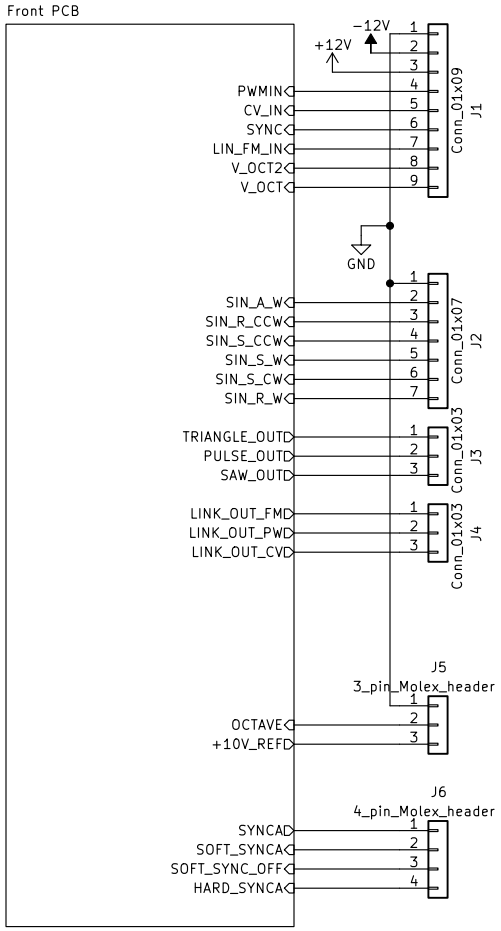
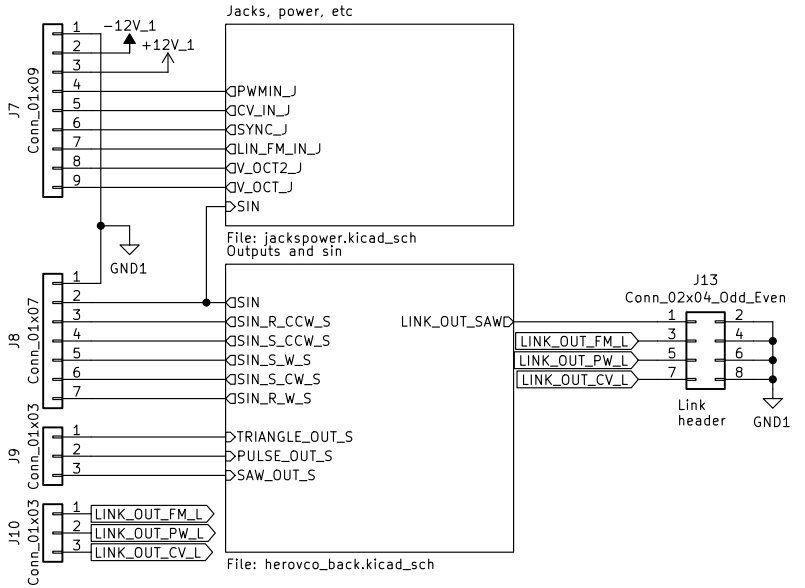
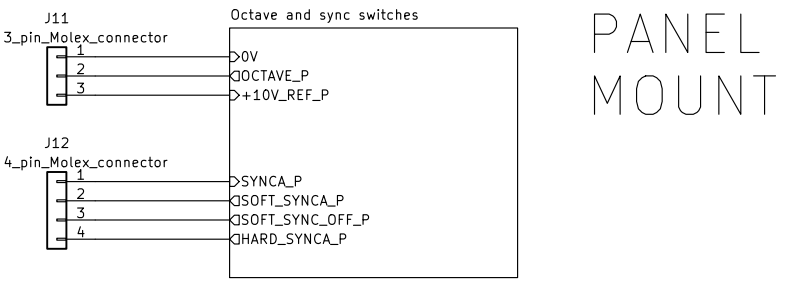
FRONT PCB



