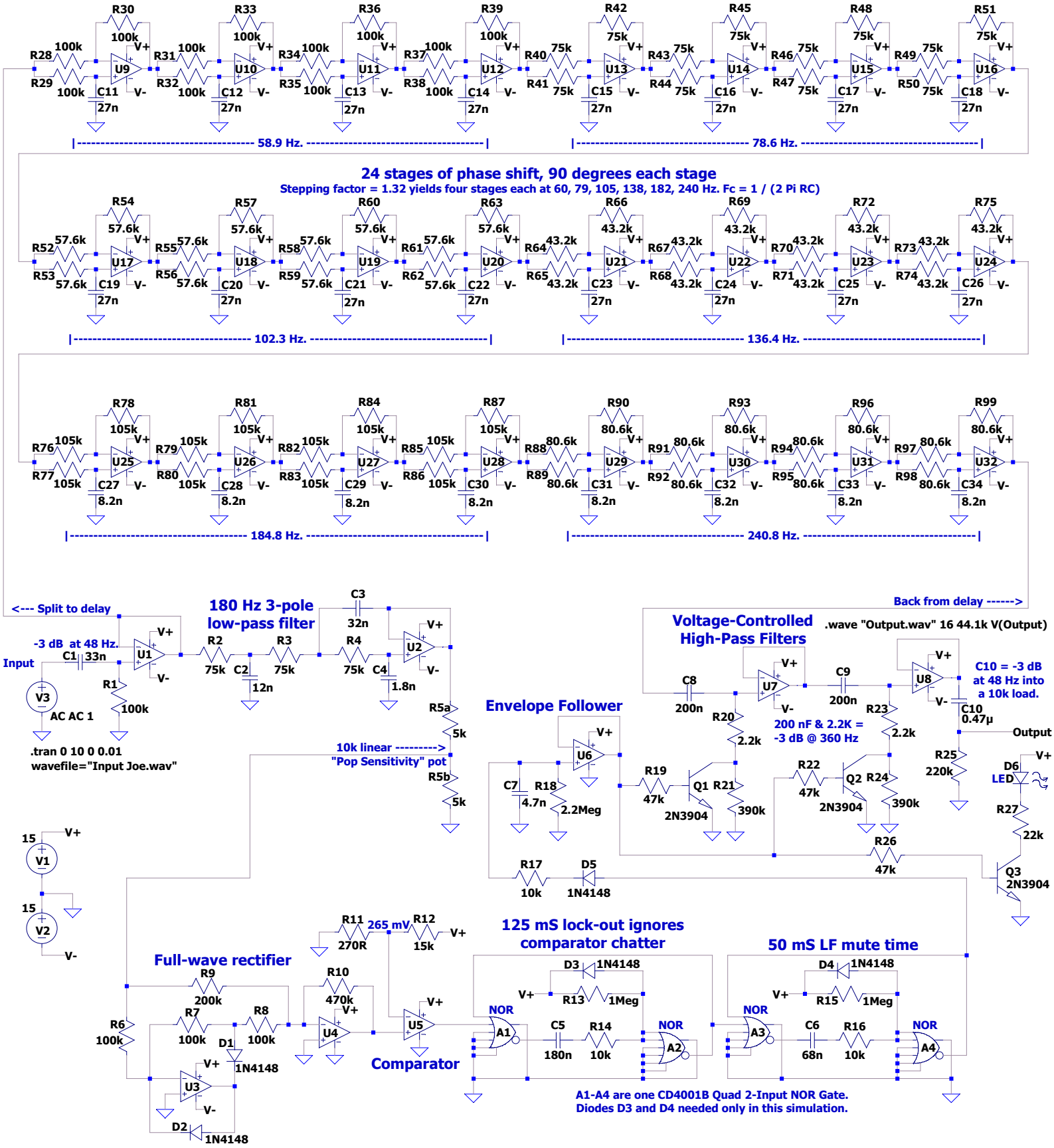
R30 100k
R28 100k
R29 100k
U9
C11 27n
R31 100k
R32 100k
U10
C12 27n
R33 100k
R34 100k
R35 100k
U11
C13 27n
R36 100k
R37 100k
R38 100k
U12
C14 27n
R39 100k
R40 75k
R41 75k
U13
C15 27n
R42 75k
R43 75k
R44 75k
U14
C16 27n
R45 75k
R46 75k
R47 75k
U15
C17 27n
R48 75k
R49 75k
R50 75k
U16
C18 27n
R51 75k
58.9 Hz.
78.6 Hz.
24 stages of phase shift, 90 degrees each stage
Stepping factor = 1.32 yields four stages each at 60, 79, 105, 138, 182, 240 Hz. Fc = 1 / (2 Pi RC)
R54 57.6k
R52 57.6k
R53 57.6k
U17
C19 27n
R55 57.6k
R56 57.6k
U18
C20 27n
R57 57.6k
R58 57.6k
R59 57.6k
U19
C21 27n
R60 57.6k
R61 57.6k
R62 57.6k
U20
C22 27n
R63 57.6k
R64 43.2k
R65 43.2k
U21
C23 27n
R66 43.2k
R67 43.2k
R68 43.2k
U22
C24 27n
R69 43.2k
R70 43.2k
R71 43.2k
U23
C25 27n
R72 43.2k
R73 43.2k
R74 43.2k
U24
C26 27n
R75 43.2k
102.3 Hz.
136.4 Hz.
R78 105k
R76 105k
R77 105k
U25
C27 8.2n
R79 105k
R80 105k
U26
C28 8.2n
R81 105k
R82 105k
R83 105k
U27
C29 8.2n
R84 105k
R85 105k
R86 105k
U28
C30 8.2n
R87 105k
R88 80.6k
R89 80.6k
U29
C31 8.2n
R90 80.6k
R91 80.6k
R92 80.6k
U30
C32 8.2n
R93 80.6k
