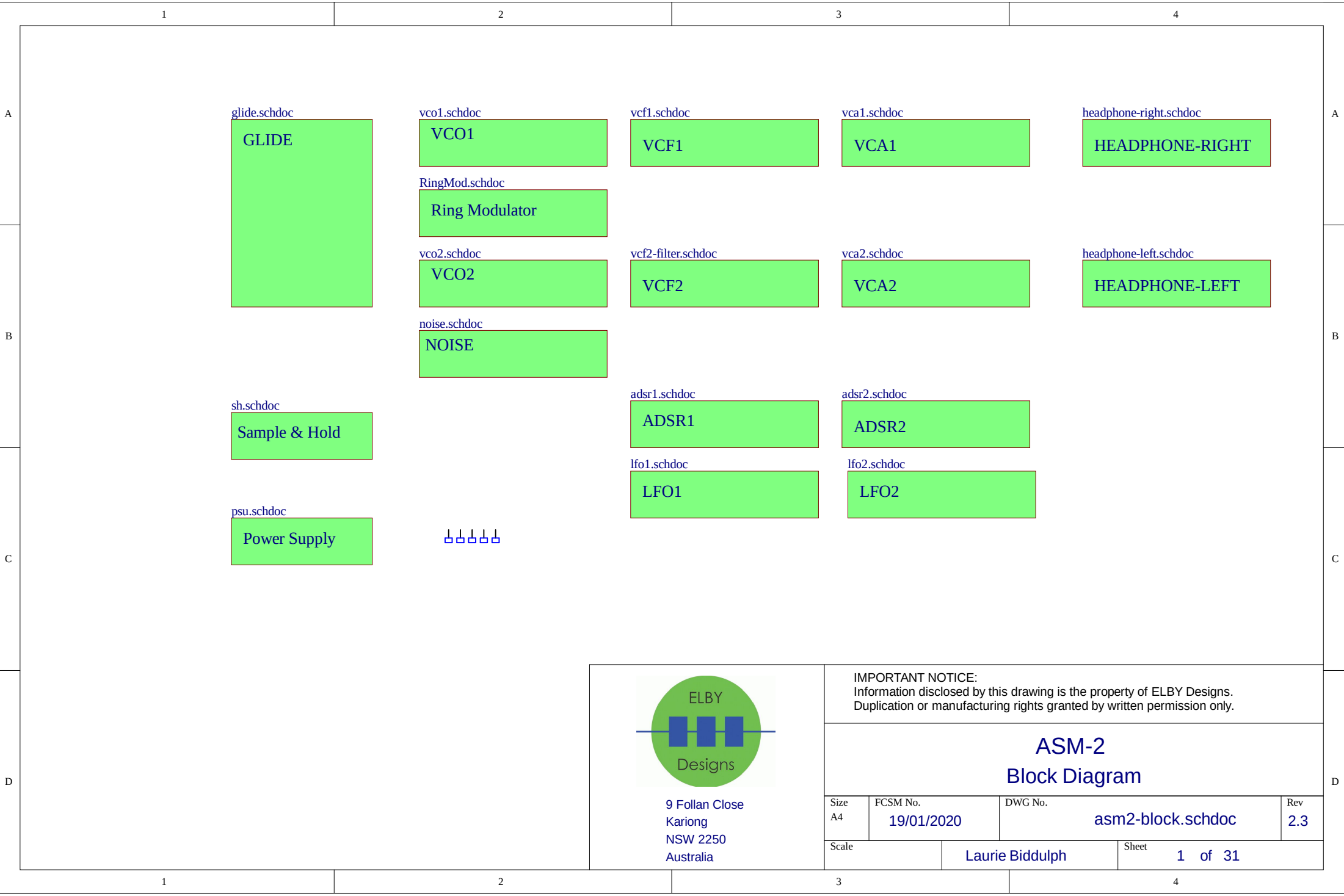
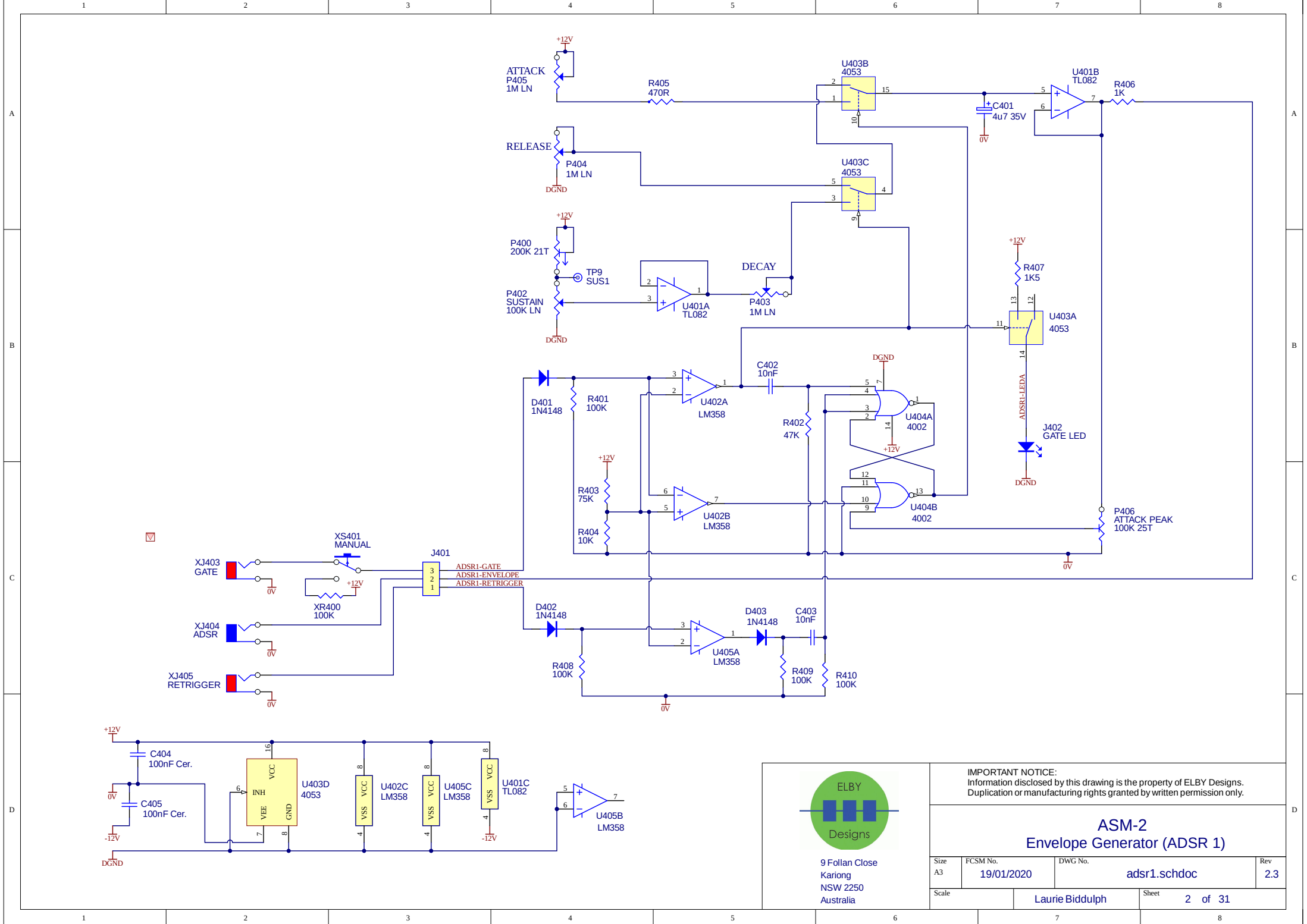




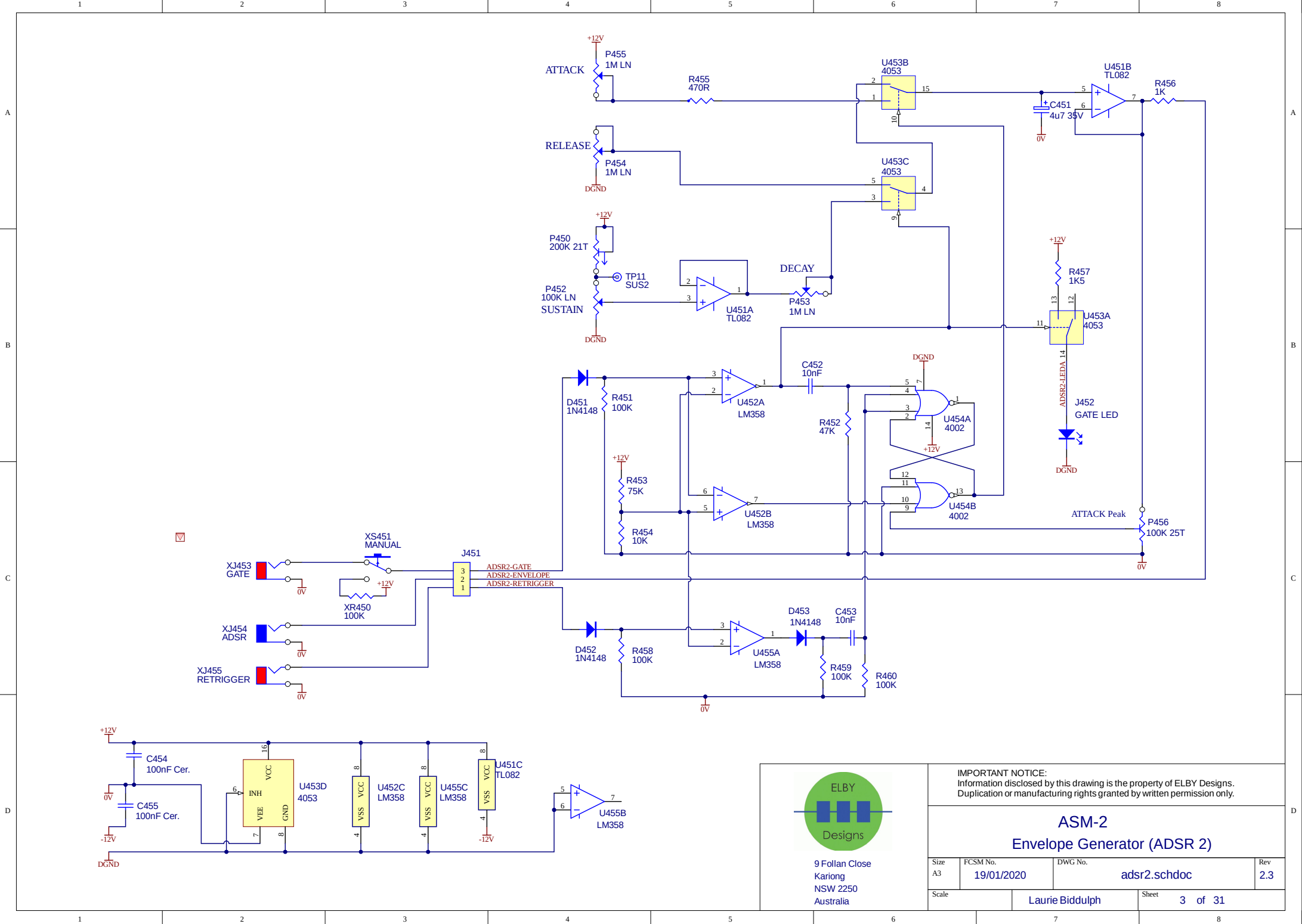


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Karing
NSW 2250
Australia

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ASM-2 Envelope Generator (ADSR 1)

Size A3	FCSM No. 19/01/2020	DWG No. adsr1.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 2 of 31



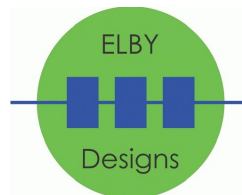
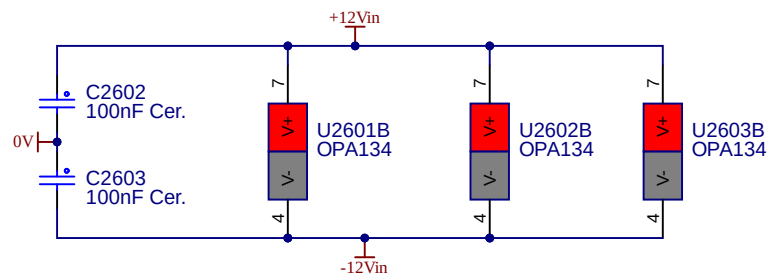
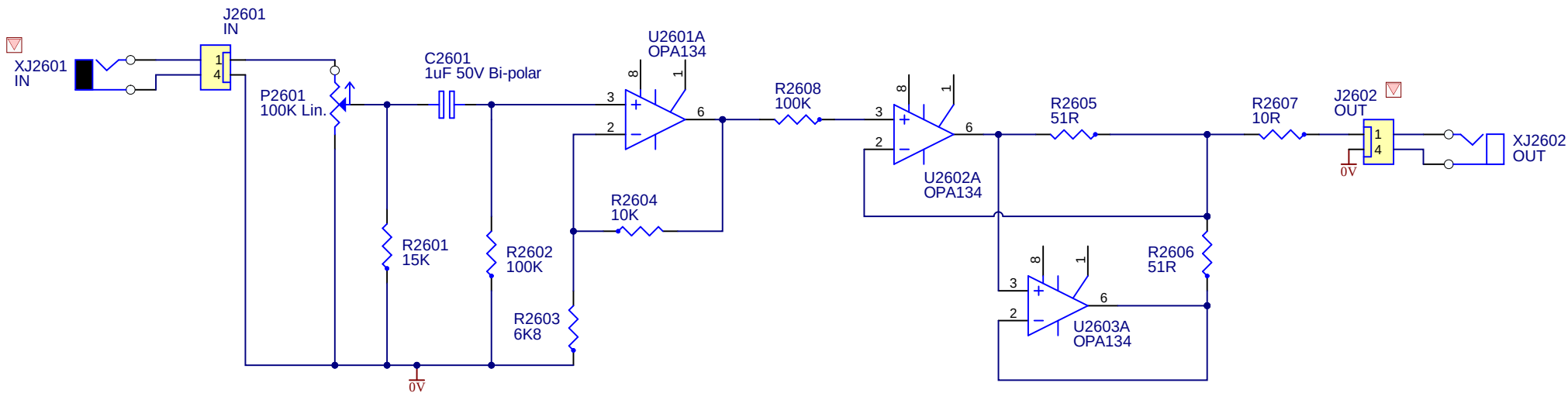


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ASM-2 Envelope Generator (ADSR 2)

