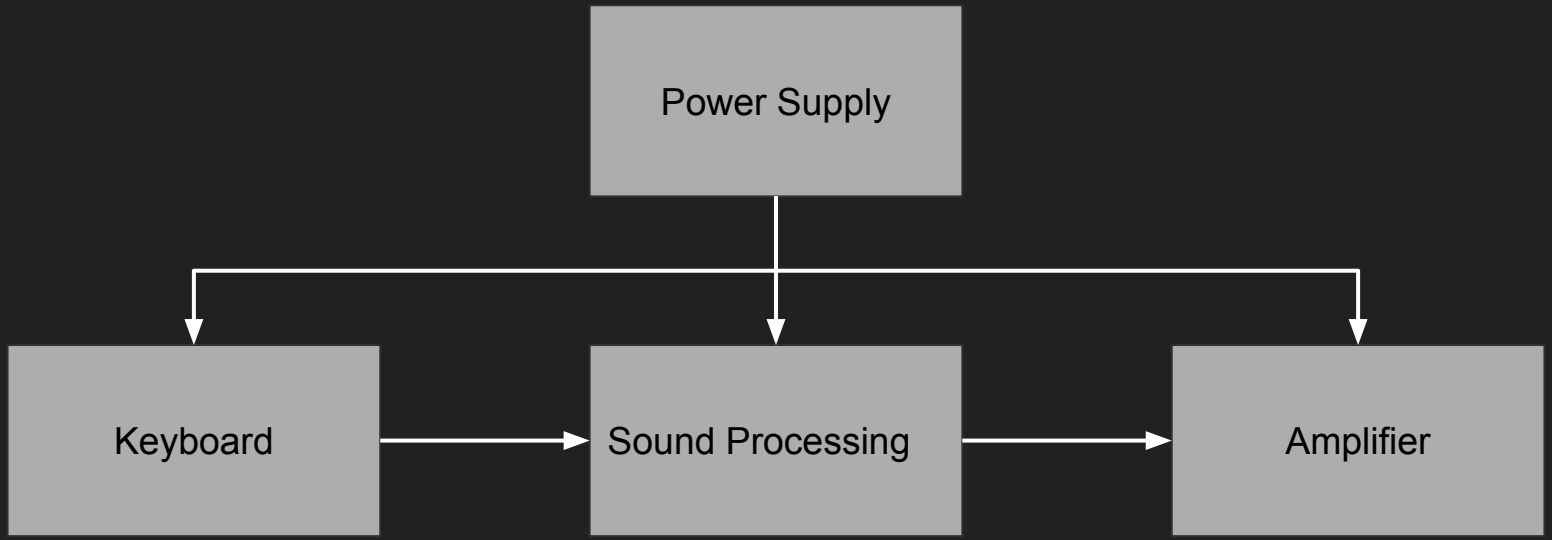
Analog Modular Synthesizer

Dominik Martinez

History

- Developed in the 1960s by Moog and other electronic researchers.
- *Modular* meant that the synthesizer had different components for handling different types of sound processing

