1
R1-R3, R5-R7, R13-R15, R17-R19, R29, R30, R45, R7	220 red-red-brown	17
R4, R8, R16, R20, R28, R32-R38, R58, R60, R65, R7	10K brown-black-orange	16
R9-R12, R21-R23, R31, R52, R53, R56	100K brown-black-yellow	11
R24, R55	6.8K blue-gray-red	2
R25, R44	2.2K red-red-red	2
R26, R46, R79	1K brown-black-red	3
R39-R41	220K red-red-yellow	3
R42, R49	68K blue-gray-orange	2
R43	2.7M red-violet-green	1
R47	820K gray-red-yellow	1
R48	330K orange-orange-yellow	1
R50, R63	100 brown-black-brown	2
R51	47K yellow-violet-orange	1
R54	1M brown-black-green	1
R57, R66	22 red-red-black	2
R59, R62	470K yellow-violet-yellow	2
R61, R64	22K red-red-orange	2
R67, R68, R72, R73	1M Potentiometer	4
R27, R69-R71, R74	50K Potentiometer	5
R75	50K Trim Pot	1

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Board Designation	Component Value	
SW1	SPDT on-off-on	1
SW2	DPDT on-off-on	1
SW3	Pushbutton momentary switch	1
SW4	4P Dip Switch	1
U1-U3	LM13700	3
U4	CD4093BE	1
U5	ATmega328	1
U6	PC900 Optoisolator	1
U7	4821 or 4822 DAC	1
X1	16mhz Crystal	1
	6 pin IC Socket	1
	8 pin IC Socket	1
	14 pin IC Socket	1
	16 pin IC Socket	3
	28 pin IC Socket	1
	5 Pin DIN (midi) Connector	1
(<i>undesigned - off board</i>) optional	Output Phone Jack - 1/4" Mono	1
(<i>undesigned - off board</i>) optional	Power Switch - SPST	1
(<i>undesigned - off board</i>) optional	Panel mount DC power jack	1
(<i>undesigned - off board</i>) optional	Piezo disk, mic, signal, etc. for trigger	1
(<i>undesigned - off board</i>) optional	"D" Shaft Knobs	9

When soldering to the PCB, it is only necessary to apply solder to the side of the board opposite to the component being soldered. The holes on the PCB are plated through so the connection will be made on both sides.

Much time and frustration can be avoided by installing the component families on the circuit board in the order shown in the following photographs.

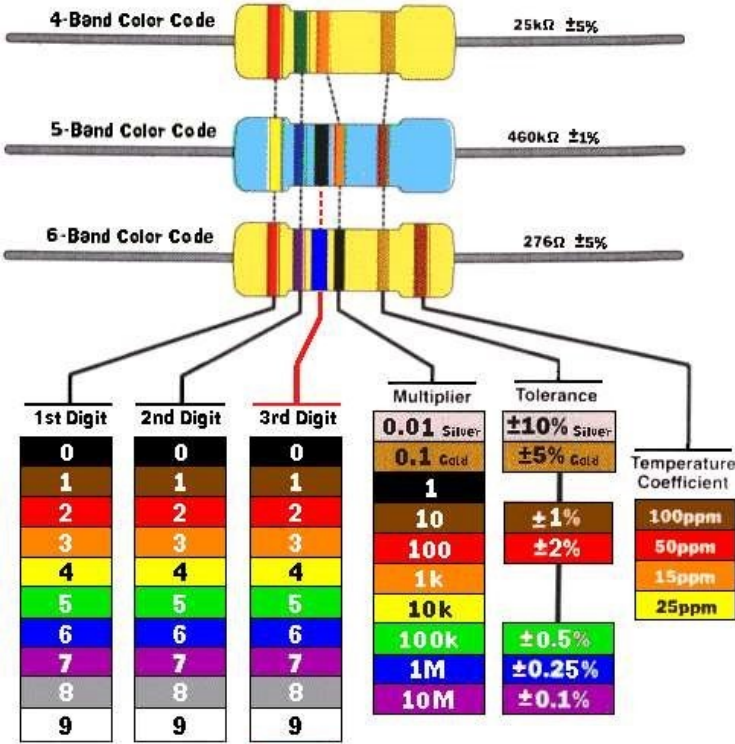
To avoid misplacement of a part, pay close attention the silkscreen part designators and any polarity indication. Once the part has been soldered, it is very difficult to remove without damage to the board and/or component.