Size A3	FCSM No. 19/01/2020	DWG No. adsr2.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 3 of 31



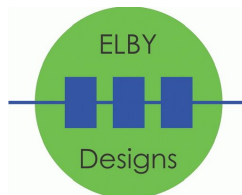
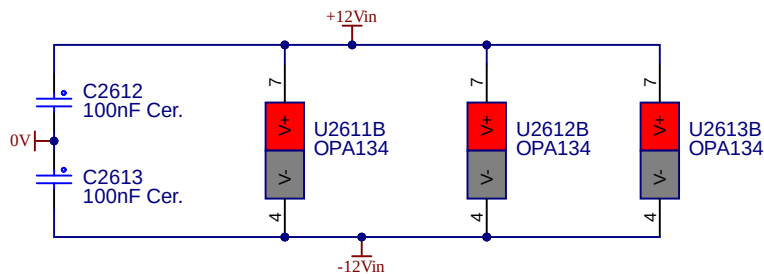
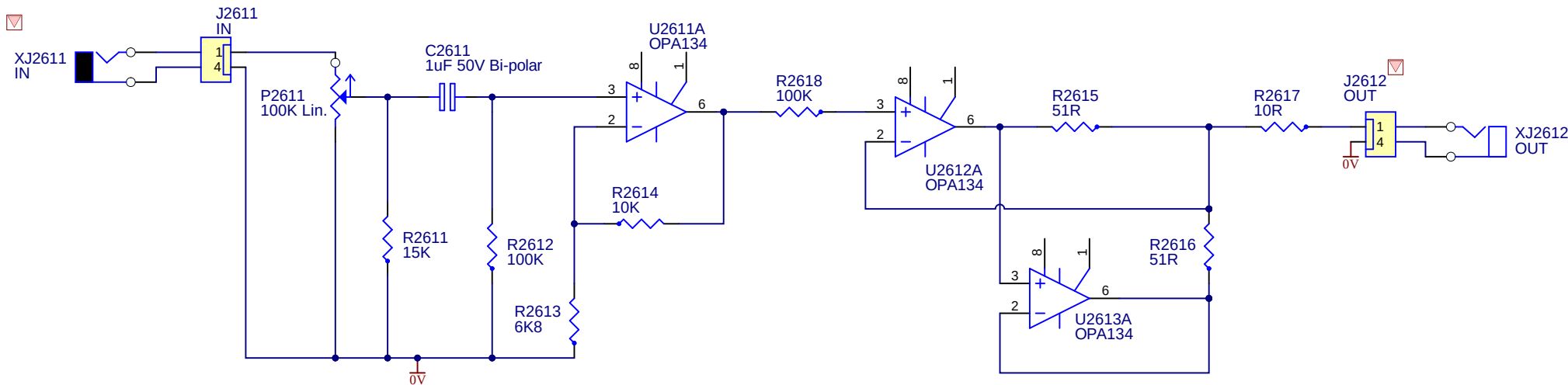
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ASM 2 Headphone Amplifier - Left Channel

Based on a design by Rod Elliott

Size A4	FCSM No. 19/01/2020	DWGN No. headphone-left.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 5 of 31



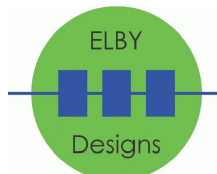
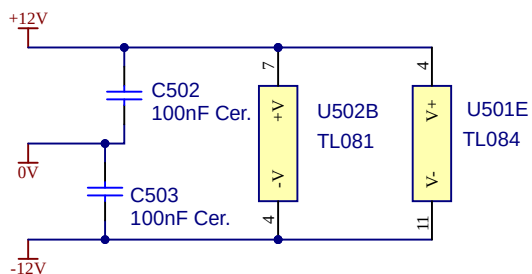
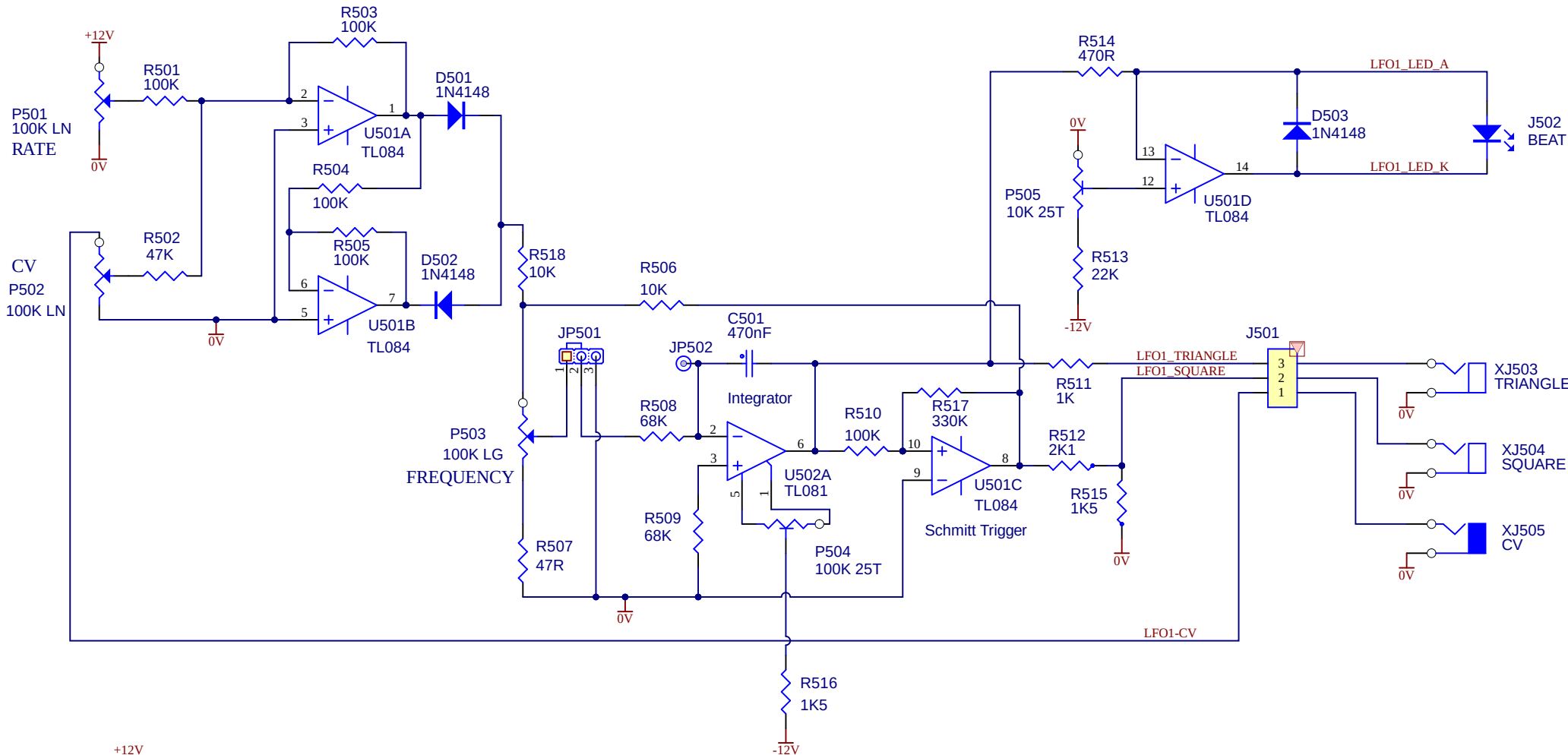
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Kariong
NSW 2250
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ASM 2 Headphone Amplifier - Right Channel

Based on a design by Rod Elliott

Size A4	FCSM No. 19/01/2020	DWGN No. headphone-right.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 6 of 31



9 Follan Close
Karing
NSW 2250
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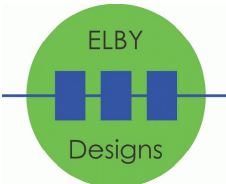
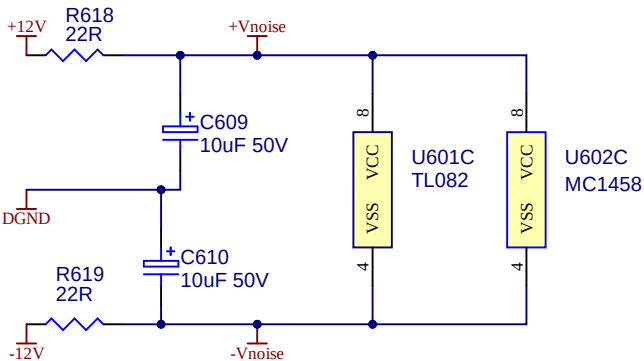
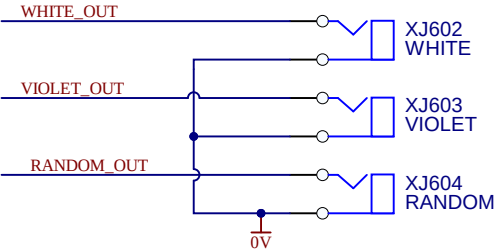
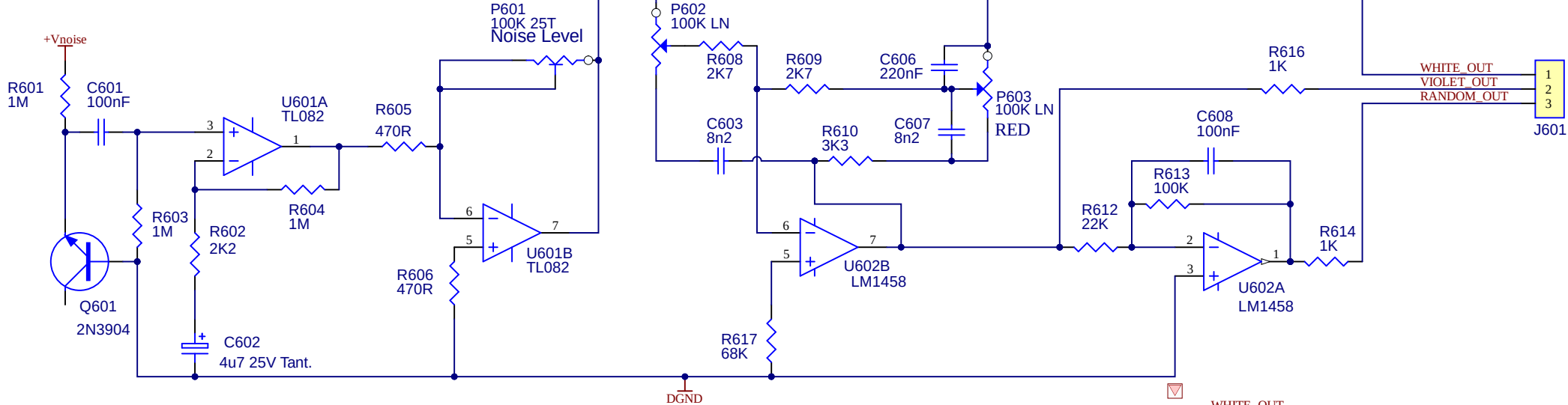
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ASM-2 Voltage Controlled Low-Frequency Oscillator (1)

Size A4	FCSM No. 19/01/2020	DWG No. lfo1.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 7 of 31

CREDITS:
Terry Mikulic
"Reader's Equipment - Four Analog Circuits from Terry Mikulic"
Electronotes, Vol. 5, No. 34, Jan 25, 1974, pg 16

Bernie Hutchins
"The ENS-76 Home-Built Synthesizer System - Part 8, Noise Sources"
Electronotes, Vol. 9, No.76, Apr. 1977, pp 3-4

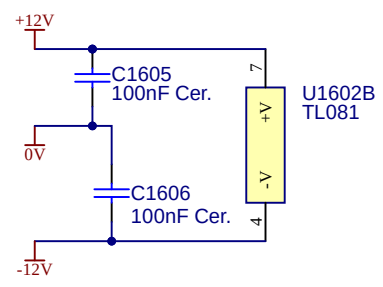
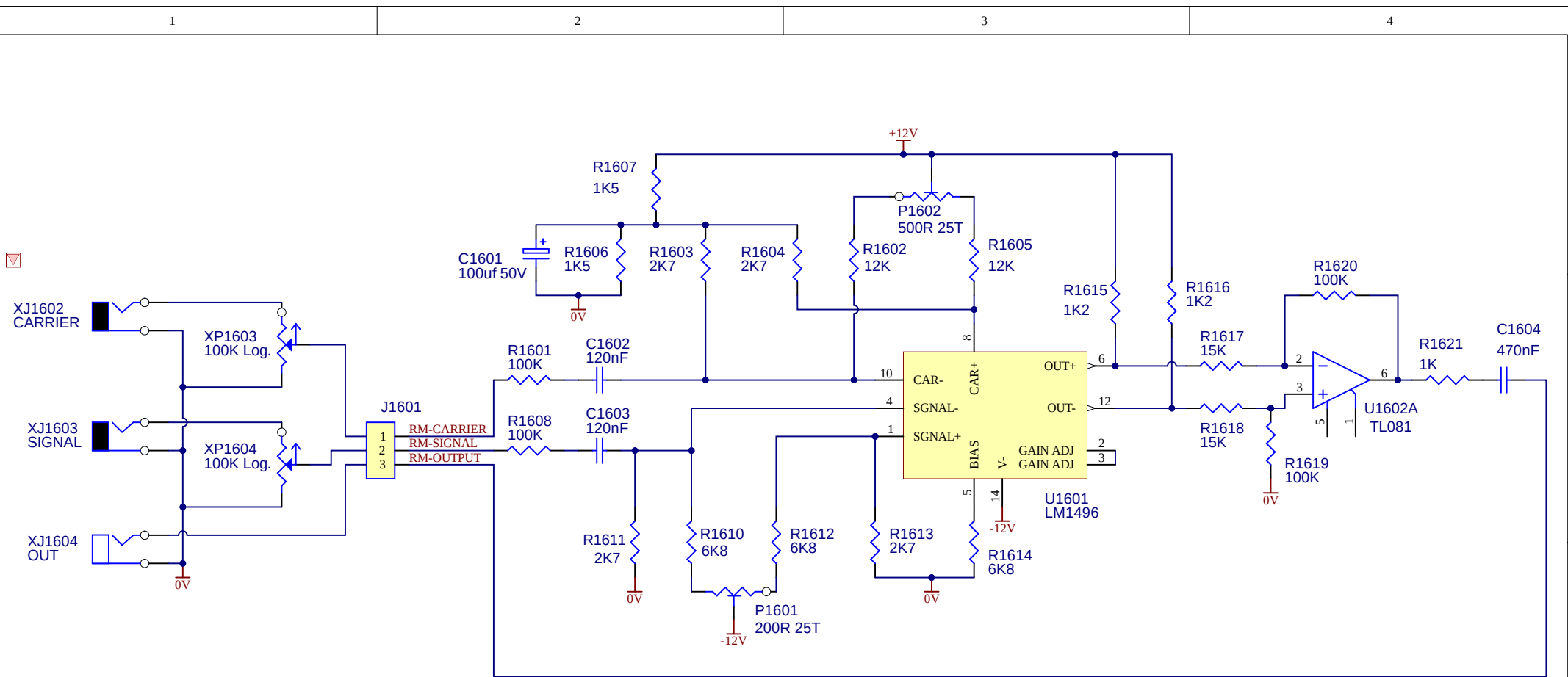