Block Diagram



Power Supply

Want to take 120VAC ⟶ +-15VDC, +-25VDC, +5VDC

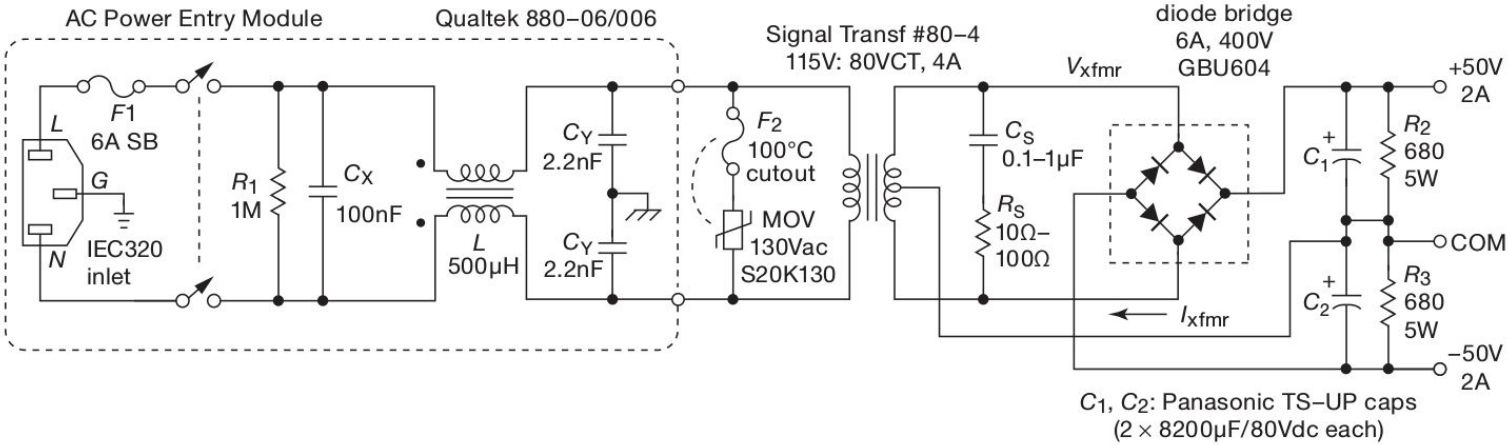
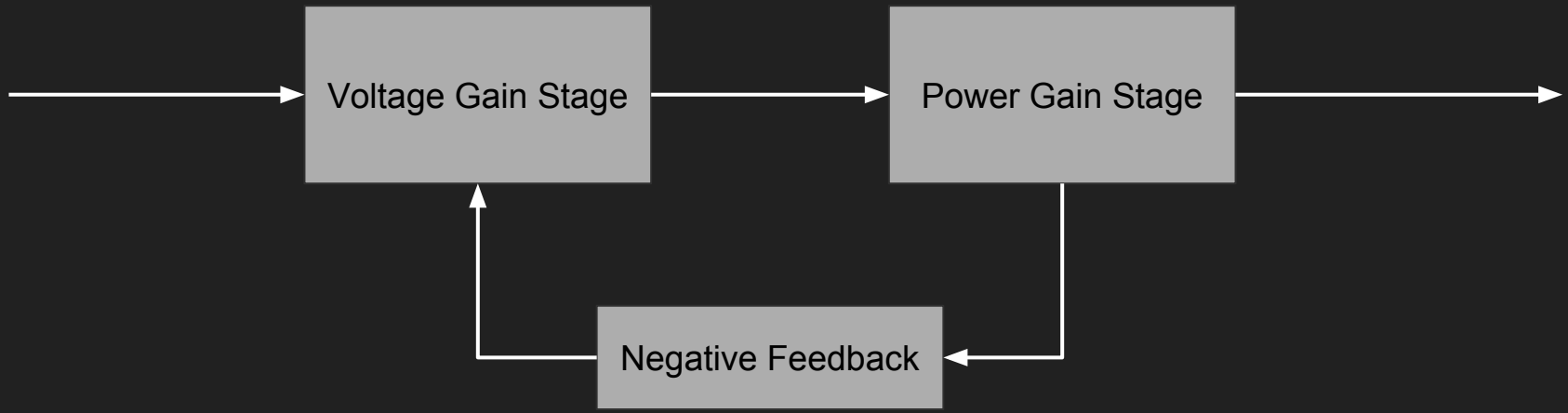


Figure 9.49. Unregulated ±50 V, 2 A power supply.