R94 80.6k
R95 80.6k
U31
C33 8.2n
R96 80.6k
R97 80.6k
R98 80.6k
U32
C34 8.2n
R99 80.6k
184.8 Hz.
240.8 Hz.
<--- Split to delay
Back from delay ------>
-3 dB at 48 Hz.
Input
C1 33n
U1
R1 100k
V3
AC AC 1
.tran 0 10 0 0.01
wavefile="Input Joe.wav"
180 Hz 3-pole
low-pass filter
R2 75k
C2 12n
R3 75k
C3 32n
R4 75k
C4 1.8n
U2
R5a 5k
R5b 5k
10k linear --------->
"Pop Sensitivity" pot
Voltage-Controlled
High-Pass Filters
.wave "Output.wav" 16 44.1k V(Output)
C8 200n
U7
R20 2.2k
C9 200n
R23 2.2k
U8
C10 = -3 dB
at 48 Hz into
a 10k load.
C10 0.47µ
Output
200 nF & 2.2K =
-3 dB @ 360 Hz
Envelope Follower
U6
C7 4.7n
R18 2.2Meg
R19 47k
Q1 2N3904
R21 390k
R22 47k
Q2 2N3904
R24 390k
R25 220k
D6 LED
R27 22k
R26 47k
Q3 2N3904
R17 10k
D5 1N4148
15 V1
15 V2
R11 270R
265 mV
R12 15k
Full-wave rectifier
R9 200k
R6 100k
R7 100k
R8 100k
D1 1N4148
U3
D2 1N4148
R10 470k
U4
U5
Comparator
125 mS lock-out ignores
comparator chatter
D3 1N4148
R13 1Meg
NOR
A1
C5 180n
R14 10k
A2
50 mS LF mute time
D4 1N4148
R15 1Meg
A3
C6 68n
R16 10k
A4
A1-A4 are one CD4001B Quad 2-Input NOR Gate.
Diodes D3 and D4 needed only in this simulation.