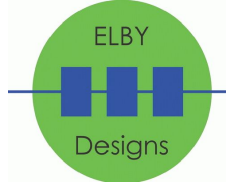
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ASM 2 Noise Module

Size A4	FCSM No. 19/01/2020	DWG No. noise.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 9 of 31



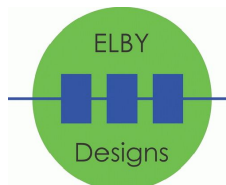
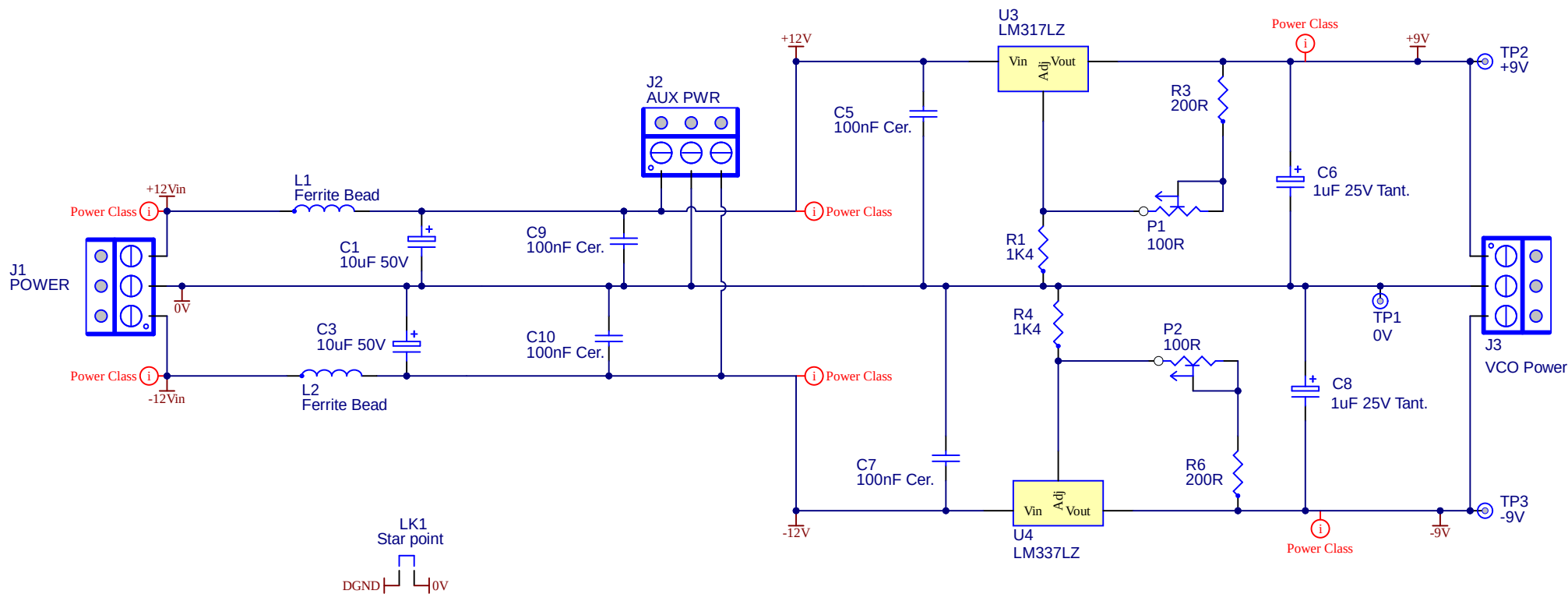


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ASM-2 Ring Modulator

Size A4	FCSM No. 19/01/2020	DWG No. RingMod.schdoc	Rev 2.3
Scale		Laurie Biddulph	Sheet 10 of 31

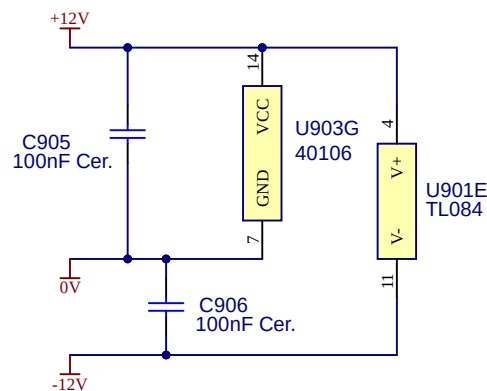
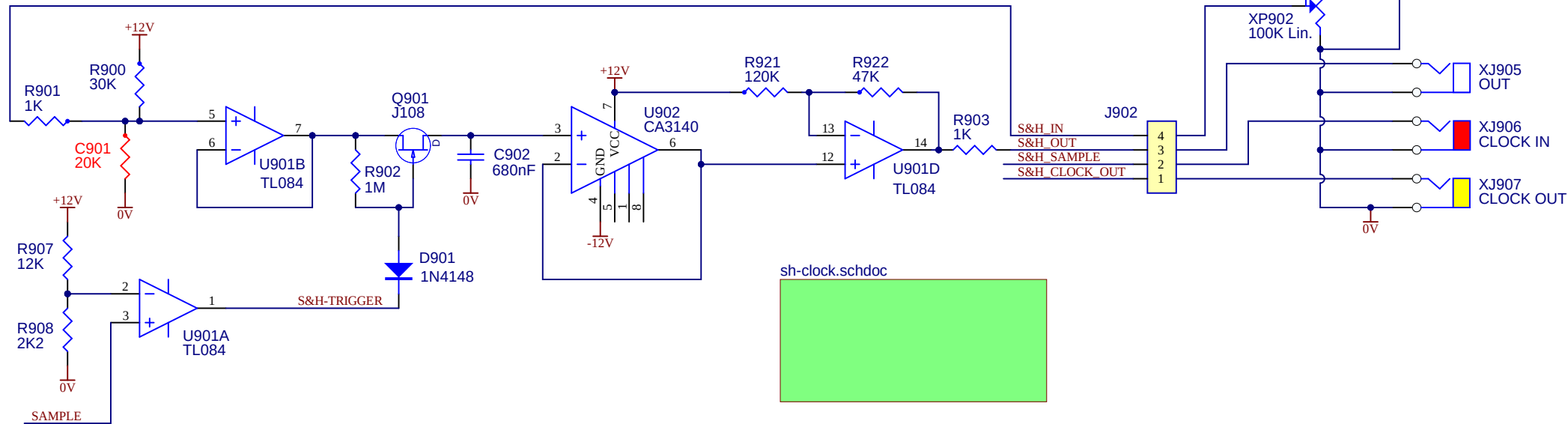


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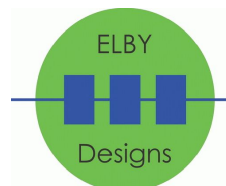
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ASM-2 Main Power Supply

Size A4	FCSM No. 19/01/2020	DWG No. psu.schdoc	Rev 2
Scale	Laurie Biddulph	Sheet 10 of 29	



LFO has a range of approximately 0.5Hz to 600Hz.
S&H circuit measured to have 45uV/S droop
Acquisition time is typically 100uS

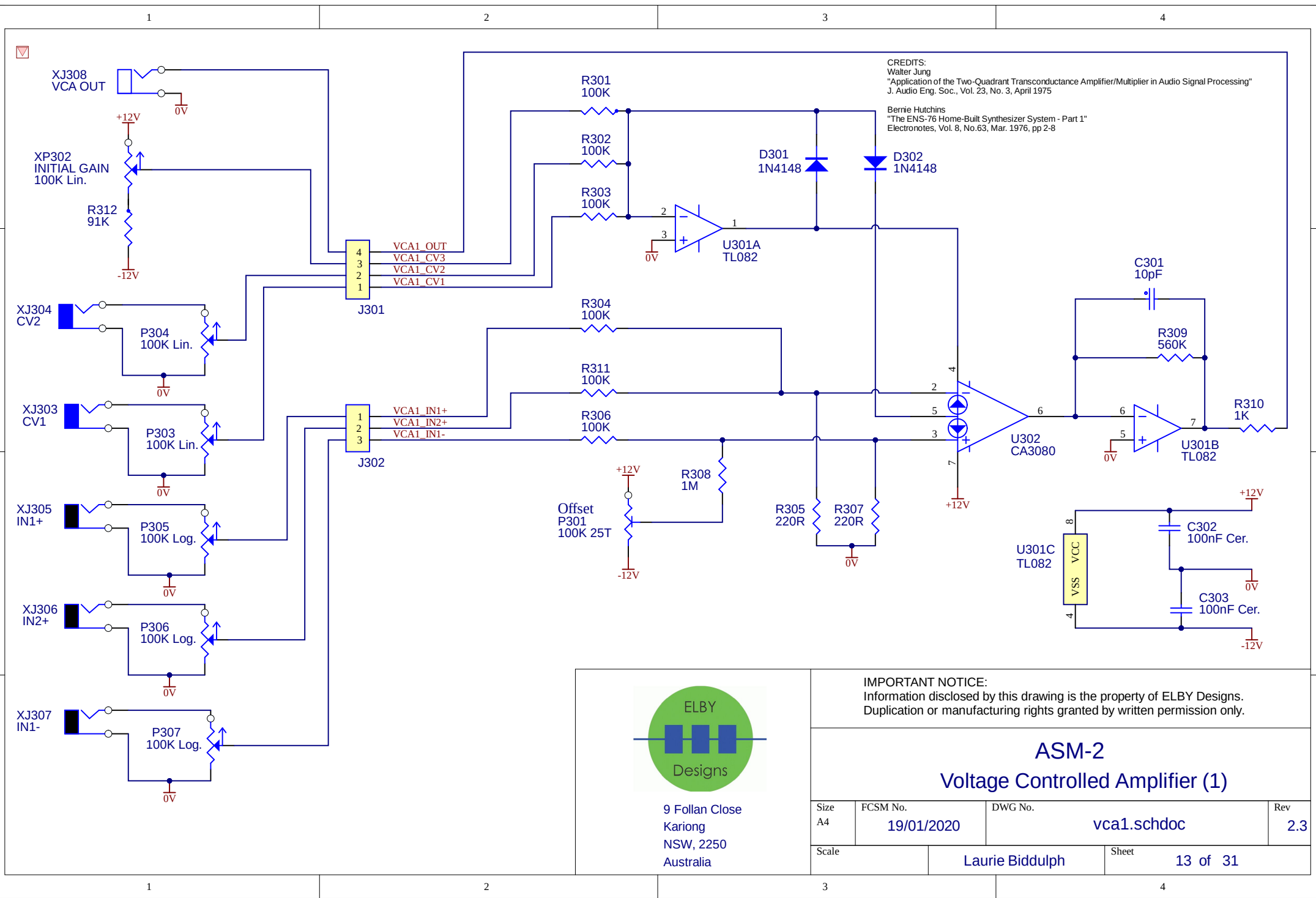


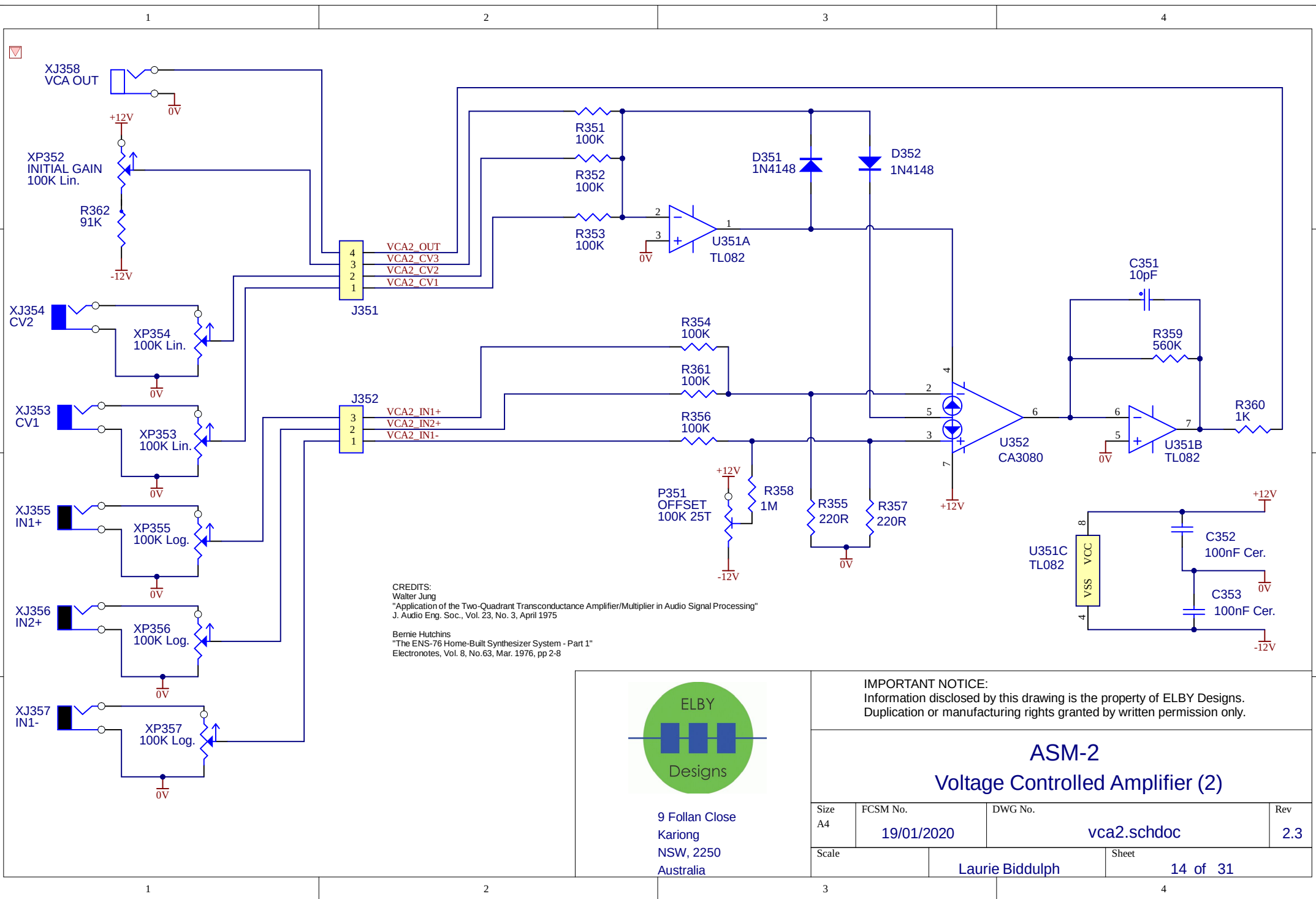
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ASM-2 Sample & Hold - Main