Tools – equipment needed

- Oscilloscope **or** Volt-Ohm meter
- Solder
- Soldering iron with fine tip (low wattage)
- Audio Amplifier
- Hook-up wire

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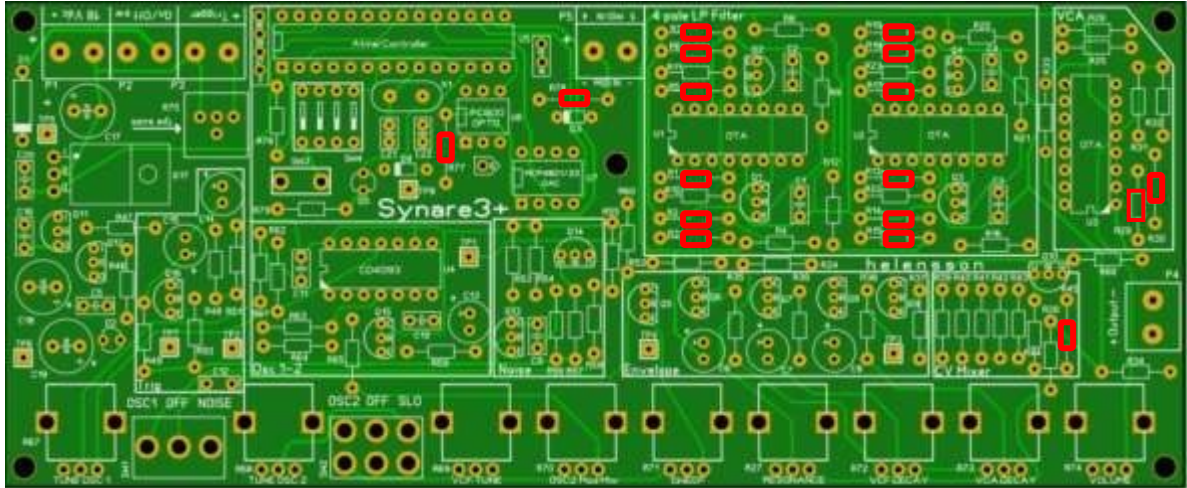
Resistor color code chart for reference.



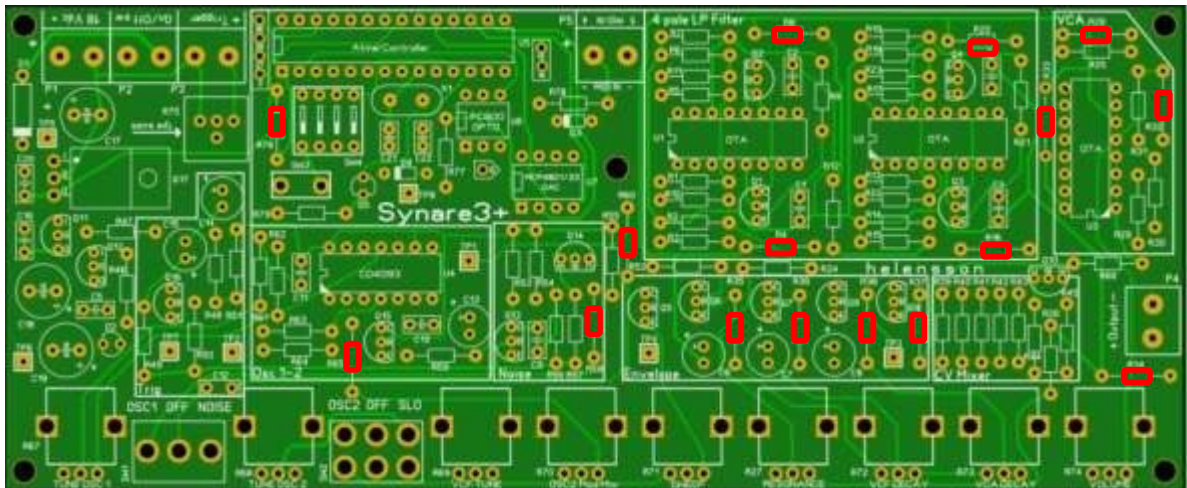
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Assembly Steps:

1. Insert and solder the 220 ohm resistors (red, red, brown).
R1-R3, R5-R7, R13-R15, R17-R19, R29, R30, R45, R77, R78

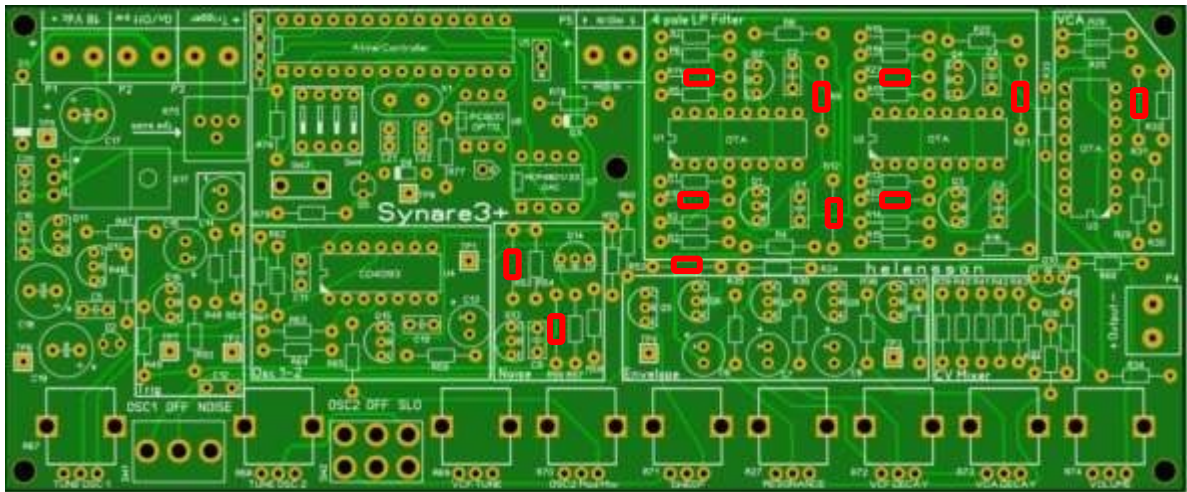


2. Insert and solder the 10K ohm resistors (brown, black, orange)
R4, R8, R16, R20, R28, R32-R38, R58, R60, R65, R76.



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3. Insert and solder the 100K ohm resistors (brown, black, yellow). R9-R12, R21-R23, R31, R52, R53, R56.



4. Insert and solder the remaining resistors.

470K - R59, R62, (yellow, violet, yellow)



2.2K - R25, R44 (red, red, red)



1M - R54 – (brown, black, green)



22 ohm - R57, R66 (red, red, black)



6.8K - R24, R55 (blue, gray, red)

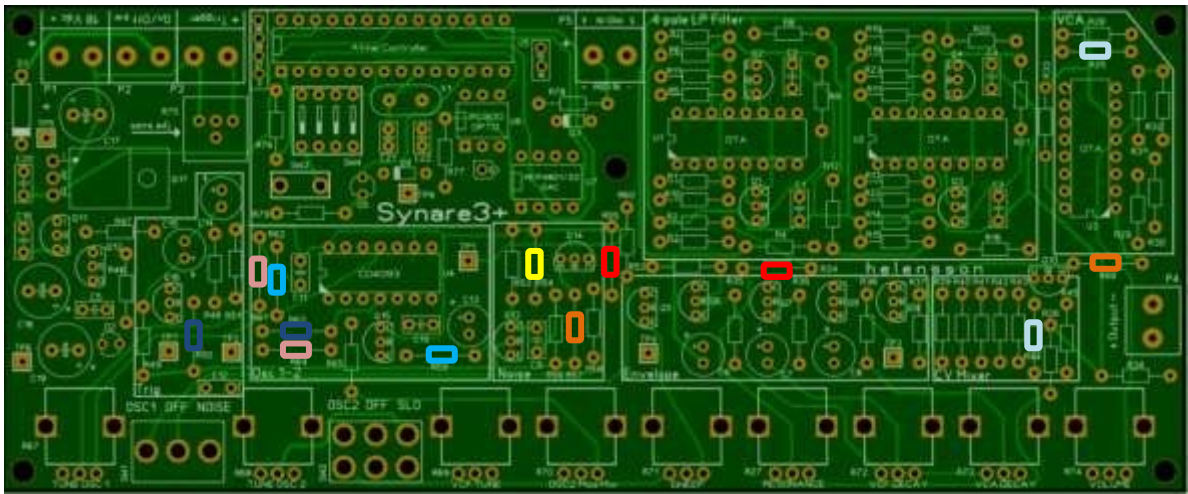



100 ohm - R50, R63 (brown, black, brown)




22K - R61, R64 (red, red, orange)







220K - R39, R40, R41 (red, red, yellow - or - red, red, black, orange) 


330K - R48, (orange, orange, yellow) 

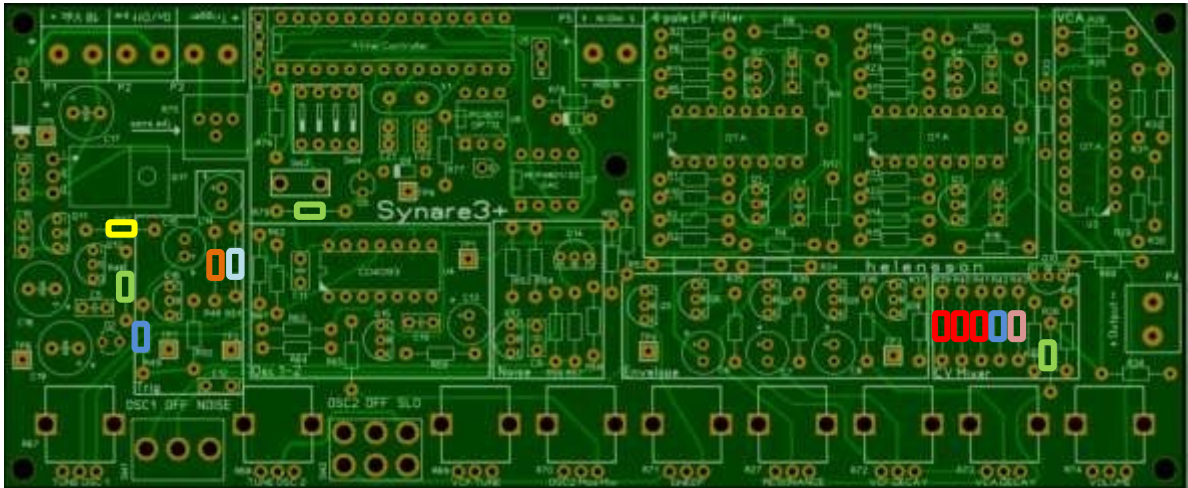
2.7Meg - R43 (red, violet, green) 