BACK PCB





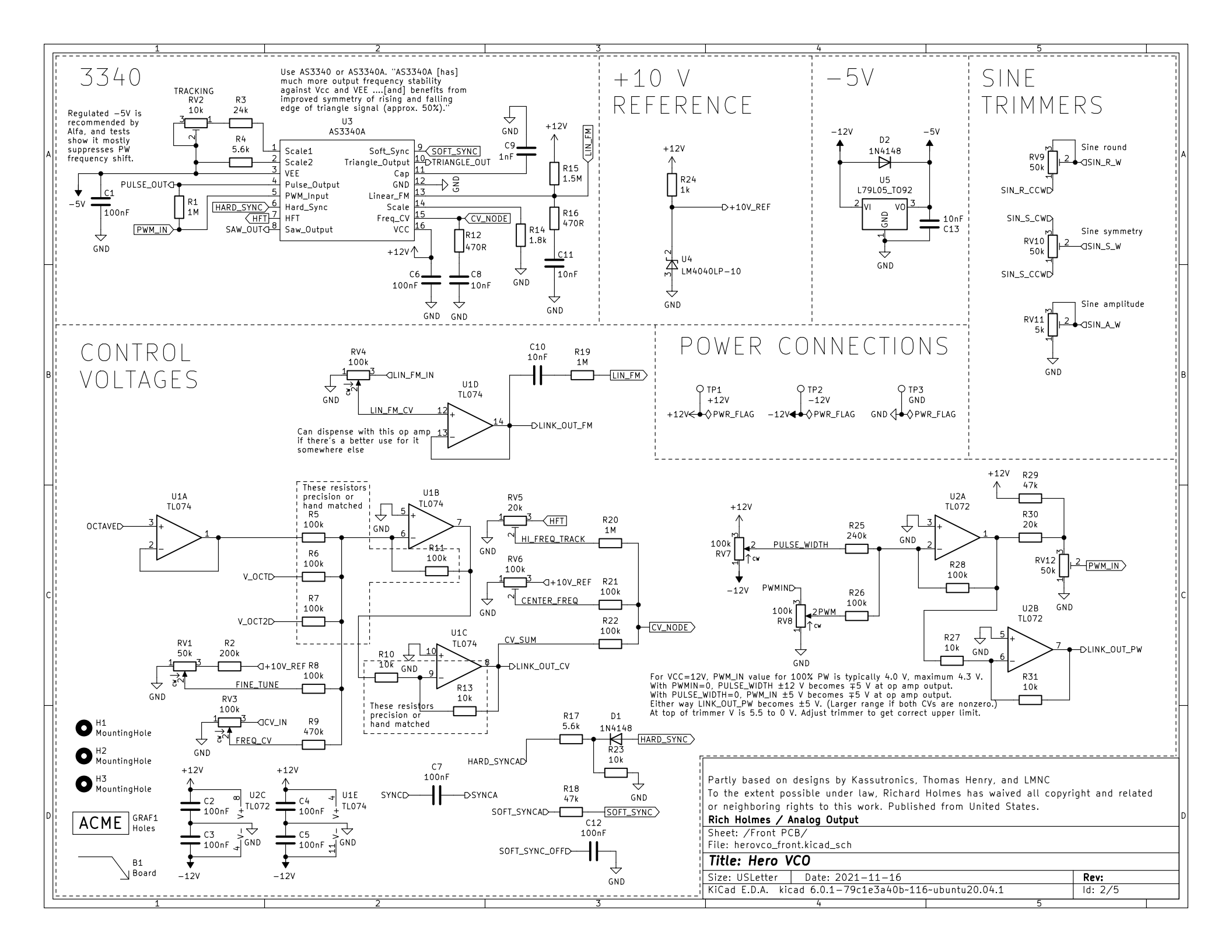
PANEL MOUNT

Rich Holmes / Analog Output

Sheet: /
File: herovco.kicad_sch

Title: Hero VCO

Size: USLetter	Date: 2021−11−16	**Rev:**
KiCad E.D.A. kicad 6.0.1−79c1e3a40b-116~ubuntu20.04.1		Id: 1/5