Size A4	FCSM No. 19/01/2020	DWG No. sh.schdoc	Rev 2.3
Scale	Laurie Biddulph	Sheet 11 of 31	





A

B

C

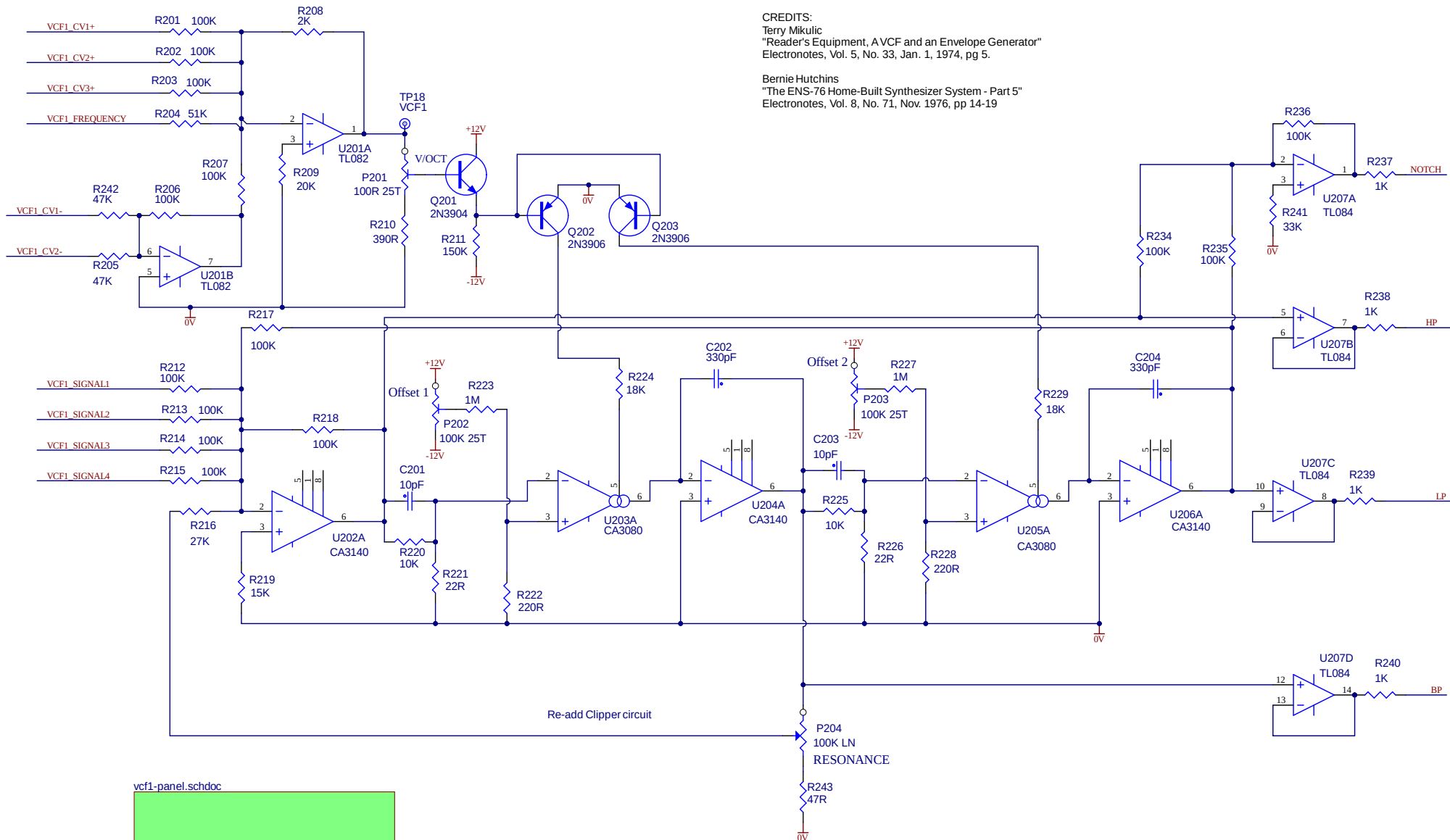
D

A

B

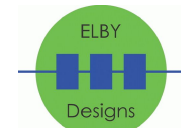
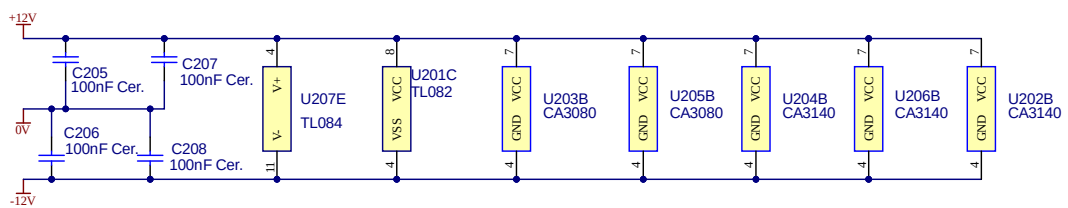
C

D



CREDITS:
Terry Mikulic
"Reader's Equipment, AVCF and an Envelope Generator"
Electronotes, Vol. 5, No. 33, Jan. 1, 1974, pg 5.

Bernie Hutchins
"The ENS-76 Home-Built Synthesizer System - Part 5"
Electronotes, Vol. 8, No. 71, Nov. 1976, pp 14-19



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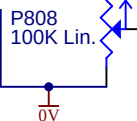
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ASM-2 State Variable Filter

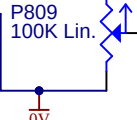
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Scale	Laurie Biddulph		Sheet 16 of 31



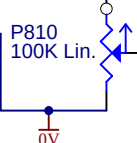
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IN1



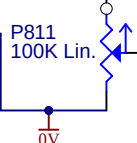
XJ803
IN2



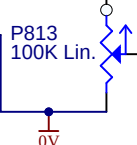
XJ804
IN3



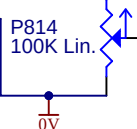
XJ805
IN4



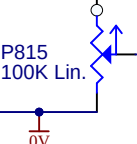
XJ806
CV1



XJ807
CV2



XJ809
CV3



9 VCF2-OUT
8 VCF2-SIGNAL1
7 VCF2-SIGNAL2
6 VCF2-SIGNAL3
5 VCF2-SIGNAL4
4 VCF2-CV1
3 VCF2-CV2
2 VCF2-CV3
1 VCF2-CV4

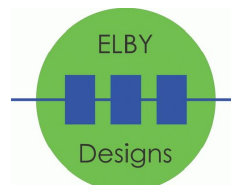
J801

XJ808

OUT

XP816
100K Lin.

XJ810
CV4

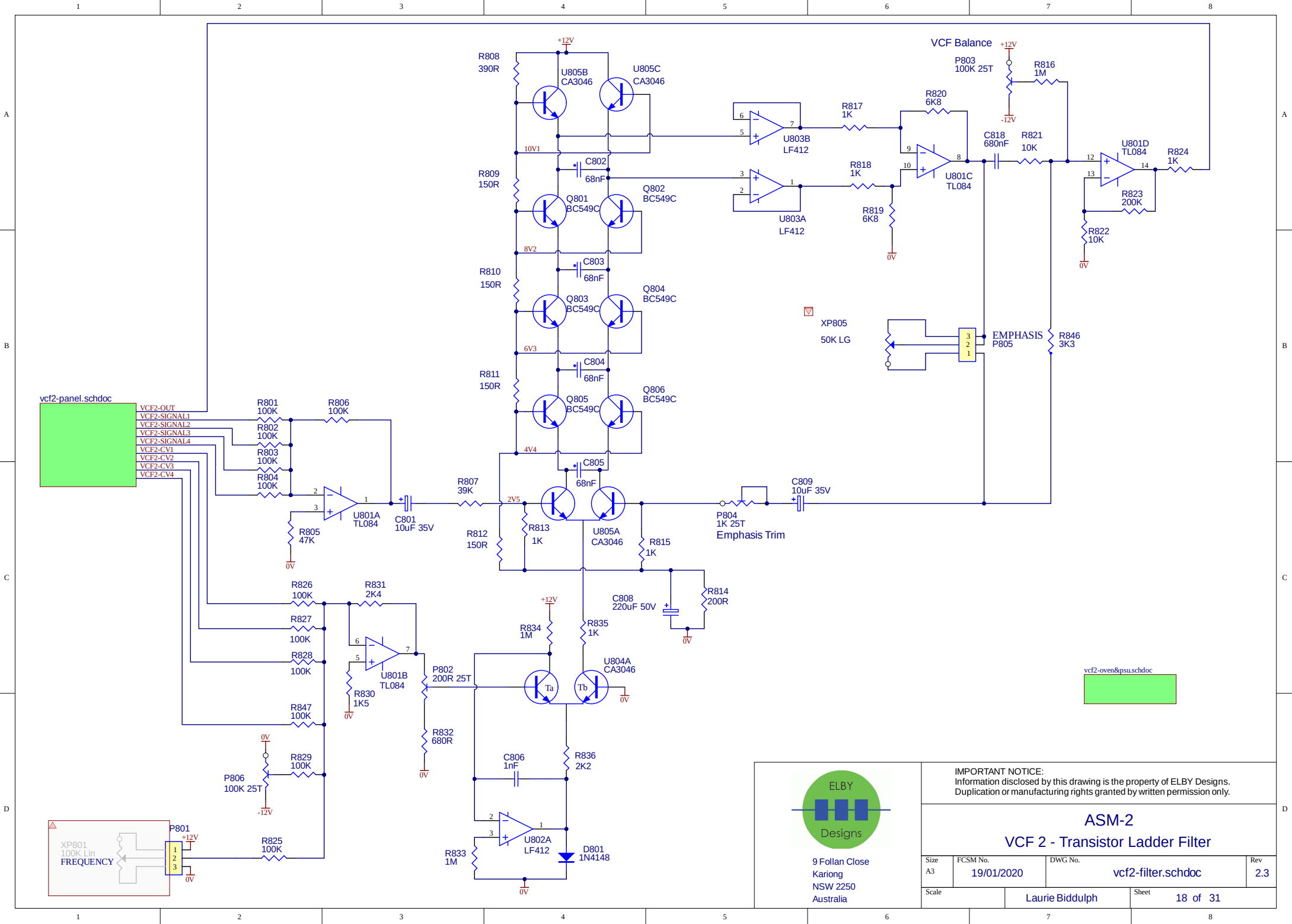


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ASM-2 VCF 2 - Panel Components

Size A4	FCSM No. 19/01/2020	DWG No. vcf2-panel.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 17 of 31



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ASM-2

VCF 2 - Transistor Ladder Filter

Size A3	FCSM No. 19/01/2020	DWG No. vcf2-filter.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 18 of 31

1

2

3

4

A

A

B

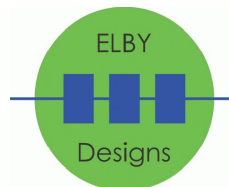
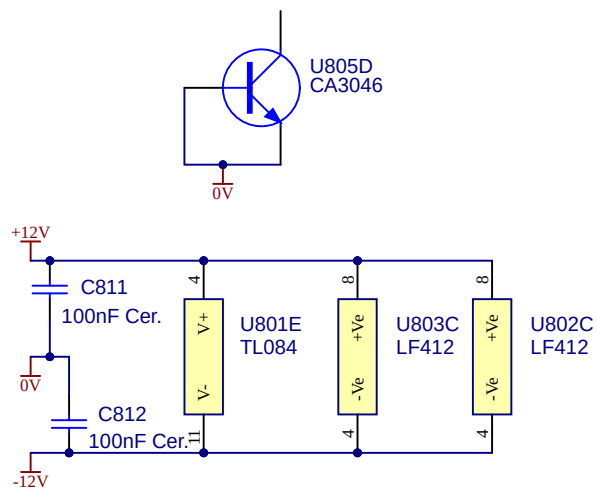
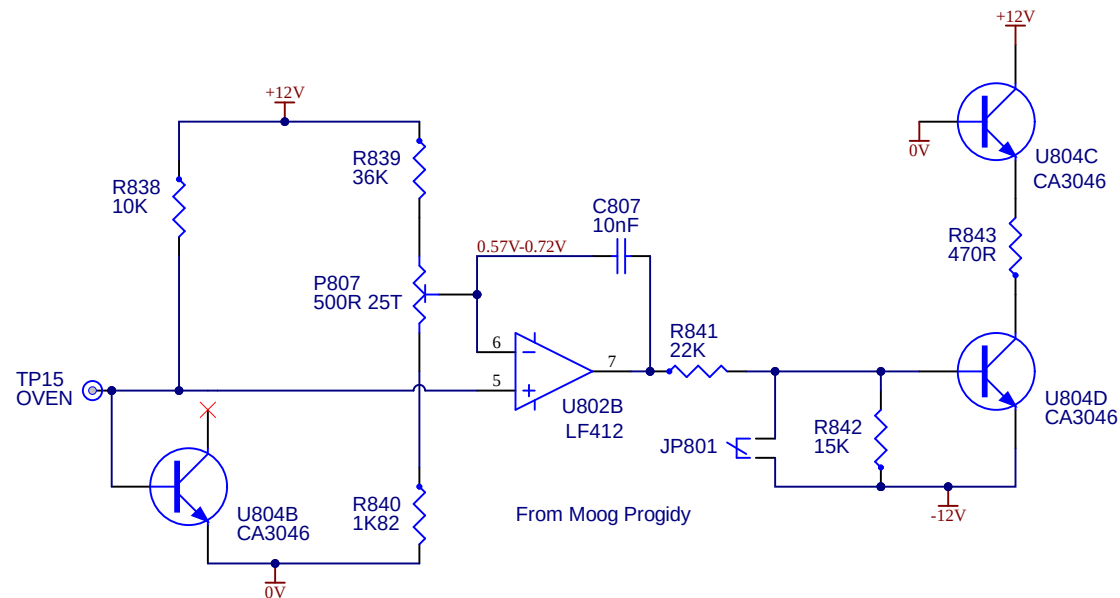
B