From *The Art of Electronics*, Horowitz and Hill

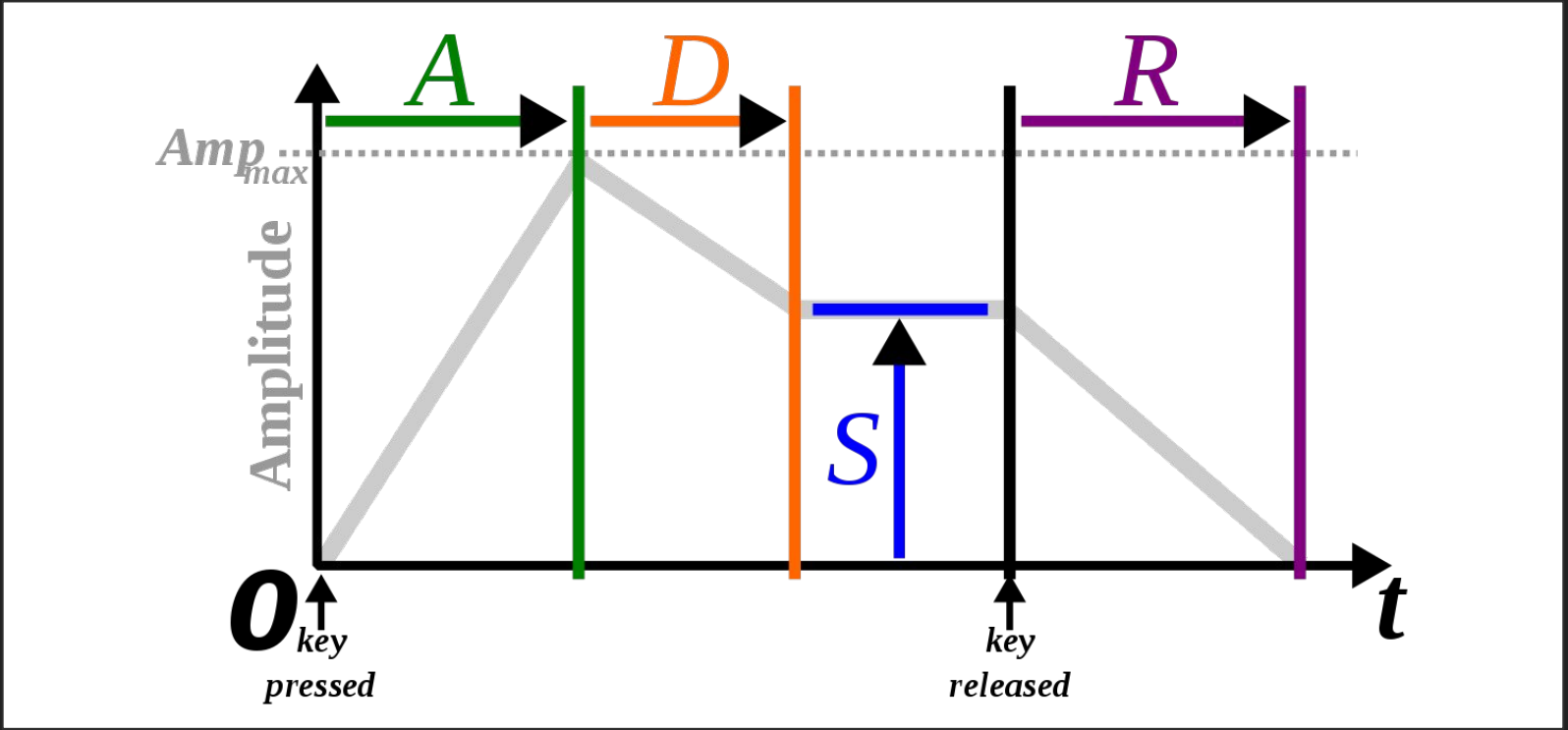
Class AB Amplifier



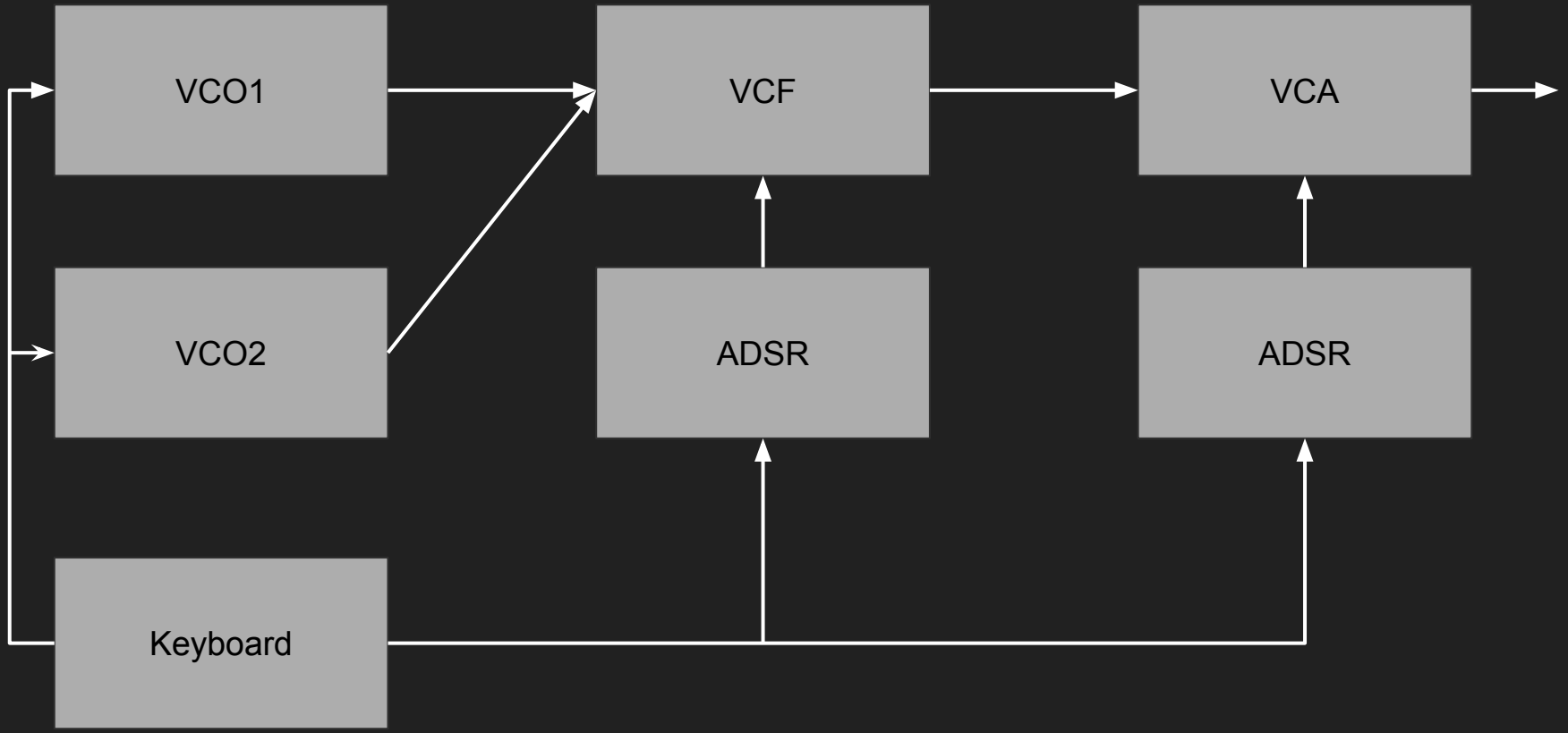
Modules

- VCO: Voltage Controlled Oscillator
  - Produces sound
- VCF: Voltage Controlled Filter
  - Controllable high pass, low pass, and band pass filter
- VCA: Voltage Controlled Amplifier
  - Allows modulation of the sound
- ADSR: Attack-Decay-Sustain-Release
  - Envelope generator
  - Attack, decay, sustain, release are the 4 main parameters for creating an envelope

Attack-Decay-Sustain-Release (ADSR)



Sound Processing Block Diagram



Voltage Controlled Oscillator (VCO)

Challenges:

- Linear voltage input to exponential musical output
- Multiple types of output waves: sine, triangle, ramp, pulse