3340
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%)."
Regulated −5V is recommended by Alfa, and tests show it mostly suppresses PW frequency shift.
TRACKING
RV2 10k
R3 24k
R4 5.6k
U3 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
HFT
SAW_OUT
PWM_IN
C1 100nF
R1 1M
C6 100nF
C8 10nF
C9 1nF
R12 470R
R14 1.8k
R15 1.5M
R16 470R
C11 10nF
+10 V REFERENCE
R24 1k
+10V_REF
U4 LM4040LP−10
−5V
D2 1N4148
U5 L79L05_TO92
VI
VO
C13 10nF
SINE TRIMMERS
Sine round
RV9 50k
SIN_R_W
SIN_R_CCW
Sine symmetry
RV10 50k
SIN_S_W
SIN_S_CW
SIN_S_CCW
Sine amplitude
RV11 5k
SIN_A_W
CONTROL VOLTAGES
RV4 100k
LIN_FM_IN
LIN_FM_CV
U1D TL074
C10 10nF
R19 1M
LIN_FM
LINK_OUT_FM
Can dispense with this op amp if there's a better use for it somewhere else
POWER CONNECTIONS
TP1 +12V
TP2 −12V
TP3 GND
PWR_FLAG
U1A TL074
OCTAVE
These resistors precision or hand matched
R5 100k
R6 100k
R7 100k
U1B TL074
R11 100k
V_OCT
V_OCT2
RV5 20k
HFT
HI_FREQ_TRACK
R20 1M
RV6 100k
CENTER_FREQ
R21 100k
R22 100k
CV_NODE
RV1 50k
R2 200k
FINE_TUNE
R8 100k
RV3 100k
CV_IN
FREQ_CV
R9 470k
U1C TL074
R10 10k
R13 10k
CV_SUM
LINK_OUT_CV
These resistors precision or hand matched
U2A TL072
R25 240k
PULSE_WIDTH
RV7 100k
R26 100k
PWMIN
RV8 100k
2PWM
R28 100k
R29 47k
R30 20k
RV12 50k
U2B TL072
R27 10k
R31 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. (Larger range if both CVs are nonzero.)
At top of trimmer V is 5.5 to 0 V. Adjust trimmer to get correct upper limit.
H1 MountingHole
H2 MountingHole
H3 MountingHole
ACME GRAF1 Holes
B1 Board
U2C TL072
U1E TL074
C2 100nF
C3 100nF
C4 100nF
C5 100nF
C7 100nF
SYNC
SYNCA
R17 5.6k
D1 1N4148
R23 10k
HARD_SYNCA
R18 47k
SOFT_SYNCA
C12 100nF
SOFT_SYNC_OFF
Partly based on designs by Kassutronics, Thomas Henry, and LMNC
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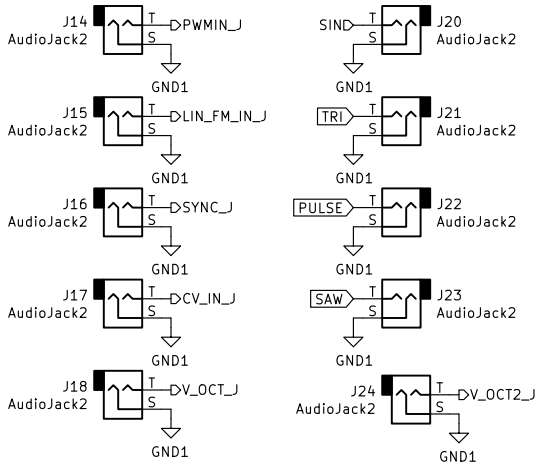
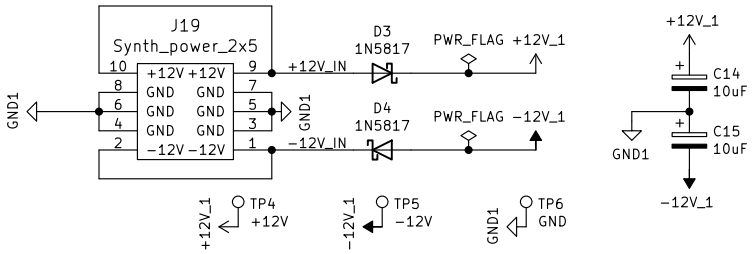
Rich Holmes / Analog Output
Sheet: /Front PCB/
File: herovco_front.kicad_sch
Title: Hero VCO
Size: USLetter
Date: 2021−11−16
Rev:
KiCad E.D.A. kicad 6.0.1−79c1e3a40b−116~ubuntu20.04.1
Id: 2/5