C

C

D

D



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ASM-2 VCF 2 - Oven & Power Supply

Size A4	FCSM No. 19/01/2020	DWG No. vcf2-oven&psu.schdoc	Rev 2.3
Scale	Laurie Biddulph	Sheet 19 of 31	

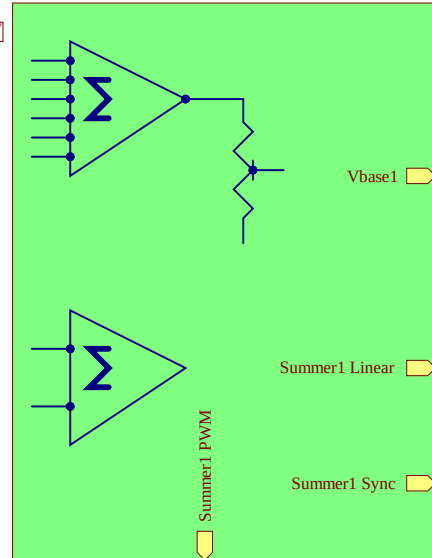
1

2

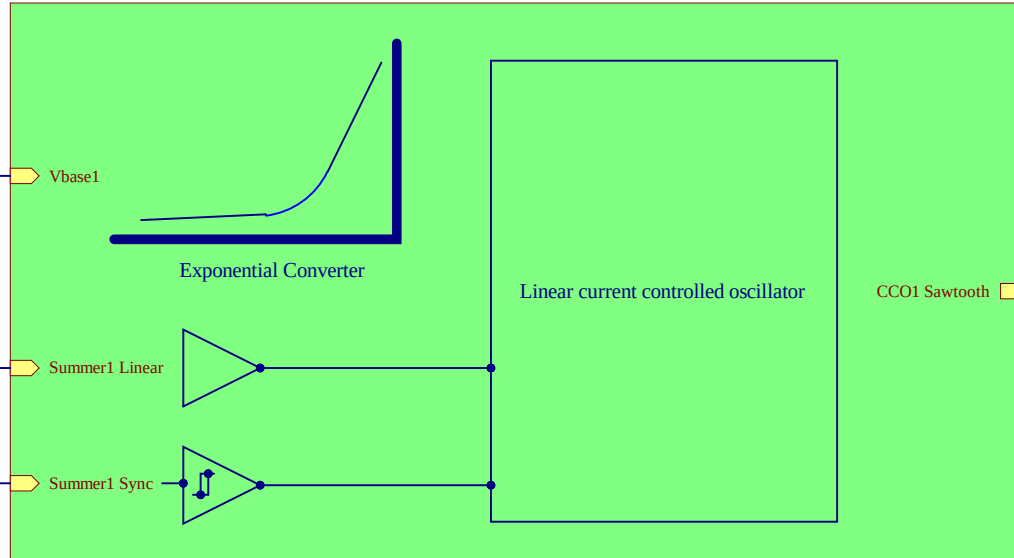
3

4

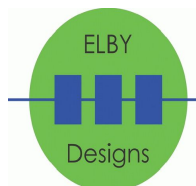
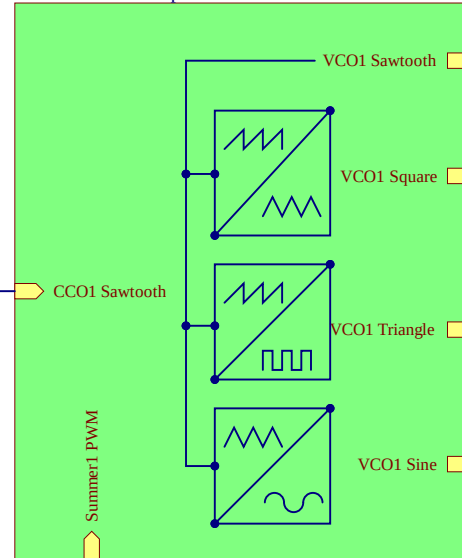
VCO 1 Summer



VCO 1 Current Controlled Oscillator



VCO 1 Wave Shaper

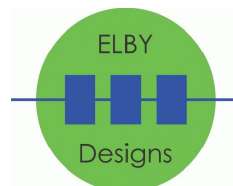
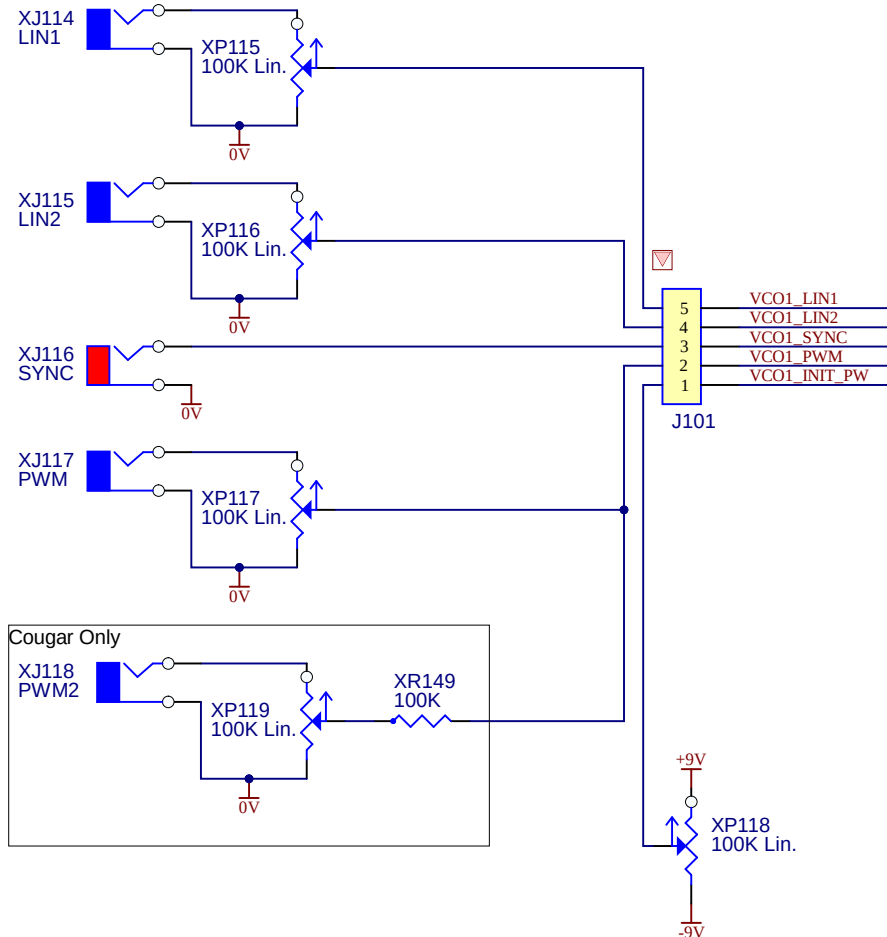
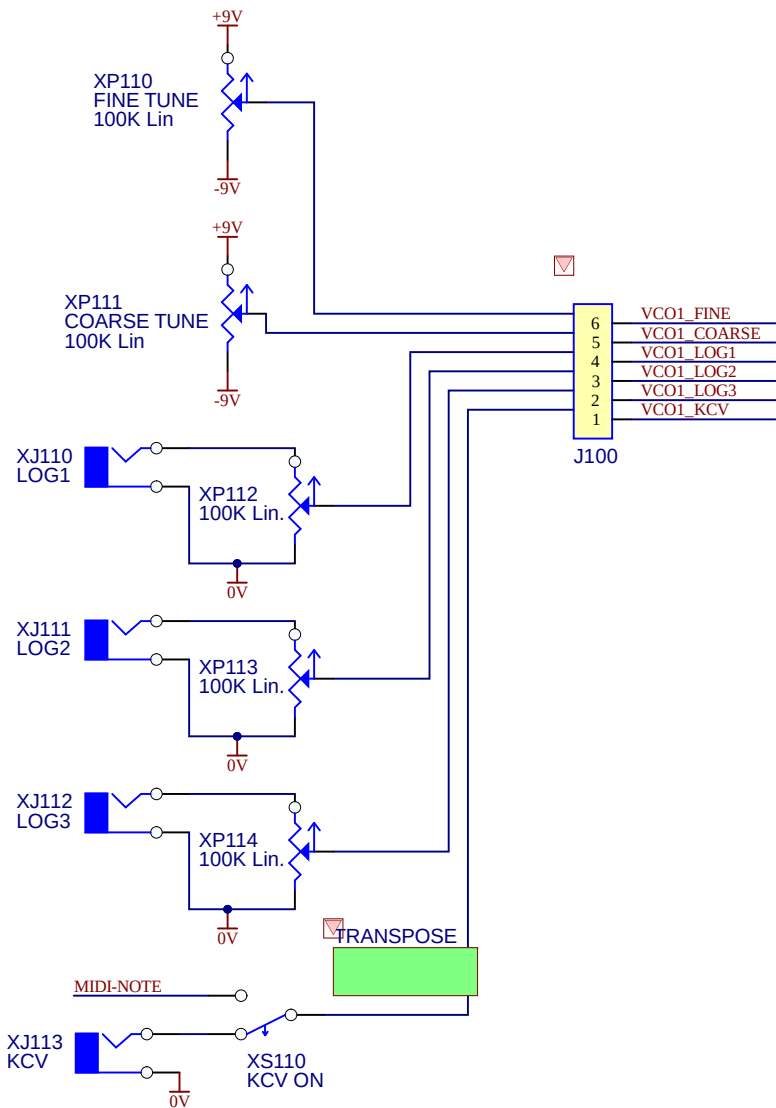


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ASM-2 VCO 1 Block Diagram

Size A4	FCSM No. 19/01/2020	DWG No. vco1.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 20 of 31

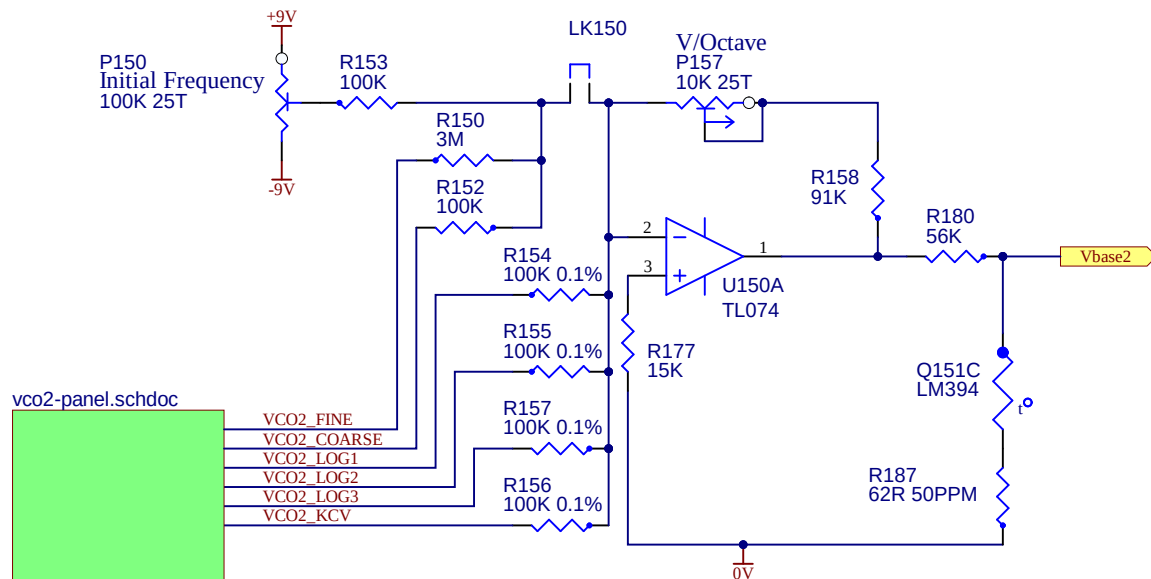


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ASM-2 VCO 1 - Panel Components

Size A4	FCSM No. 19/01/2020	DWG No. vco1-panel.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 21 of 31



Vbase is calculated as follows:-

$$V_{base} = \frac{V_{in} * \text{Gain}}{(56K + 1K + 62R)} \times (1K + 62R) = 18.61mV \text{ for a } 1V \text{ input and unity gain}$$

The range afforded by P101 is (assuming 100K input resistor), is,

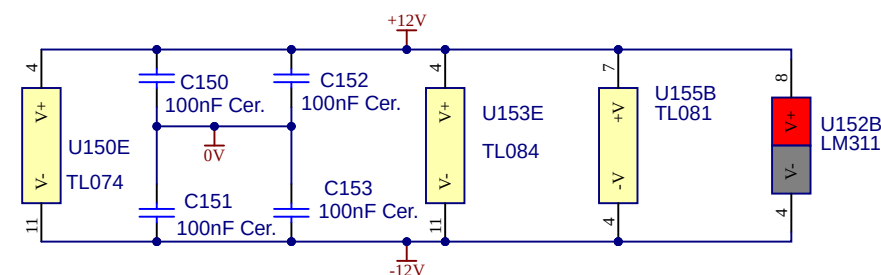
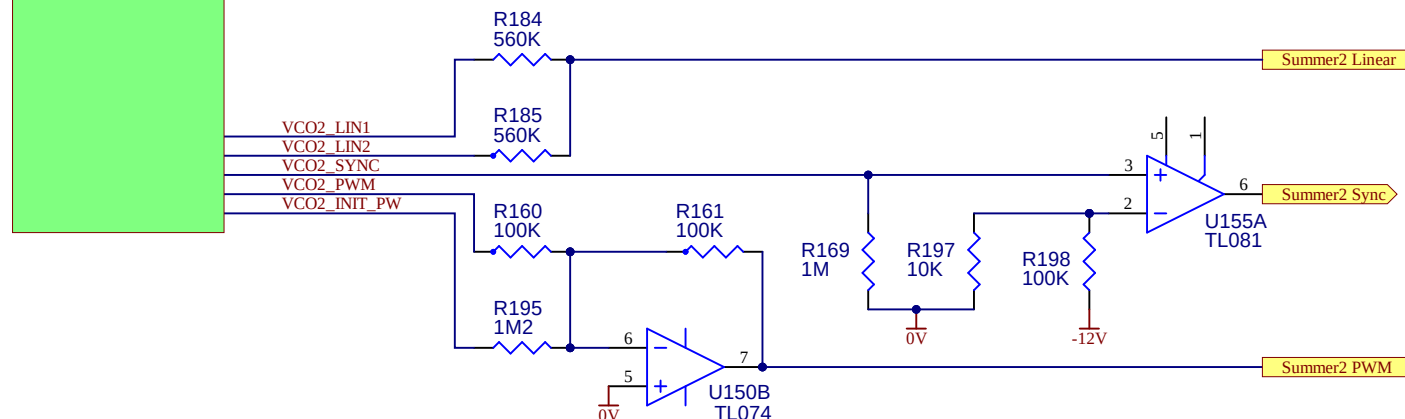
P157	Gain	Vbase
0K (minimum)	0.91	16.9mV
10K (maximum)	1.01	18.8mV