68K - R42, R49 (blue, gray, orange) 

820K - R47 (gray, red, yellow) 

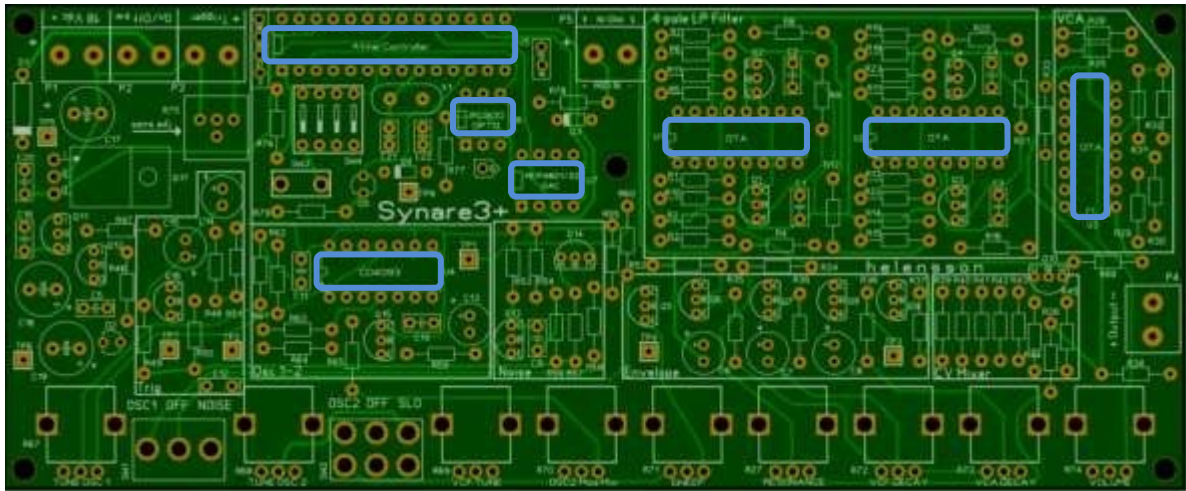
47K - R51 (yellow, violet, orange) 

1K - R26, R46, R79 (brown, black, red) 

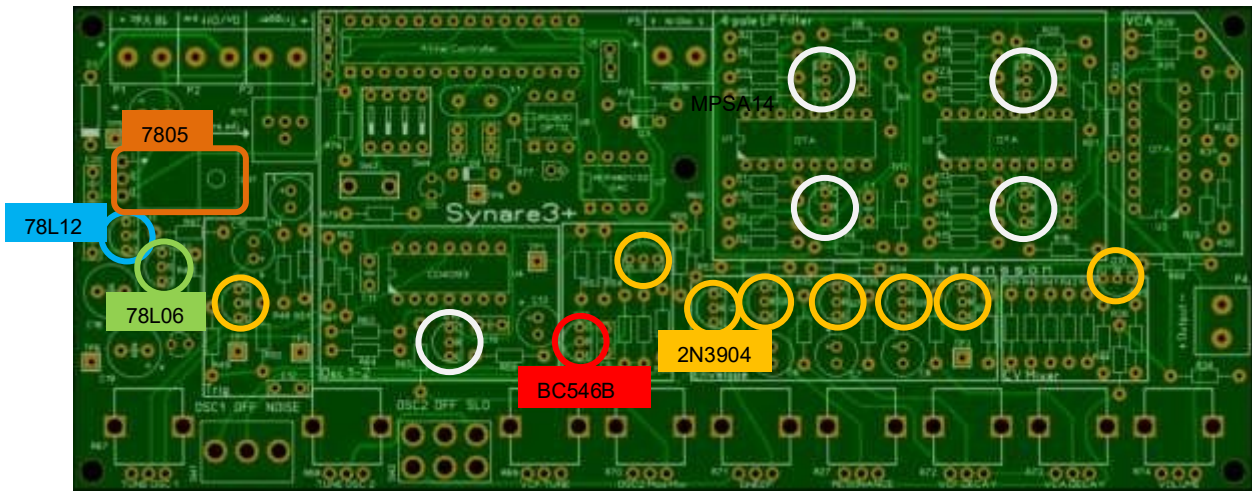


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5. Insert and solder all DIP IC SOCKETS. Note: **Do Not install the ICs yet, only the sockets.** Some initial testing will be done before the board is populated fully with active components.