JACKS



POWER



H4 MountingHole
H5 MountingHole
H6 MountingHole

ACME GRAF2 Holes
ACME GRAF3 AO logo
ACME GRAF4 CC0 logo

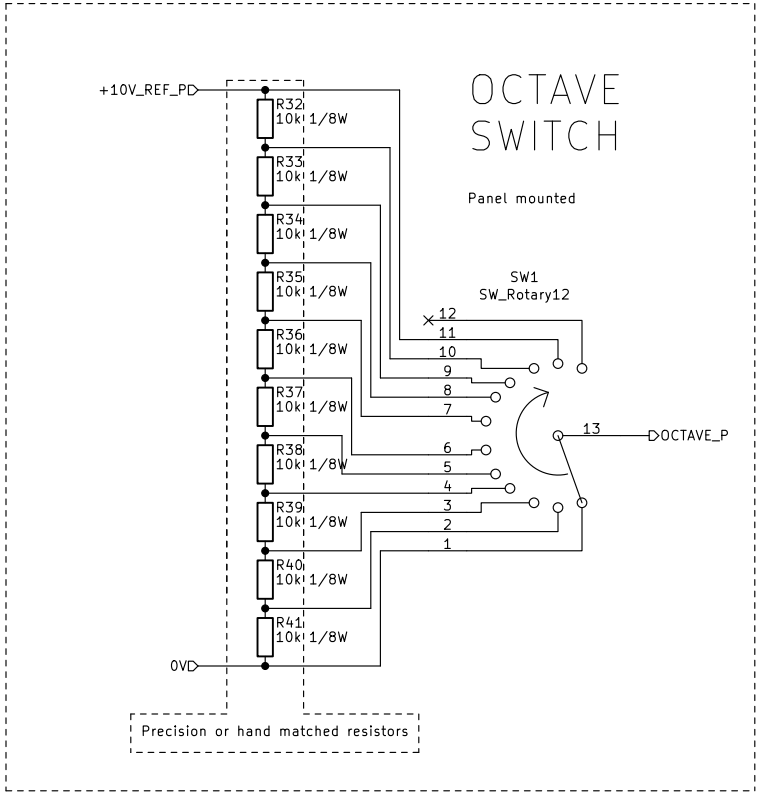
B2 Board

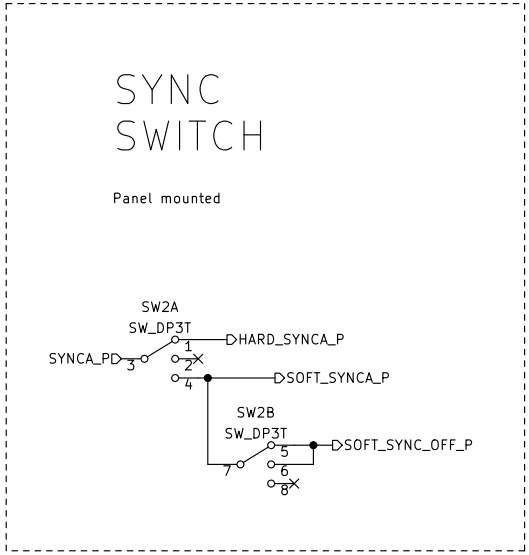
Rich Holmes / Analog Output

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

Title: Hero VCO

Size: USLetter	Date: 2021−11−16	**Rev:**
KiCad E.D.A. kicad 6.0.1−79c1e3a40b-116~ubuntu20.04.1		Id: 3/5