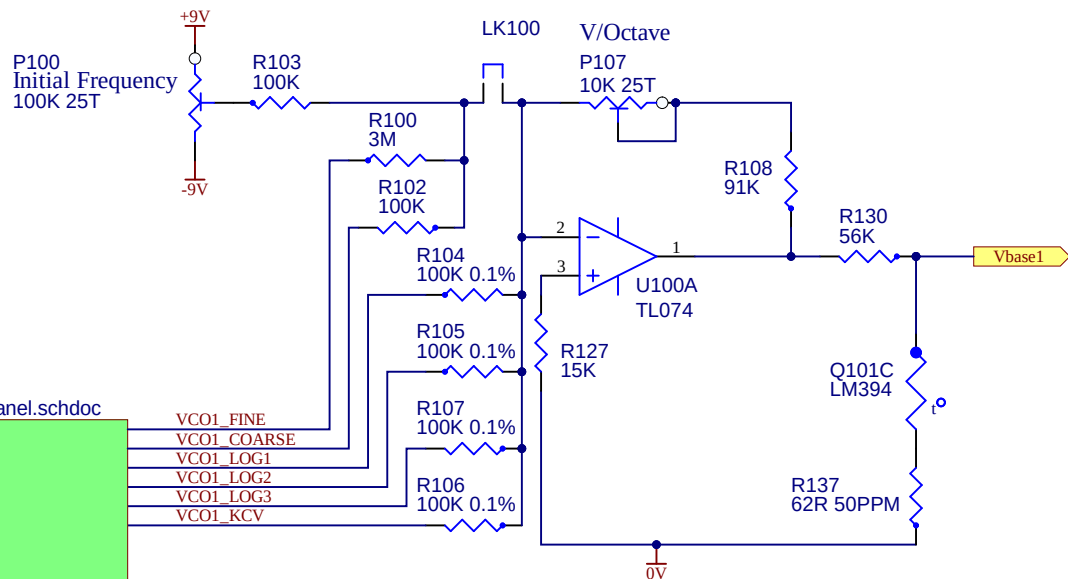
This puts 18mV near the centre of the trim range.

CREDITS:

Terry Mikulic, "New Design Ideas for Voltage-Controlled Oscillators"
Electronotes, Vol. 8, No. 62, Feb. 1976, pp 13-15

Bernie Hutchins, "The ENS-76 Home-Built Synthesizer System - Part 7, VCO Options"
Electronotes, Vol. 9, No. 75, March 1977, pp 3-10





Vbase is calculated as follows:-

$$V_{base} = \frac{V_{in} * \text{Gain}}{(56K + 1K + 62R)} \times (1K + 62R) = 18.61\text{mV for a 1V input and unity gain}$$

The range afforded by P101 is (assuming 100K input resistor), is,

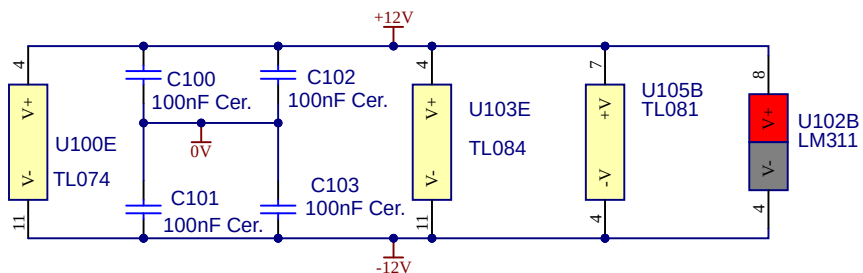
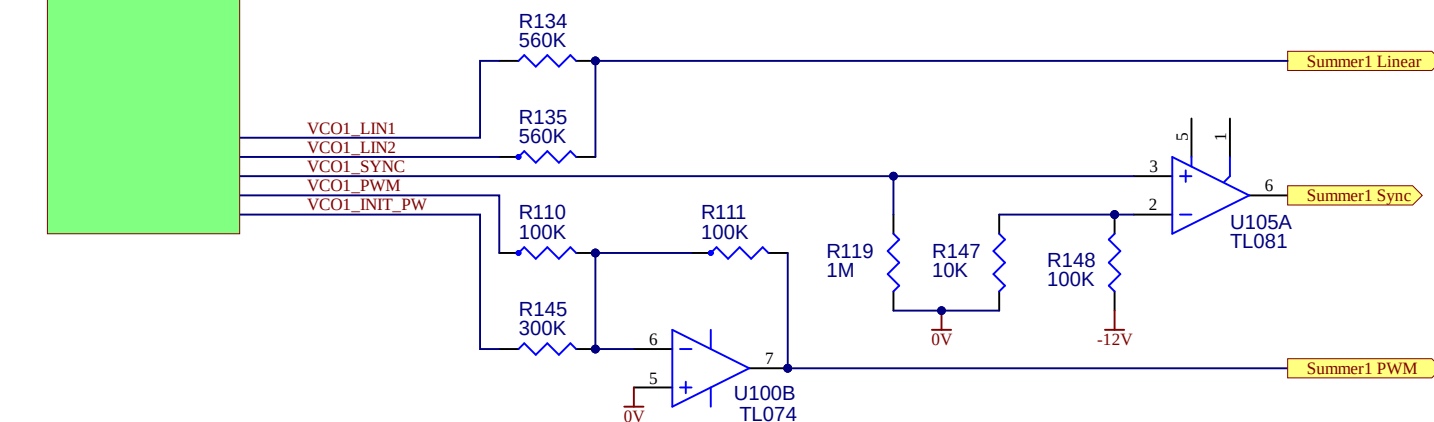
P157	Gain	Vbase
0K (minimum)	0.91	16.9mV
10K (maximum)	1.01	18.8mV

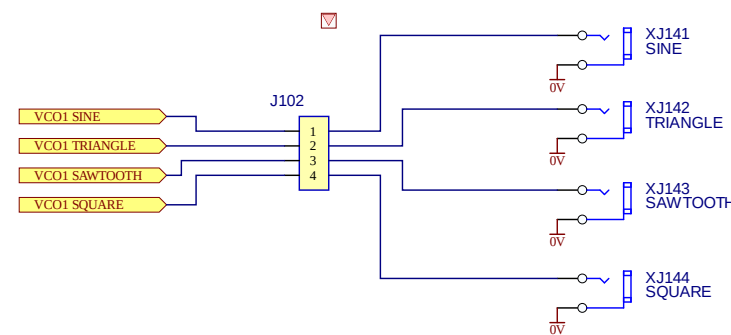
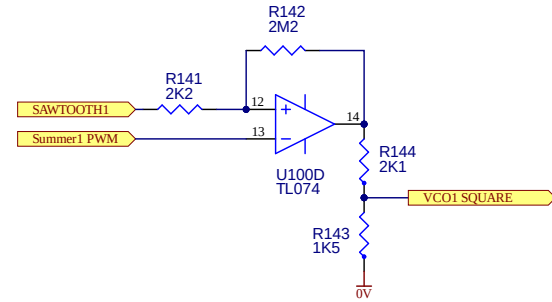
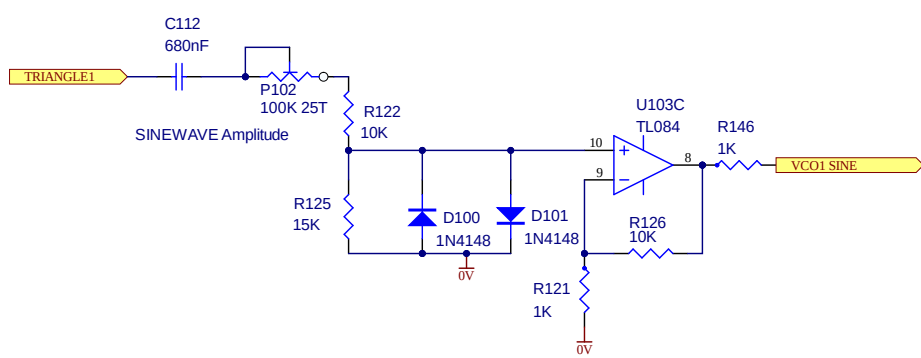
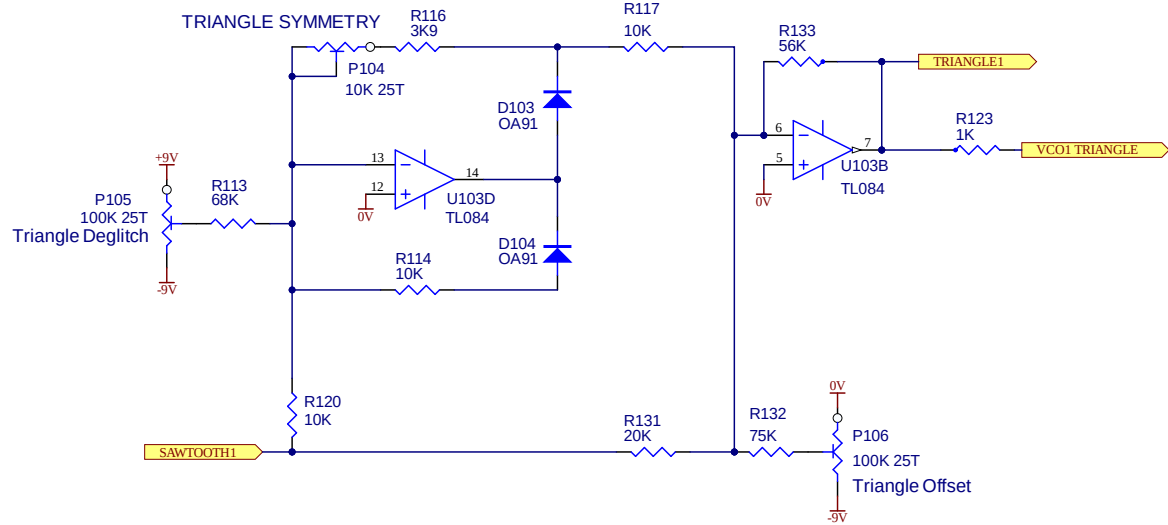
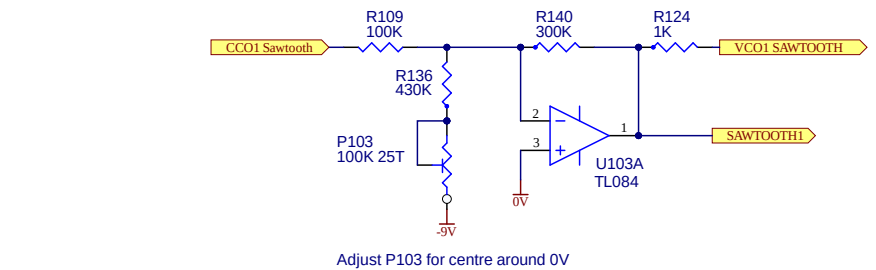
This puts 18mV near the centre of the trim range.

CREDITS:

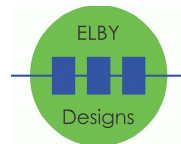
Terry Mikulic, "New Design Ideas for Voltage-Controlled Oscillators"
Electronotes, Vol. 8, No. 62, Feb. 1976, pp 13-15

Bernie Hutchins, "The ENS-76 Home-Built Synthesizer System - Part 7, VCO Options"
Electronotes, Vol. 9, No. 75, March 1977, pp 3-10





All outputs set for -5V to +5V swing



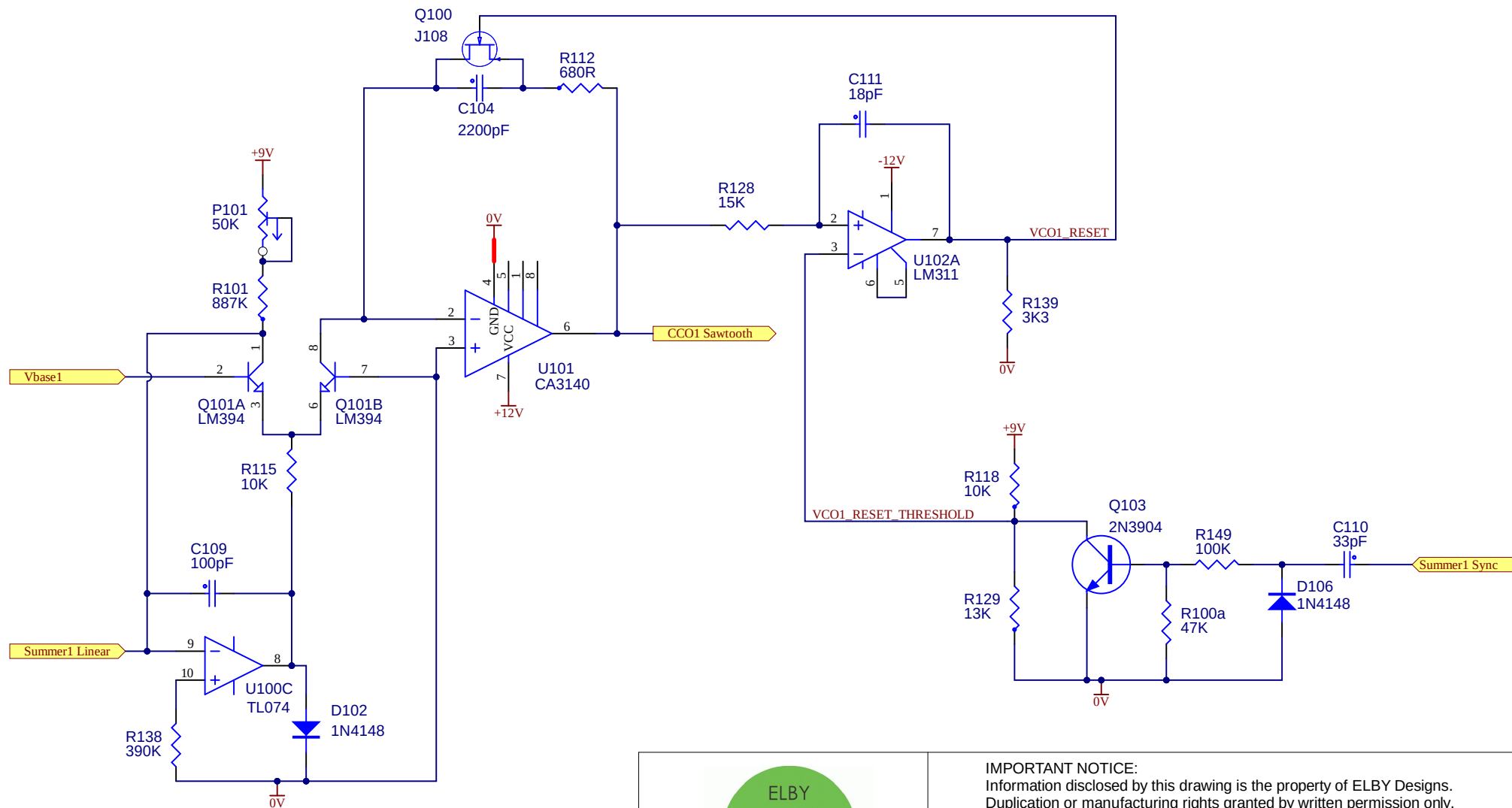
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ASM-2