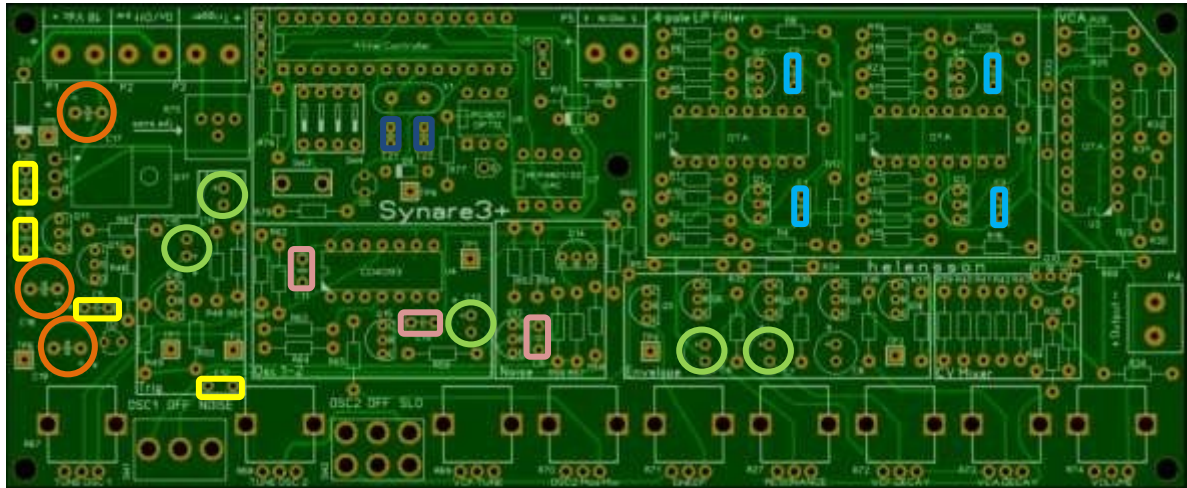
- 6. Insert the 78L12 (Q11), 78L06 (Q12), and 7805 (Q17) voltage regulators.
- Insert all 2N3904 transistors Q5-Q10, Q14, Q16.
- Insert all MPSA14 transistors Q1-Q4, Q15.
- Insert BC546B transistors Q13.



7. Insert all of the capacitors. Be aware of the polarity markings on the electrolytic capacitors.

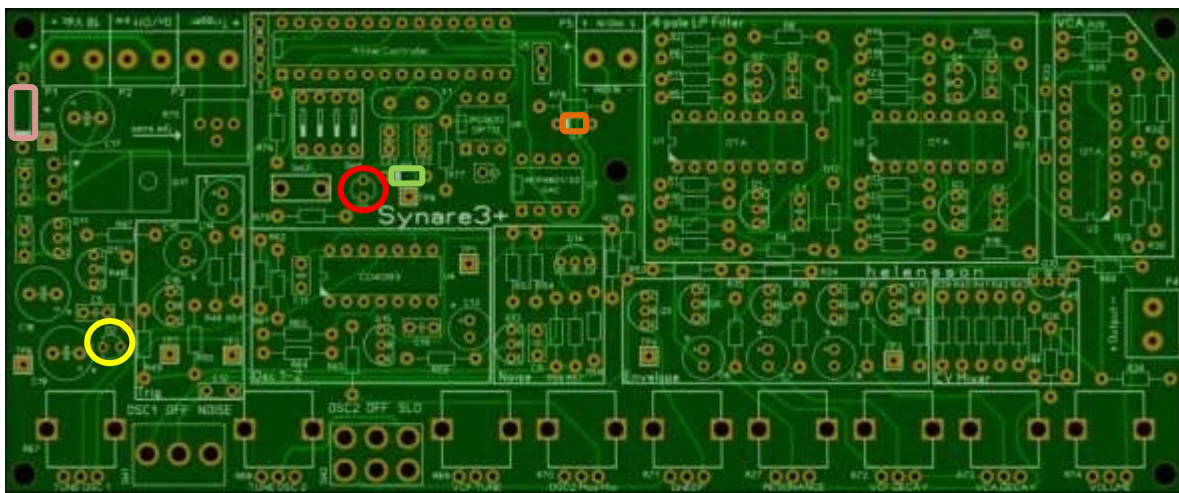
- .001uf - C1, C2, C3, C4 ■
- .1uf - C5, C12, C16, C20 ■
- .047 - C9, C10, C11 ■
- 22pf - C21, C22 ■
- 1uf - C6, C7, C13, C14, C15 ■
- 330uf - C17, C18, C19 ■

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8. Install all Diodes and LEDs

- 1N4007 Diode- D1
- Yellow LED - D2
- 1N914 (or) - DiodeD3
- 1N5817 Diode D4
- Red LED - D5