Voltage Controlled Oscillators - Moog

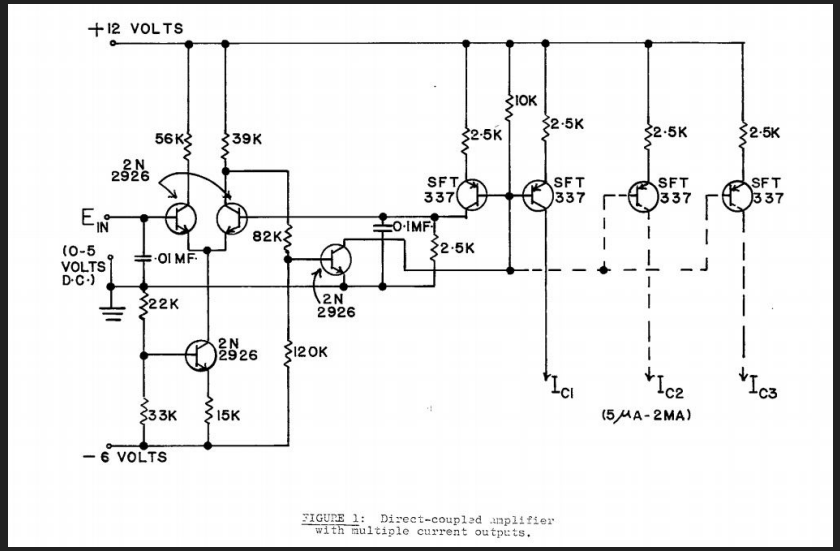


FIGURE 1: Direct-coupled amplifier with multiple current outputs.