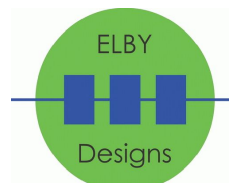
VCO 1 - Wave Shaper Section

Size B	FCSM No. 19/01/2020	DWG No. vco1-shape.schdoc	Rev 2.3
Scale	Laurie Biddulph	Sheet 24 of 31	



CREDITS:
Terry Mikulic, "New Design Ideas for Voltage-Controlled Oscillators"
Electronotes, Vol. 8, No. 62, Feb. 1976, pp 13-15

Bernie Hutchins, "The ENS-76 Home-Built Synthesizer System - Part 7, VCO Options"
Electronotes, Vol. 9, No. 75, March 1977, pp 3-10



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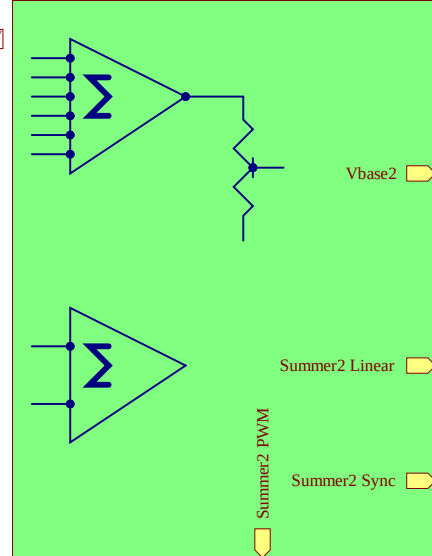
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ASM-2

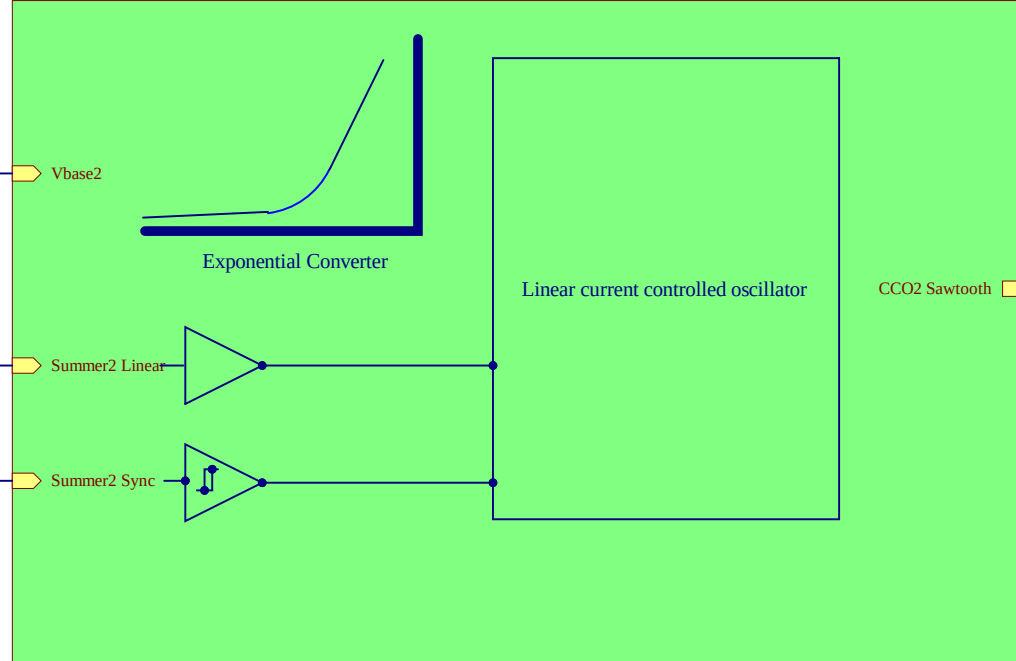
VCO 1 - Current-Controlled Oscillator

Size A4	FCSM No. 19/01/2020	DWG No. vco1-cco.schdoc	Rev 2
Scale	Laurie Biddulph		Sheet 24 of 29

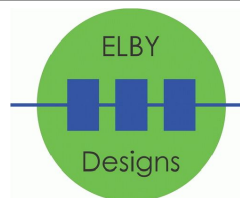
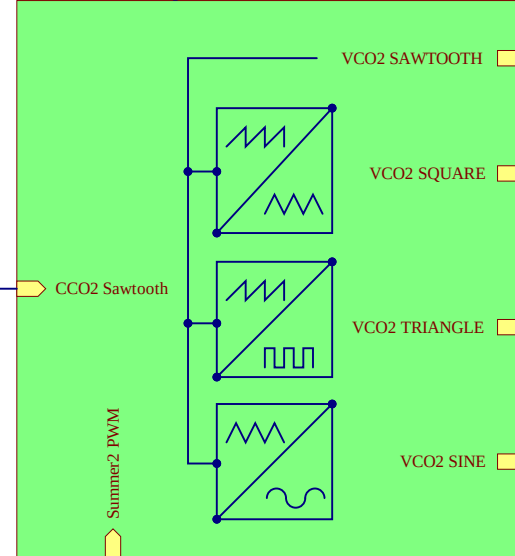
VCO 2 Summer



VCO 2 Current Controlled Oscillator



VCO 2 Wave Shaper

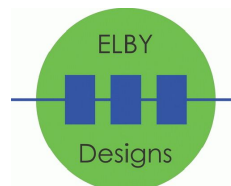
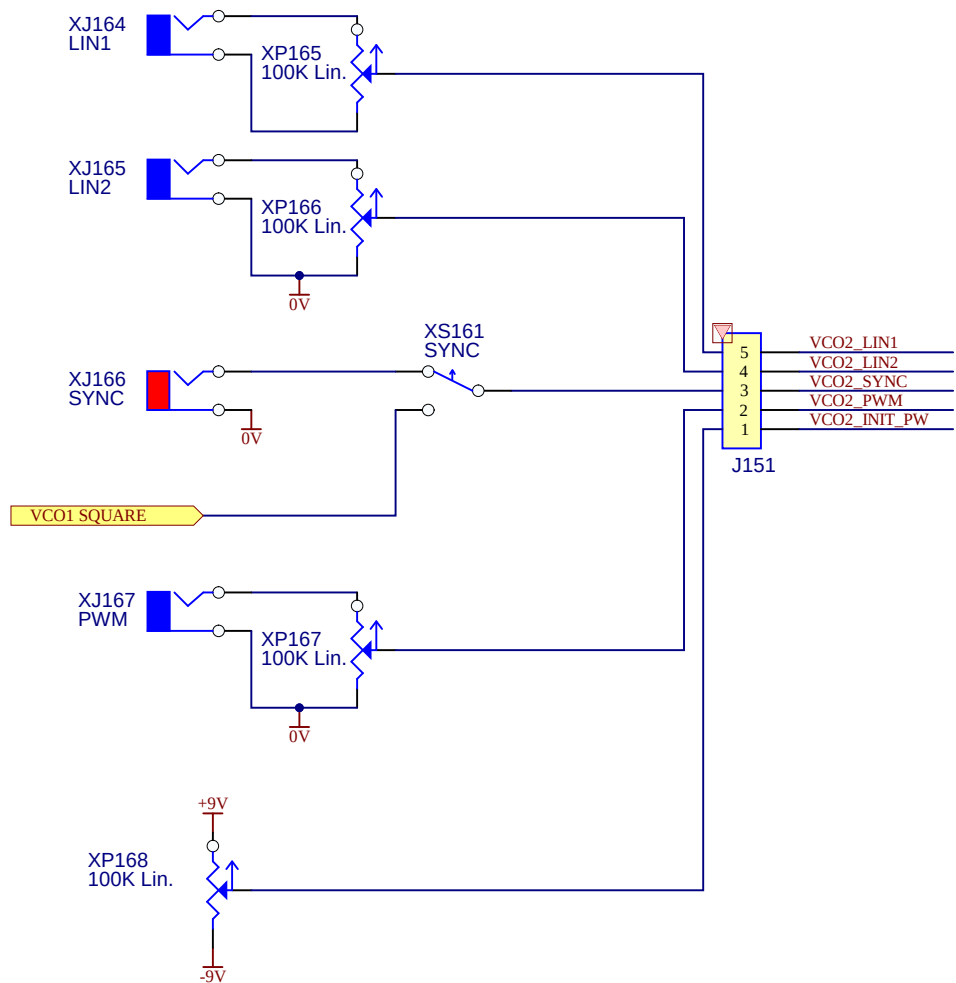
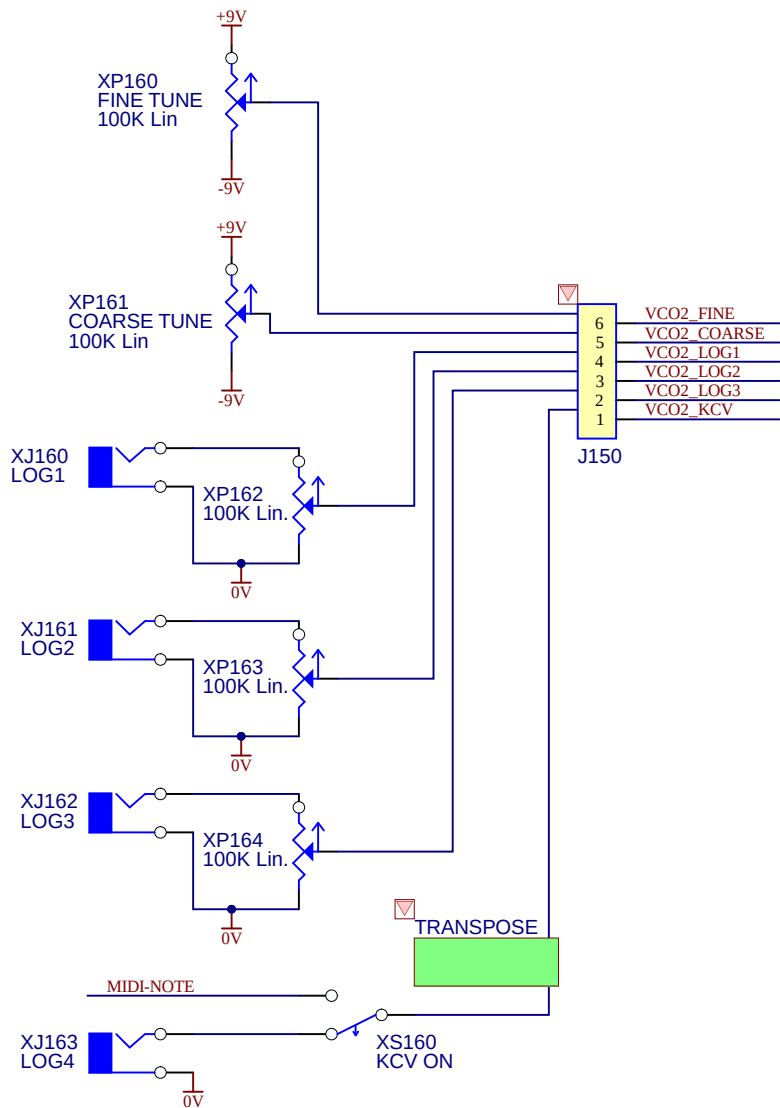


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ASM-2 VCO 2 Block Diagram

Size A4	FCSM No. 19/01/2020	DWG No. vco2.schdoc	Rev 2.3
Scale	Laurie Biddulph		Sheet 25 of 31

