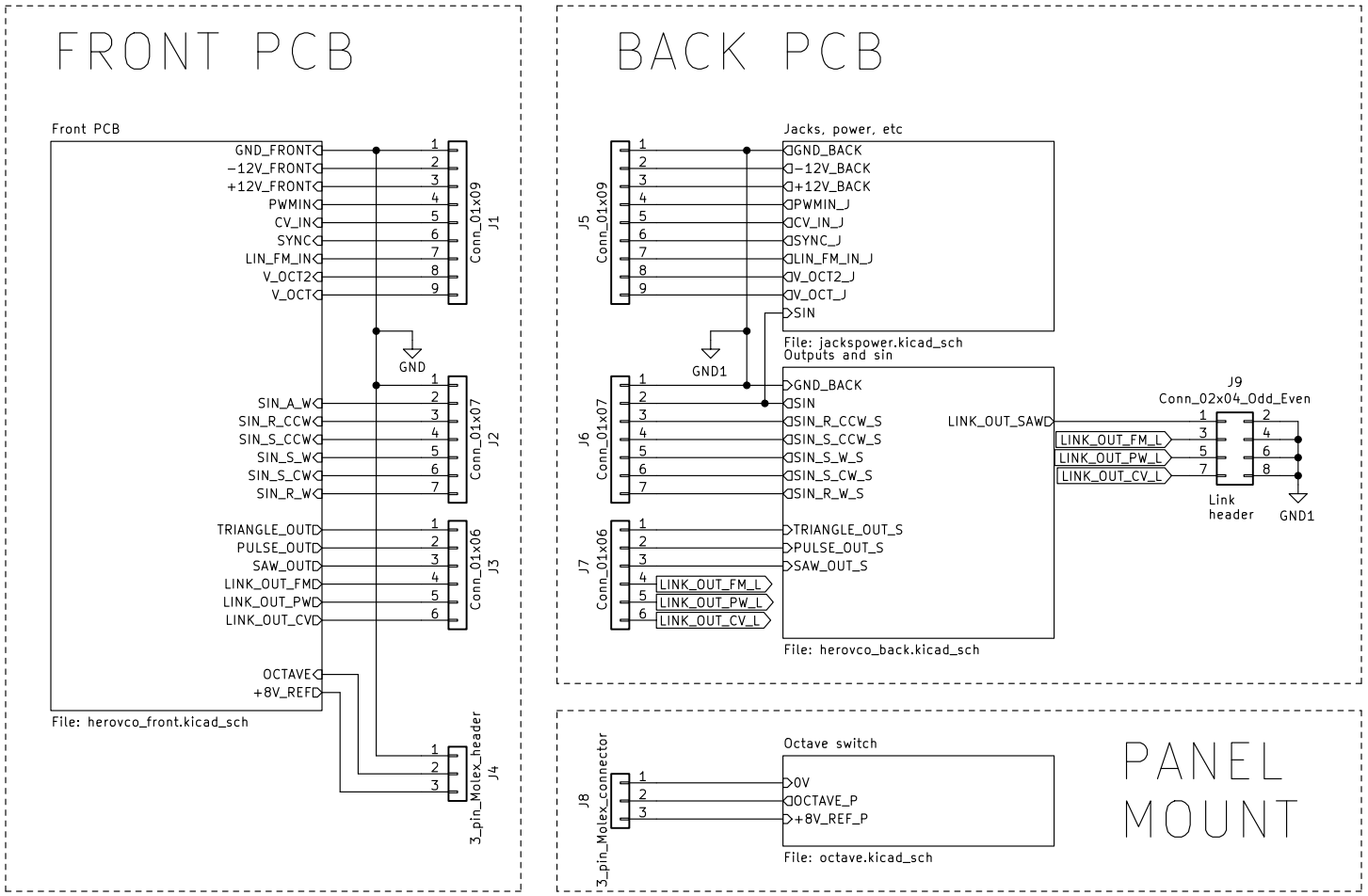