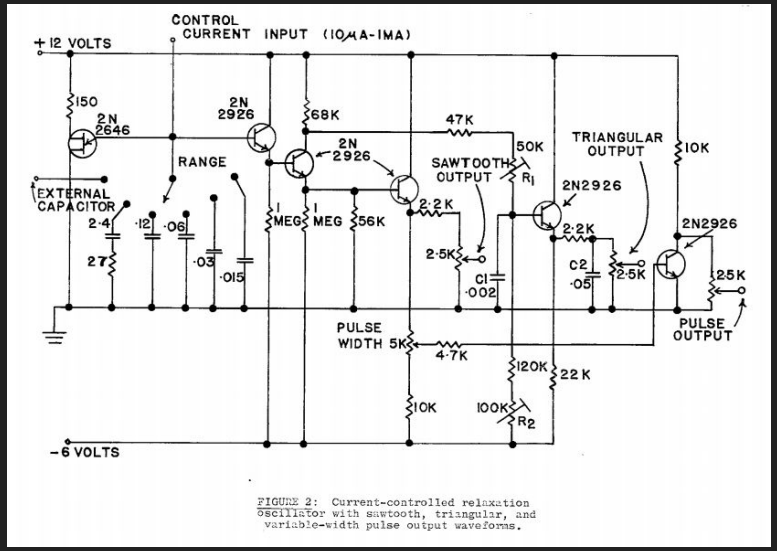
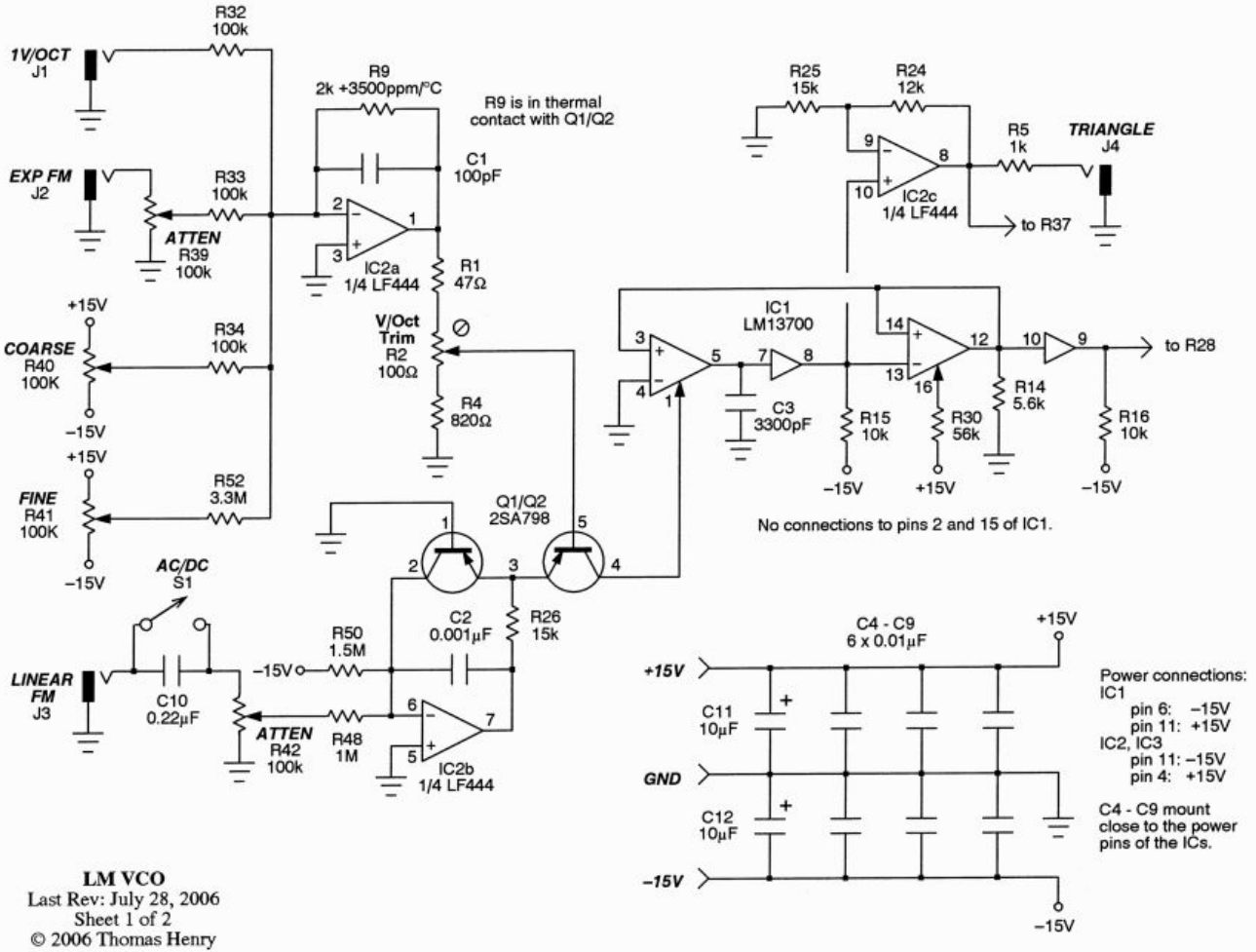