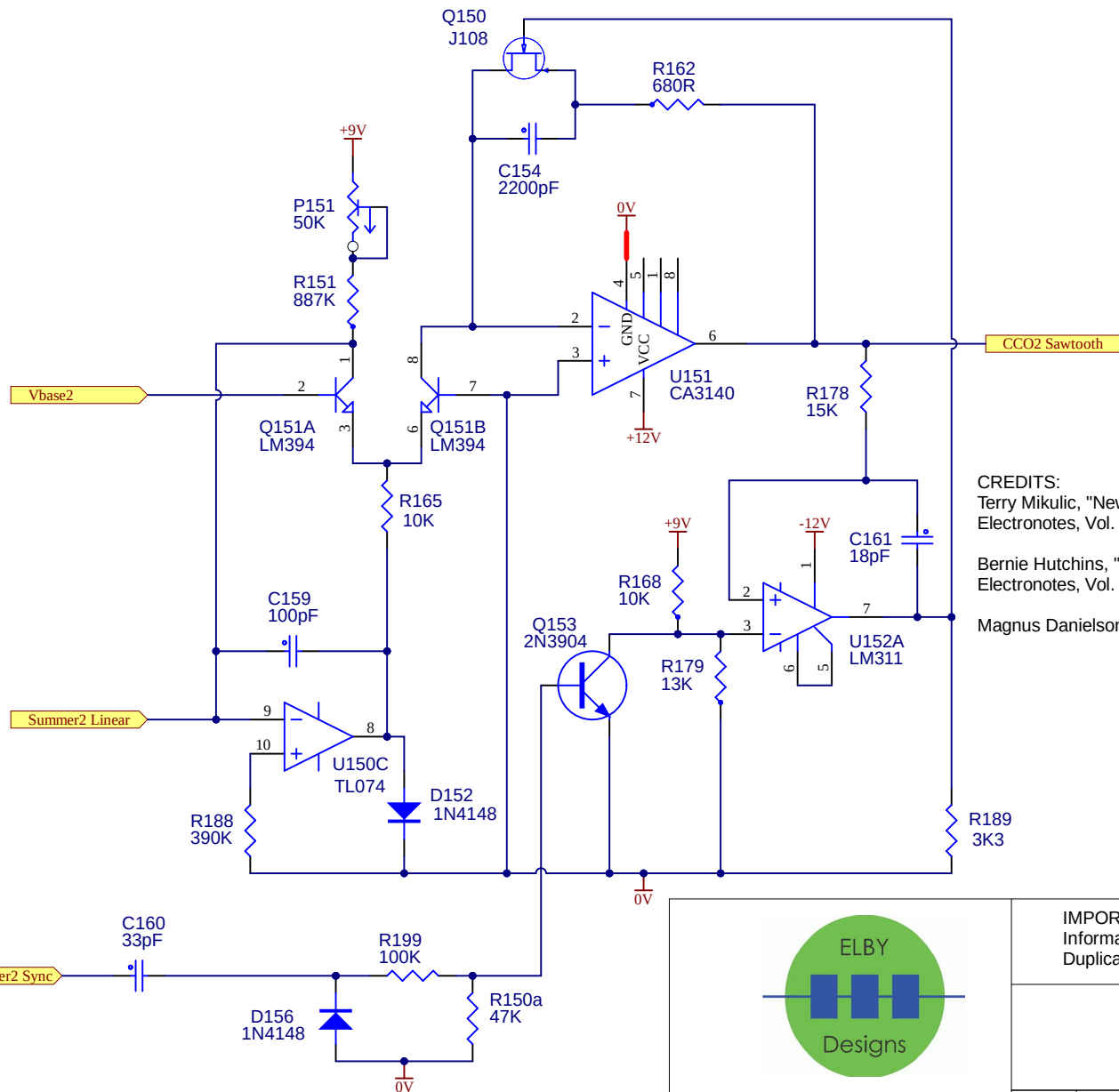


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ASM-2 VCO 2 - Panel Components

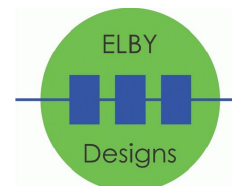
Size A4	FCSM No. 19/01/2020	DWG No. vco2-panel.schdoc	Rev 2.3
Scale	Laurie Biddulph	Sheet 26 of 31	



CREDITS:
Terry Mikulic, "New Design Ideas for Voltage-Controlled Oscillators"
Electronotes, Vol. 8, No. 62, Feb. 1976, pp 13-15

Bernie Hutchins, "The ENS-76 Home-Built Synthesizer System - Part 7, VCO Options"
Electronotes, Vol. 9, No. 75, March 1977, pp 3-10

Magnus Danielson, "Refinements to the ASM-1 VCO"



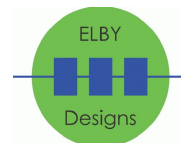
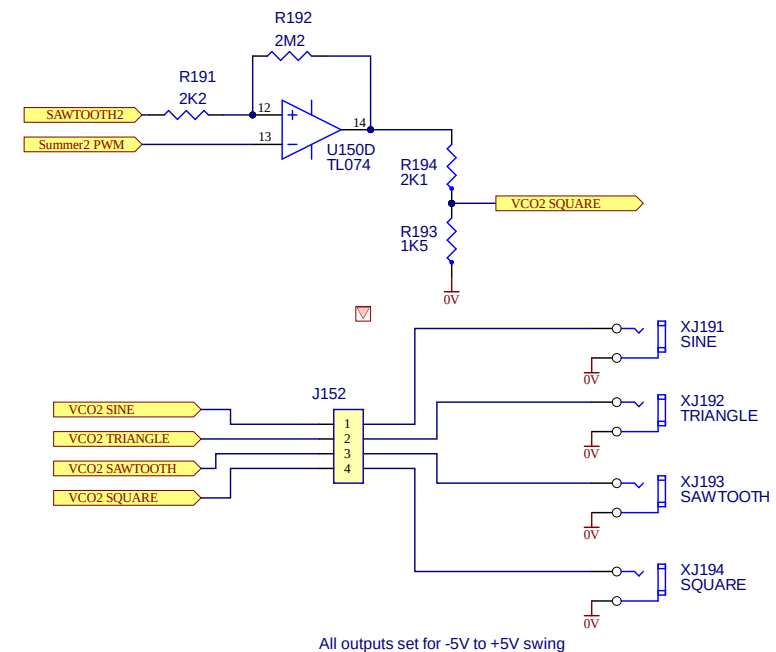
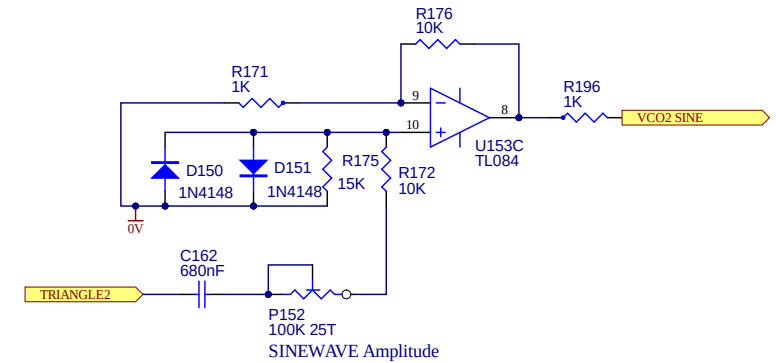
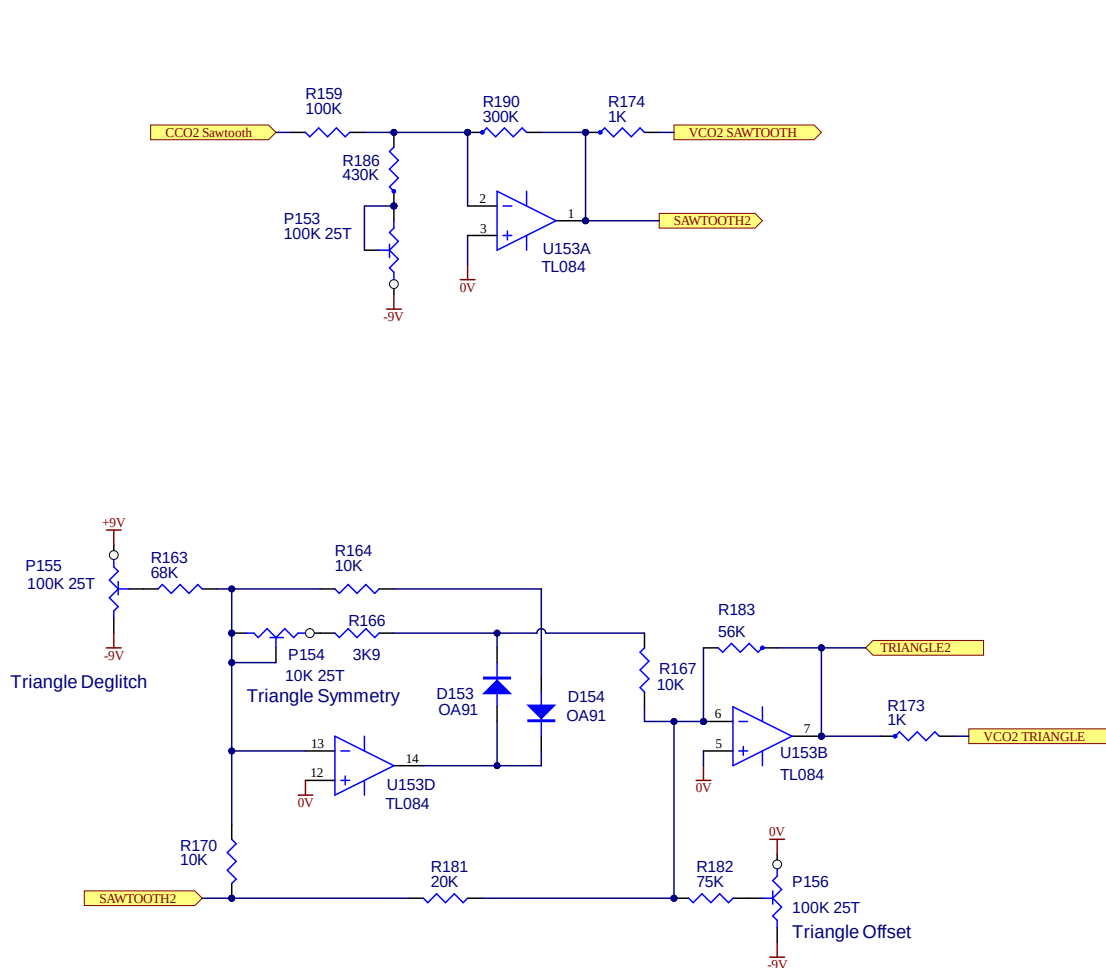
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ASM-2

VCO 2 - Current-Controlled Oscillator

Size A4	FCSM No. 19/01/2020	DWG No. vco2-cco.schdoc	Rev 2
Scale	Laurie Biddulph		Sheet 28 of 29

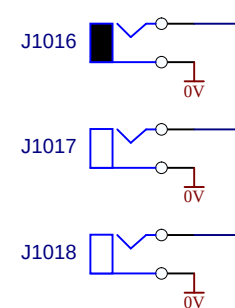
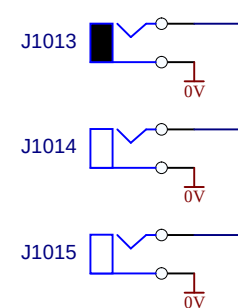
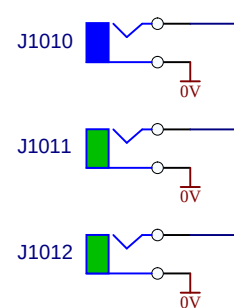
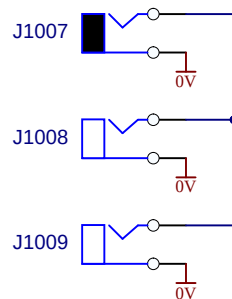
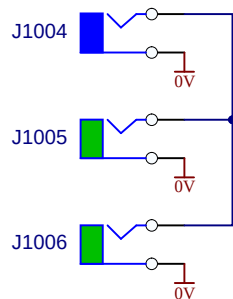
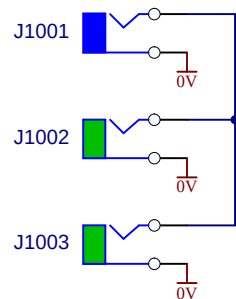


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ASM-2 VCO 2 - Wave Shaper Section

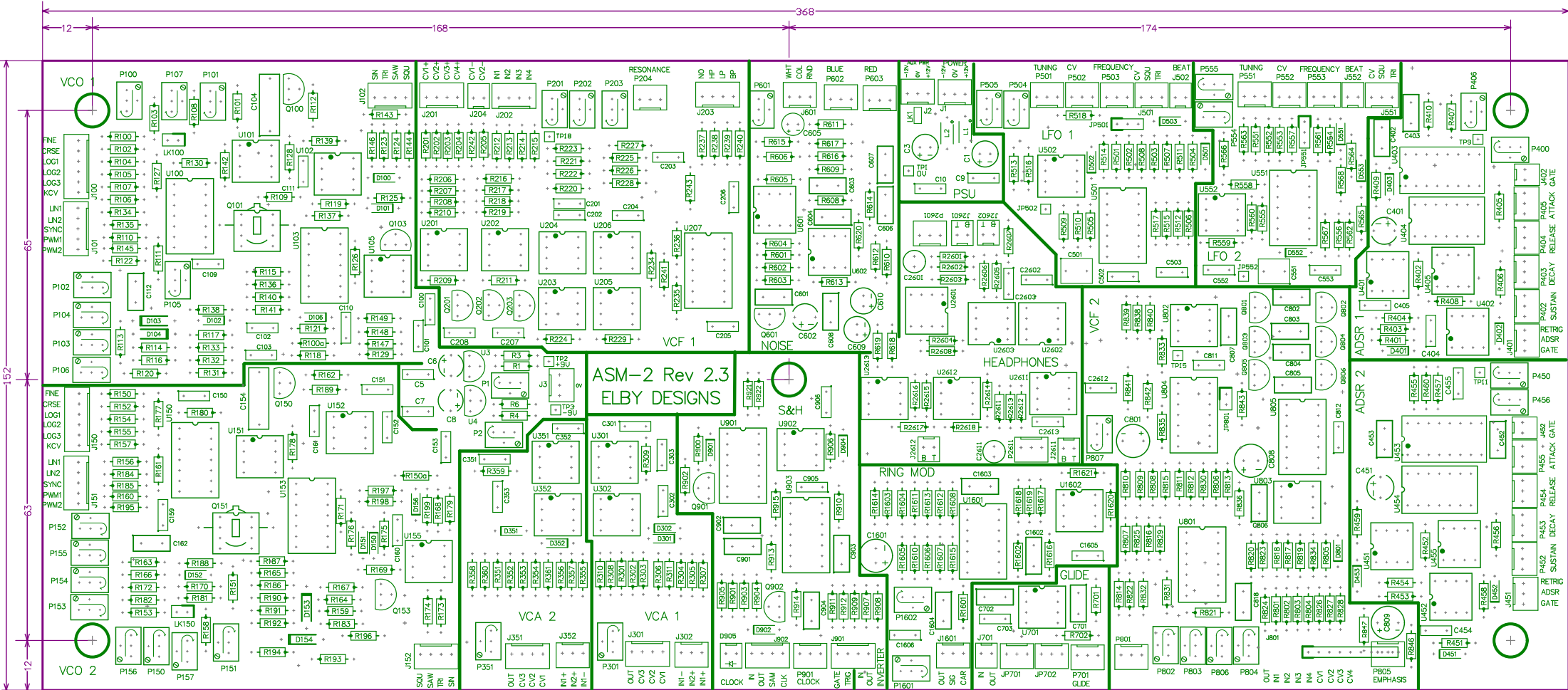
Size B	FCSM No. 19/01/2020	DWG No. vco2-shape.schdoc	Rev 2.3
Scale	Laurie Biddulph	Sheet 29 of 31	



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ASM 2 Multiples

Size A4	FCSM No.	DWG No. multiples.schdoc		Rev 2.3
Scale 19/01/2020	Laurie Biddulph		Sheet 31 of 31	



Origin 0,0

U3 & U4 orientation is incorrect C901 has been replaced with a RESISTOR.
Stand it on end to fit the footprint