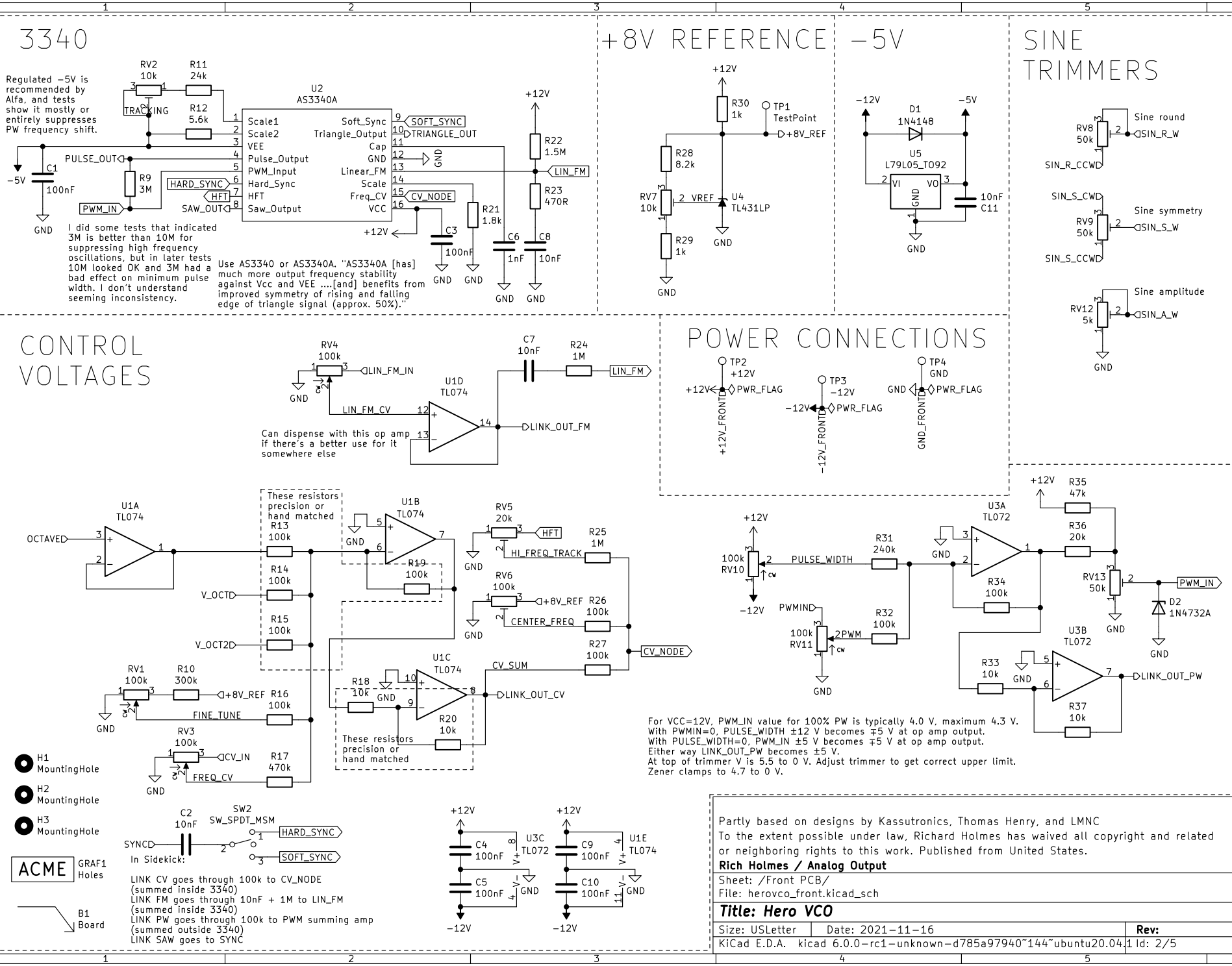