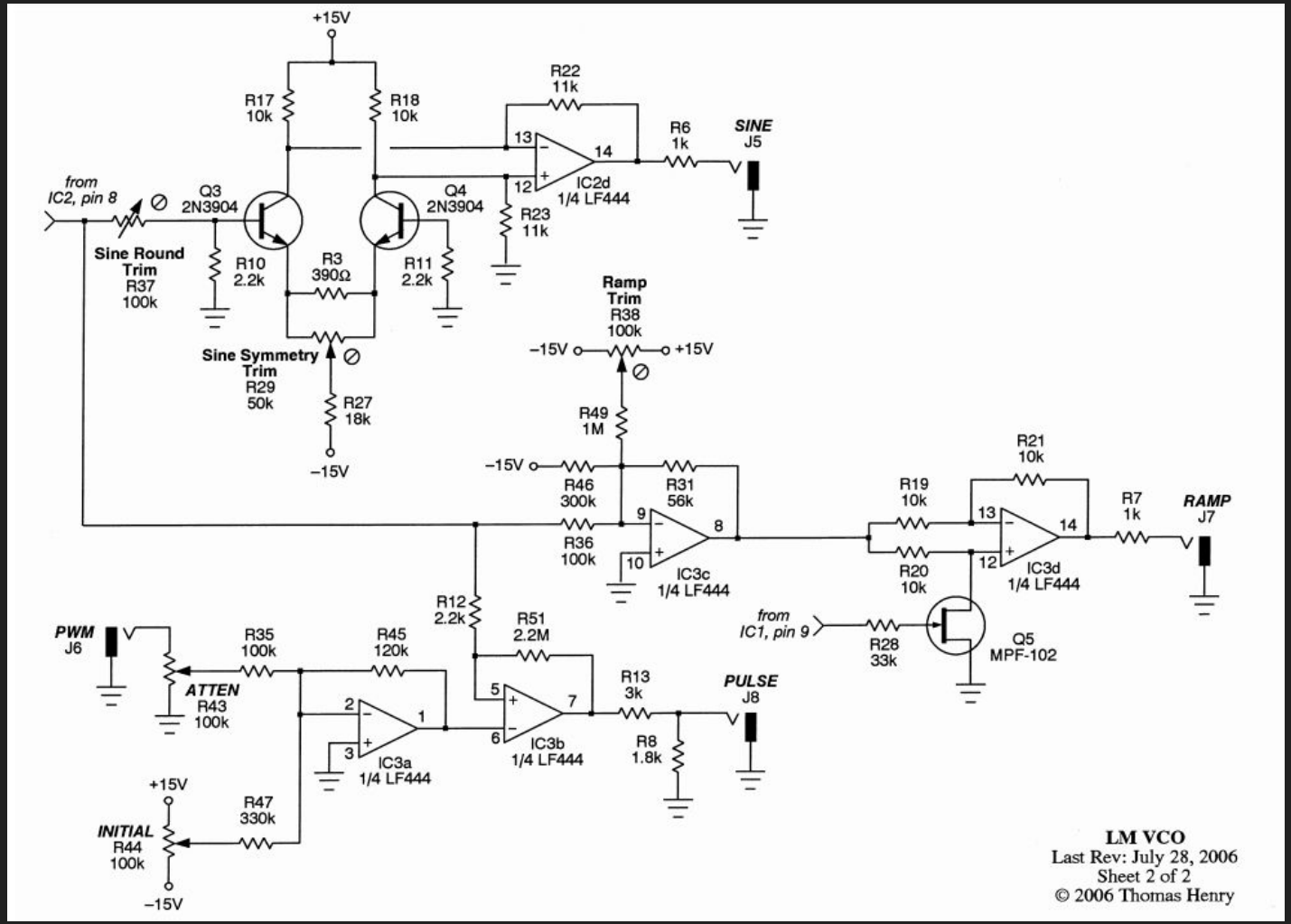