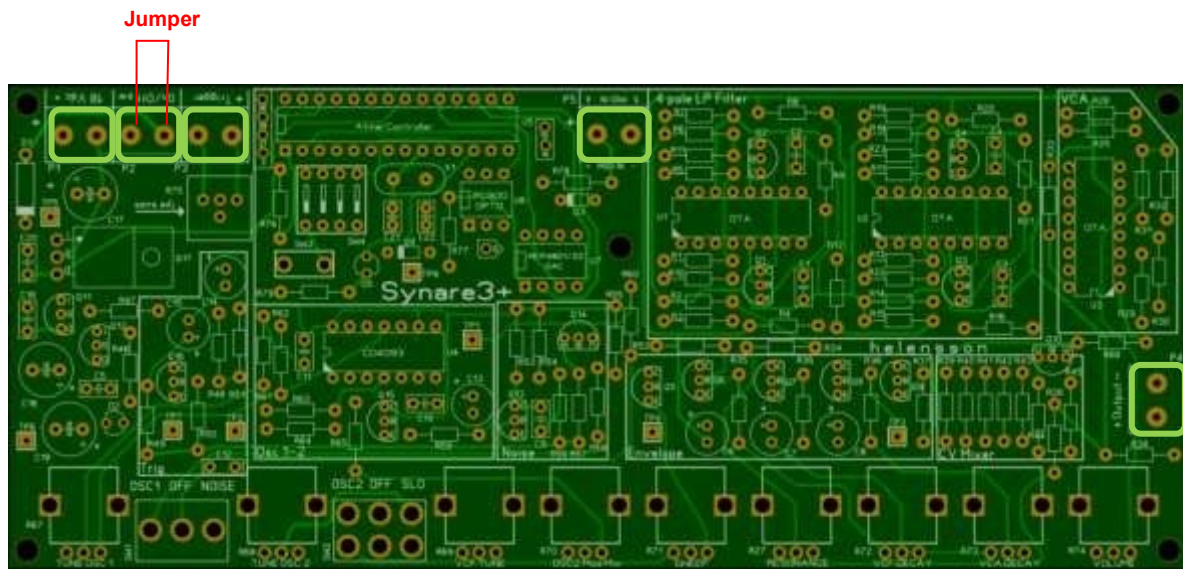


9. Install the five screw terminals blocks

- a. Couple three of the dual screw terminal blocks together and insert into the board at P1, P2, and P3.
- b. Insert a single dual terminal block in the P4, and one in the P5 position.

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NOTE: If you do not plan on using an external on/off switch connected to P2, you must jumper this connection... otherwise the board will not function.

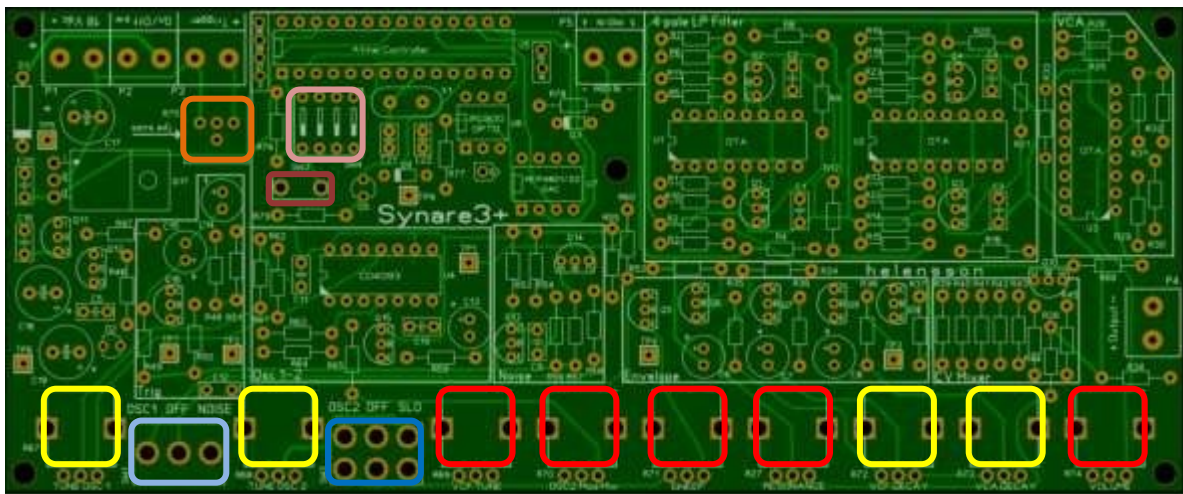


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10. Install the potentiometers and the switches. There are six 50K pots and four 1M pots that mount on the front of the board. There are two toggle switches. Be careful not mix the values of the potentiometers