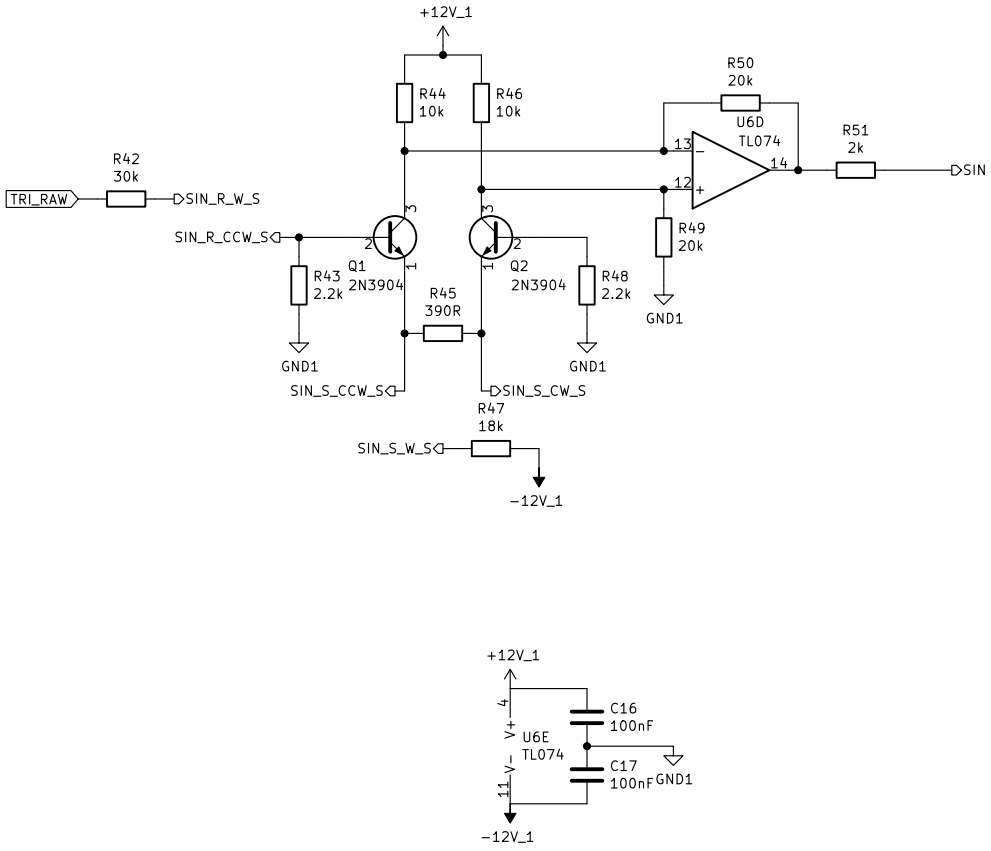
Rich Holmes / Analog Output

Sheet: /Octave and sync switches/
File: octave.kicad_sch

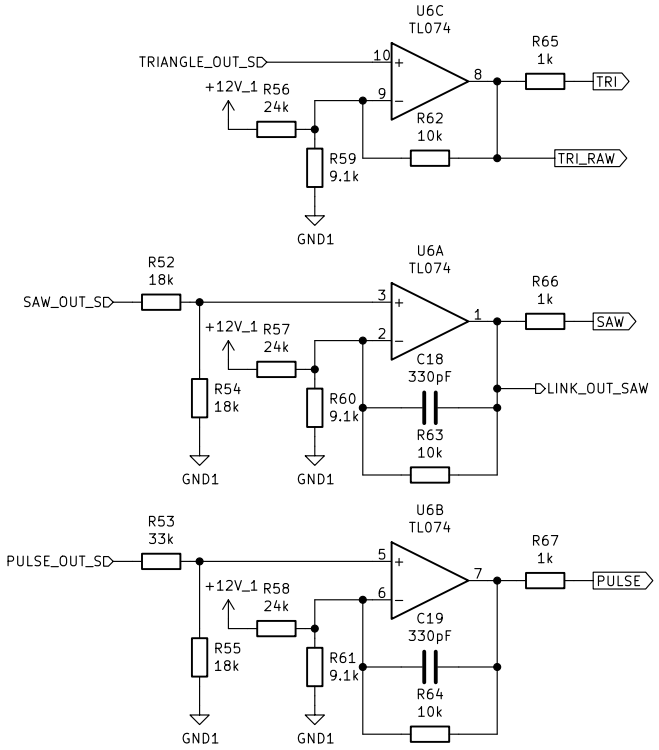
Title: Hero VCO

Size: USLetter	Date: 2021-11-16	**Rev:**
KiCad E.D.A. kicad 6.0.1-79c1e3a40b-116~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:**
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