FIGURE 2: Current-controlled relaxation oscillator with sawtooth, triangular, and variable-width pulse output waveforms.



LM VCO
Last Rev: July 28, 2006
Sheet 1 of 2


+15V
R17
10k
R18
10k
R22
11k
R6
1k
SINE
J5
13
14
12
IC2d
1/4 LF444
R23
11k
from
IC2, pin 8
Q3
2N3904
Q4
2N3904
Sine Round
Trim
R37
100k
R10
2.2k
R3
390Ω
R11
2.2k
Sine Symmetry
Trim
R29
50k
R27
18k
−15V
Ramp
Trim
R38
100k
−15V
+15V
R49
1M
−15V
R46
300k
R31
56k
R36
100k
9
8
10
IC3c
1/4 LF444
R21
10k
R19
10k
13
14
12
IC3d
1/4 LF444
R7
1k
RAMP
J7
R20
10k
R12
2.2k
R51
2.2M
from
IC1, pin 9
R28
33k
Q5
MPF-102
PWM
J6
R35
100k
R45
120k
ATTEN
R43
100k
2
1
3
IC3a
1/4 LF444
5
7
6
IC3b
1/4 LF444
R13
3k
PULSE
J8
R8
1.8k
+15V
R47
330k
INITIAL
R44
100k
−15V
LM VCO
Last Rev: July 28, 2006
Sheet 2 of 2
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Schedule

- End of week of 4/24
  - Have built and tested power supply, amplifier, and keyboard
- End of week of 5/1
  - Have built and tested VCO, VCF, and VCA
- End of week of 5/8
  - Have connected all the parts with ADSR