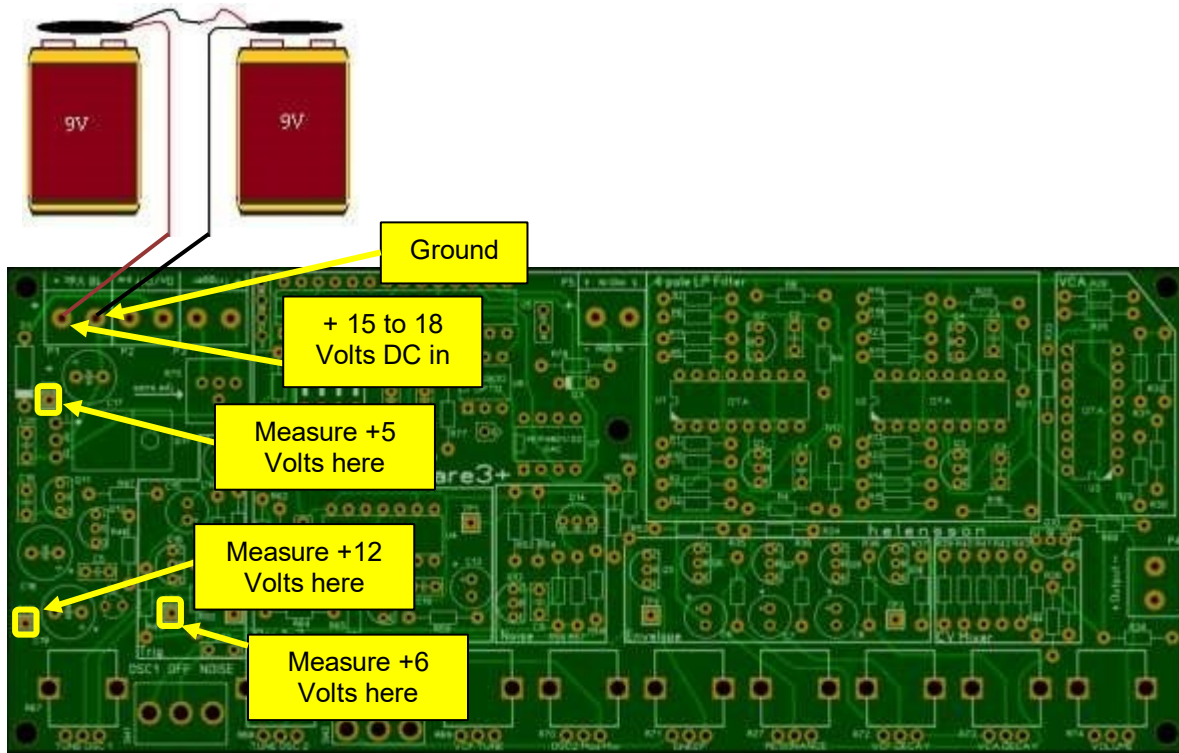
Note: If you plan on building a custom enclosure you might want to mount the pots (and switches) off-board instead of on the board... once soldered to board they will be very difficult to remove.

- 50K Potentiometer - R27, R69-R71, R74 ■
- 1M Potentiometer – R68, R68, R71, R74 ■
- 50k “sensitivity” trimpot R75 ■
- SPDT on-off-on Switch - ■ SW1
- DPDT on-off-on Switch - ■ SW2
- 4 Position DIP Switch - ■ SW4
- Momentary Switch - SW3 ■



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11. With the IC's **NOT** in their sockets yet, **Connect power to the board via terminal P1 and verify that +12, +6 volts +5 volts are being supplied to the circuitry.** This is accomplished by first supplying 15 to 18 volts DC to terminal P1 on the board. This should be obtained from a low noise, well-regulated supply, or for merely testing, use two 9 Volt batteries. If using batteries, use two battery clips and wire them in series to provide 18 volts. **With a VOM measure the outputs of the +12 volt regulator (TP6), the +6 volt regulator (TP7), and the +5 volt regulator (TP5) referenced to ground.**



12. After the power test are complete, **remove the power. You may now insert all IC's into their sockets. To avoid possible damage, please pay close attention the correct pin placement of these parts.**
13. **Connect a piezo trigger or audio source to the board via input terminal P3.**
14. **Connect an audio amplifier from the output terminal P4.** Make sure that your amplifier is at a comfortable, low volume to begin.
15. **Turn R75 (sensitivity) to the mid position.**
16. **Turn R74 (Volume) up so that the output will be at an audible level,** and turn the remaining pots to their mid-positions.
17. **Reconnect the power.** Power LED D2 will illuminate and the processor LED D5 will blink quickly six times.

You may now experiment by tapping on the trigger while tweaking the front panel controls. Experiment with the various effects on the output of the synthesizer. Listed below are the front panel controls and the parameters that they adjust on the synth.

For board #030816 only.