Rich Holmes / Analog Output

Sheet: /
File: herovco.kicad_sch

Title: Hero VCO

Size: USLetter	Date: 2021−11−16	**Rev:**
KiCad E.D.A. kicad 6.0.0−rc1−unknown−d785a97940~144~ubuntu20.04.1		Id: 1/5


3340
Regulated −5V is recommended by Alfa, and tests show it mostly or entirely suppresses PW frequency shift.
I did some tests that indicated 3M is better than 10M for suppressing high frequency oscillations, but in later tests 10M looked OK and 3M had a bad effect on minimum pulse width. I don't understand seeming inconsistency.
Use AS3340 or AS3340A. "AS3340A [has] much more output frequency stability against Vcc and VEE ....[and] benefits from improved symmetry of rising and falling edge of triangle signal (approx. 50%)."
U2
AS3340A
Scale1
Scale2
VEE
Pulse_Output
PWM_Input
Hard_Sync
HFT
Saw_Output
Soft_Sync
Triangle_Output
Cap
GND
Linear_FM
Scale
Freq_CV
VCC
SOFT_SYNC
TRIANGLE_OUT
CV_NODE
LIN_FM
PULSE_OUT
HARD_SYNC
SAW_OUT
PWM_IN
TRACKING
RV2 10k
R11 24k
R12 5.6k
R9 3M
C1 100nF
R22 1.5M
R23 470R
R21 1.8k
C3 100nF
C6 1nF
C8 10nF
+8V REFERENCE
R30 1k
TP1 TestPoint
+8V_REF
R28 8.2k
RV7 10k
VREF
U4 TL431LP
R29 1k
−5V
D1 1N4148
U5 L79L05_TO92
VI
VO
C11 10nF
SINE TRIMMERS
Sine round
RV8 50k
SIN_R_W
SIN_R_CCW
Sine symmetry
RV9 50k
SIN_S_W
SIN_S_CW
SIN_S_CCW
Sine amplitude
RV12 5k
SIN_A_W
CONTROL VOLTAGES
RV4 100k
LIN_FM_IN
C7 10nF
R24 1M
LIN_FM
U1D TL074
LIN_FM_CV
LINK_OUT_FM
Can dispense with this op amp if there's a better use for it somewhere else
POWER CONNECTIONS
TP2 +12V
TP3 −12V
TP4 GND
PWR_FLAG
+12V_FRONT
−12V_FRONT
GND_FRONT
U1A TL074
OCTAVE
These resistors precision or hand matched
R13 100k
R14 100k
R15 100k
R19 100k
U1B TL074
V_OCT
V_OCT2
RV5 20k
HFT
R25 1M
HI_FREQ_TRACK
RV6 100k
+8V_REF
R26 100k
CENTER_FREQ
R27 100k
CV_SUM
CV_NODE
U1C TL074
R18 10k
R20 10k
LINK_OUT_CV
These resistors precision or hand matched
RV1 100k
R10 300k
R16 100k
FINE_TUNE
RV3 100k
CV_IN
R17 470k
FREQ_CV
U3A TL072
R35 47k
R36 20k
RV10 100k
PULSE_WIDTH
R31 240k
R34 100k
RV13 50k
PWM_IN
D2 1N4732A
RV11 100k
PWMIN
2PWM
R32 100k
U3B TL072
R33 10k
R37 10k
LINK_OUT_PW
For VCC=12V, PWM_IN value for 100% PW is typically 4.0 V, maximum 4.3 V.
With PWMIN=0, PULSE_WIDTH ±12 V becomes ∓5 V at op amp output.
With PULSE_WIDTH=0, PWM_IN ±5 V becomes ∓5 V at op amp output.
Either way LINK_OUT_PW becomes ±5 V.
At top of trimmer V is 5.5 to 0 V. Adjust trimmer to get correct upper limit.
Zener clamps to 4.7 to 0 V.
H1 MountingHole
H2 MountingHole
H3 MountingHole
ACME GRAF1 Holes
B1 Board
C2 10nF
SW2 SW_SPDT_MSM
SYNC
HARD_SYNC
SOFT_SYNC
In Sidekick:
LINK CV goes through 100k to CV_NODE (summed inside 3340)
LINK FM goes through 10nF + 1M to LIN_FM (summed inside 3340)
LINK PW goes through 100k to PWM summing amp (summed outside 3340)
LINK SAW goes to SYNC
U3C TL072
C4 100nF
C5 100nF
U1E TL074
C9 100nF
C10 100nF
Partly based on designs by Kassutronics, Thomas Henry, and LMNC
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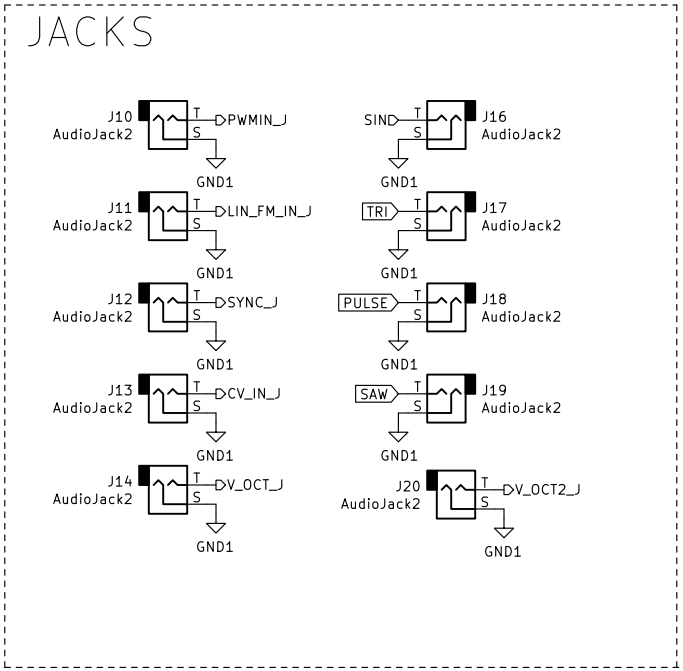
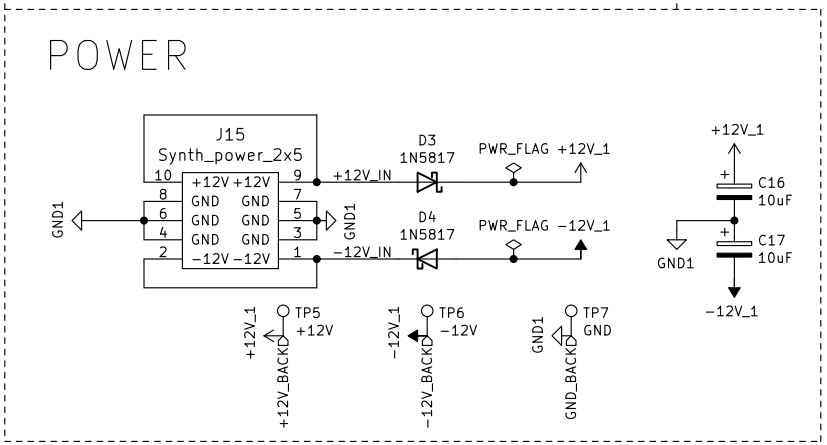
Rich Holmes / Analog Output
Sheet: /Front PCB/
File: herovco_front.kicad_sch
Title: Hero VCO
Size: USLetter
Date: 2021−11−16
Rev:
KiCad E.D.A. kicad 6.0.0−rc1−unknown−d785a97940~144~ubuntu20.04.1
Id: 2/5