Controls:

Oscillator 1 - Pitch Source

TUNE: controls pitch of Oscillator in OSC 1 position

OFF: no function

NOISE: white noise source

OSC 1: turns on Oscillator pitch

Oscillator 2 - Pitch source and controller

TUNE: controls pitch of oscillator in OSC 2 position or speed of LFO in SLO position

OFF: no function

SLO: makes oscillator an LFO controller

OSC 2: turns on oscillator pitch (or higher speed LFO)

Filter - Sound modifier or source

TUNE: controls sound quality of an oscillator or tune (pitch) of the filter

OSC 2: controls how much LFO (Oscillator 2) affects the filter

SWEEP: determines how much pitch drop the Tune of the Filter will have

RES: controls sound quality of an oscillator or turns the Filter into a sound source
DECAY: determines how long it takes for the Sweep to effect the Tune of the Filter

Amplifier - Controls how the output will sound

DECAY: determines how long the sound will take to die out

VOL: controls the volume of the output

Synare3+ Midi operation

1. Connect a midi signal cable to the board the via the midi in terminal P5. Make sure the polarity is correct. If the polarity of the signal is reversed, the midi will not function.

2. Set the desired midi channel (1 to 16) to “listen” on. This is done with the switch combinations of DIP Switch SW4. See Chart for SW4 midi channel selection.

3. Press, then release the reset switch SW3. You will see the Red LED (D5) blink 6 times. The selected midi channel will now be set.

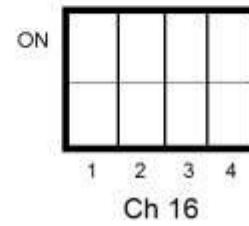
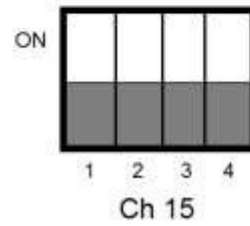
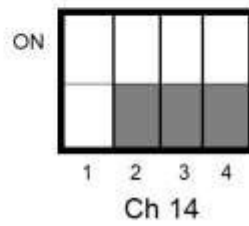
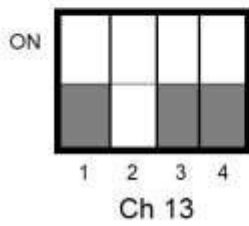
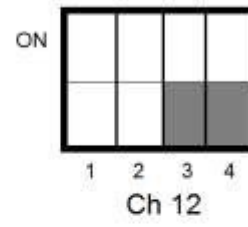
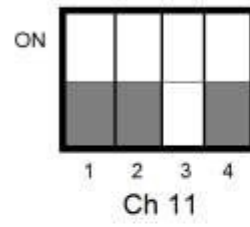
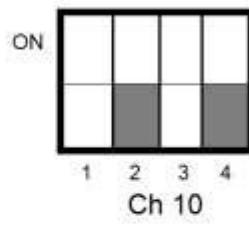
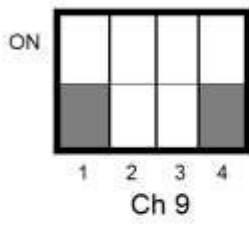
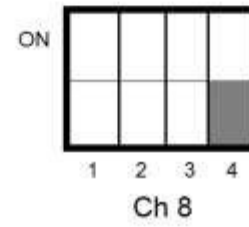
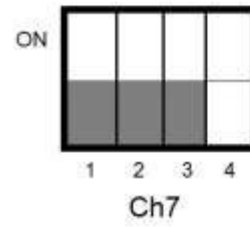
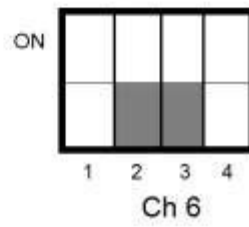
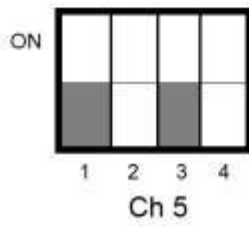
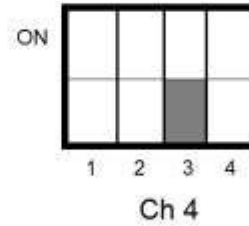
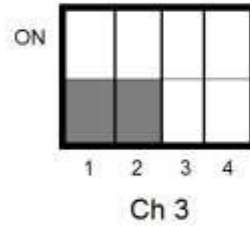
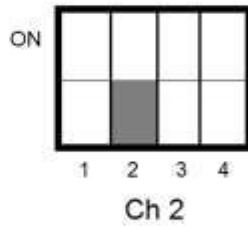
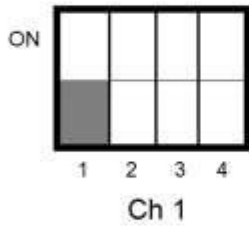
4. Repeat steps 2 and 3 at any time to choose another midi channel. Also note that the board will set its midi channel on power-up to however the DIP Switch is set.

The midi circuitry will trigger the Synare whenever it detects midi note #40 on the selected channel. Midi velocity values of 1 to 128 are converted to a voltage pulse that is then sent to the analog trigger section. Both midi and auxiliary piezo triggering is possible.... Separately or simultaneously.

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MIDI Channel Switch Settings

module triggers on Note# 40 (E2)



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HAVE FUN!