H4 MountingHole
H5 MountingHole
H6 MountingHole

ACME GRAF2 Holes
ACME GRAF3 AO logo
ACME GRAF4 CC0 logo

B2 Board

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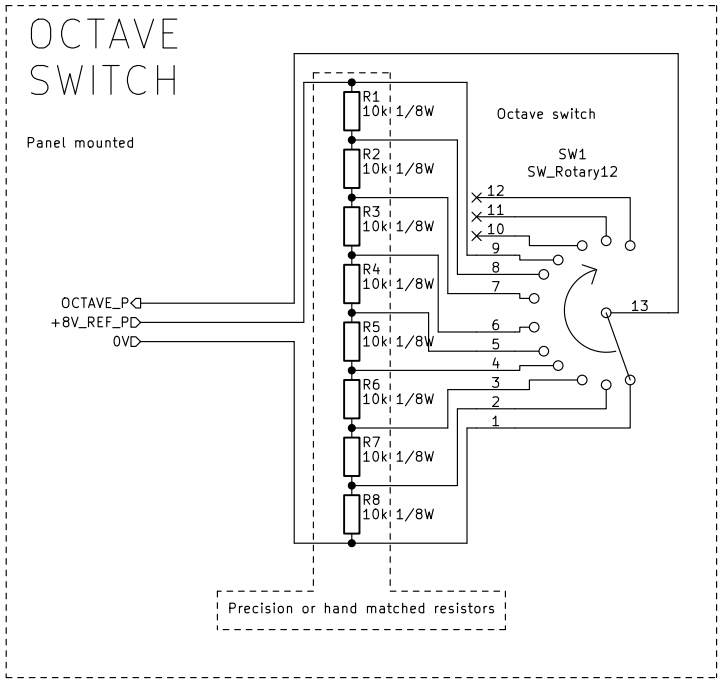
Sheet: /Jacks, power, etc/
File: jackspower.kicad_sch

Title: Hero VCO

Size: USLetter	Date: 2021-11-16	**Rev:**
KiCad E.D.A. kicad 6.0.0-rc1-unknown-d785a97940~144~ubuntu20.04.1		Id: 3/5



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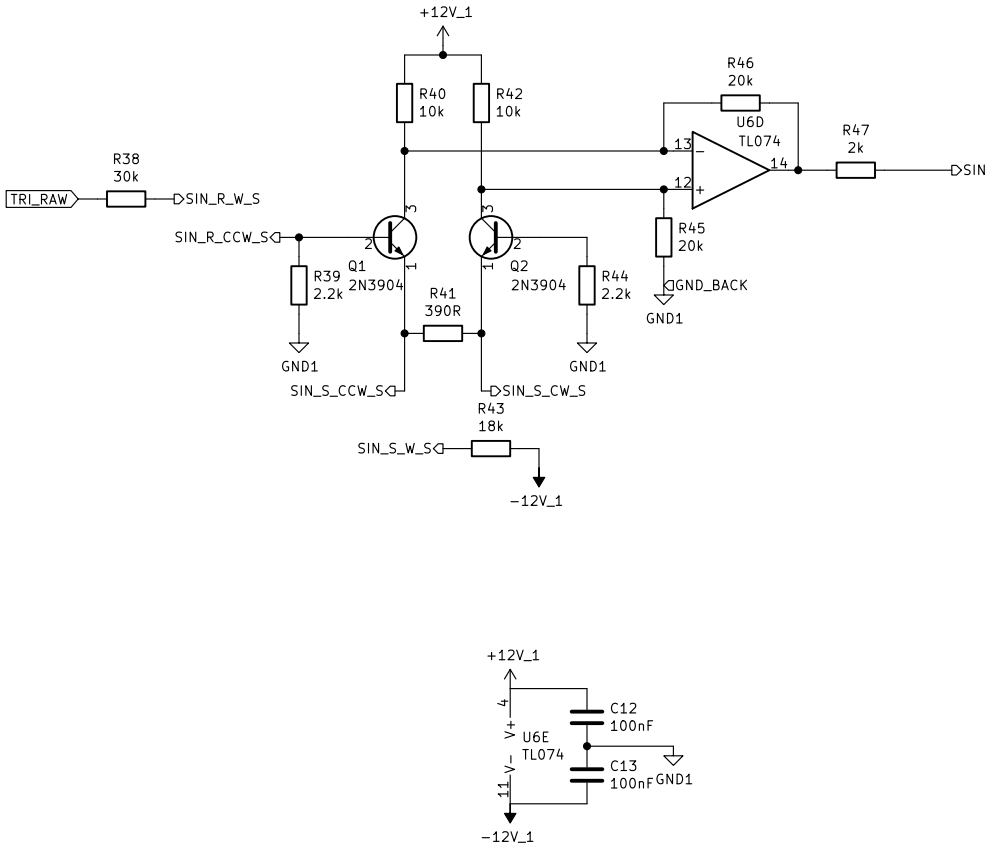
Sheet: /Octave switch/
File: octave.kicad_sch

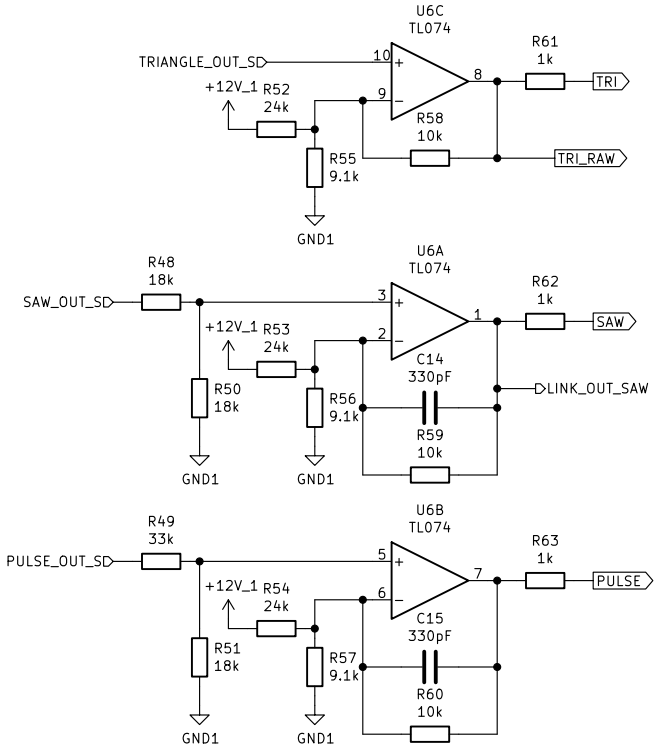
Title: Hero VCO

Size: USLetter	Date: 2021-11-16	**Rev:**
KiCad E.D.A. kicad 6.0.0-rc1-unknown-d785a97940~144~ubuntu20.04.1		Id: 4/5

SINE SHAPING



OUTPUT CONDITIONING



Kassutronics used 100k feedback resistors and similarly large values for voltage divider resistors. AS3340 datasheet calls for a 51k pulldown on pin 4, so I reduced the voltage divider resistances by a factor ~ (51k/(180k+100k)). Op amp resistances were reduced by a factor of 10. Then stabilization caps were increased more to make 1/(2πRC) ~ 50kHz.

Rich Holmes / Analog Output

Sheet: /Outputs and sin/
File: herovco_back.kicad_sch

Title: Hero VCO

Size: USLetter	Date: 2021-11-16	**Rev:**
KiCad E.D.A. kicad 6.0.0-rc1-unknown-d785a97940~144~ubuntu20.04.1		Id: 5/5