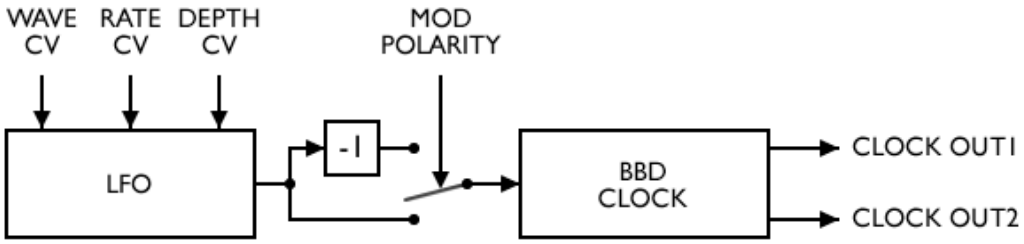
Electric Druid MULTIFLANGE

Introduction

The Electric Druid MULTIFLANGE flanger delay clock chip is a biphase high frequency clock suitable for driving MN32xx series bucket brigade delay lines (BBDs), combined with a multi-waveform LFO. All parameters are controlled by 0-5V control voltages. The LFO has controls for the rate and waveform, as well as for the depth of clock modulation. In addition the polarity of the clock modulation can inverted from "bottom up" to "top down", providing further variations.



Features

BBD Clock and LFO on one chip

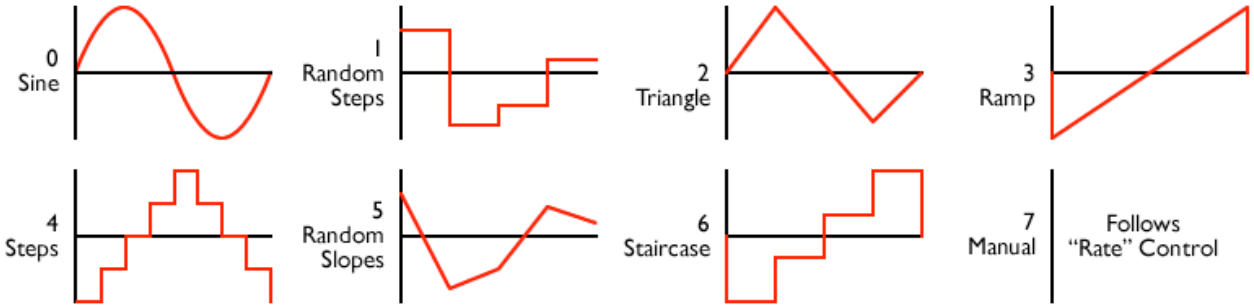
The chip provides an LFO and a biphase BBD clock output suitable for directly driving MN32xx series bucket brigade chips on one chip. It can replace the MN3102 clock chip and the associated LFO in many modulation effects, whilst providing many new features.

Wide output frequency range of 20:1

The chip can produce clock frequencies from 25 to 500KHz. A wider range gives the best flanger effects.

Flexible LFO with range of 0.05Hz to 12Hz and seven waveshapes

The LFO provides frequencies from 0.05Hz to 12Hz. It can provide seven waveshapes, including random steps and random slopes modes.



Fixed flanger effects

The eighth waveform setting is a "fixed flanger" mode which allows "fixed flanger" effects (AKA "matrix filtering"). Rather than being swept by the LFO, the flanger position follows the Rate knob position. It can be swept manually or left in a particular position to emphasize certain frequencies. This gives a hollow, metallic sound which can be very effective on fuzzed or distorted tones. This is also ideal for use with an expression pedal.

Exponential response for musical modulation

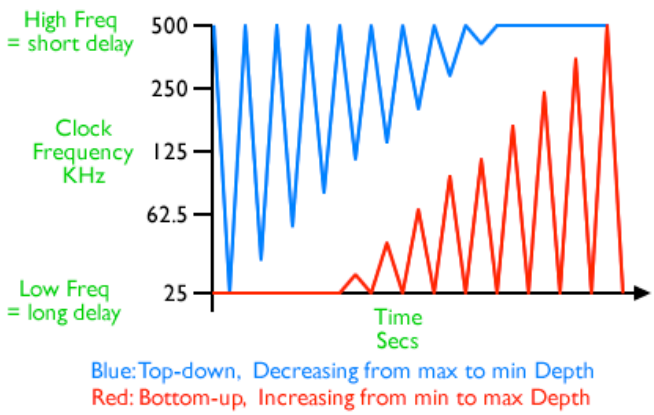
The clock modulation is exponential in character, based on octaves. This means that if you use a normal triangle wave for the LFO, you get the same smooth effect you get using a hypertriangle on a normal BBD clock. The whole point of the hypertriangle waveform is to compensate for the linear clock modulation by applying an exponential function to the triangle waveform. So if you don't use linear modulation, but rather use exponential "V/Oct" modulation, you don't need to bother with hypertriangles to get an even sweep.

The typical linear clock modulation is also the reason why chorus effects get "warbley". With linear modulation, the depth increases when the delay time gets longer. If the LFO modulates the clock by +/-25KHz around a 200KHz centre point, that's only 12% or so variation. If it does the same around a 50KHz clock (lower clock frequency equals longer delay, remember) then that +/-25KHz shifts the pitch by 50%. Keeping the modulation in the exponential world of octaves

removes this problem - half an octave of mod depth is still half an octave whether it's from 50KHz or 200KHz.

The short version is our ears hear music in octaves, and musical modulation should work the same way. The MULTIFLANGE chip does.

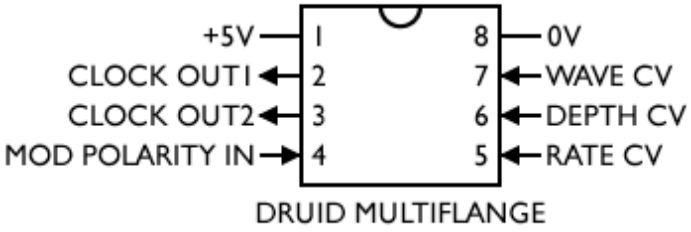
Variable modulation polarity for "Bottom up" or "Top down" sweeps



The Depth control introduces LFO modulation into the clock. The modulation is unipolar and can either be introduced from the "bottom up" - e.g. from the longest delay time towards the shortest, or "top down", from the shortest delay towards the longest.

The MOD POLARITY input allows you to select between these two options.

Pinout Diagram



Pin	Function	Details	Notes
1	+5V	Power supply	
2	CLOCK OUT1	0-5V digital output	Biphase clock output suitable for directly driving MN3200 series BBDs
3	CLOCK OUT2	0-5V digital output	
4	MOD POLARITY IN	0-5V digital input	Sets modulation direction (0=Top Down, 1=Bottom Up) Note this pin has an internal pull-up, so can be left unconnected.
5	DEPTH CV	0-5V analog input	Modulation depth (LFO->Clock) (AKA "width")
6	WAVE CV	0-5V analog input	LFO waveform selection
7	RATE CV	0-5V analog input	LFO rate
8	0V	Power supply	

Application Notes

Delay times

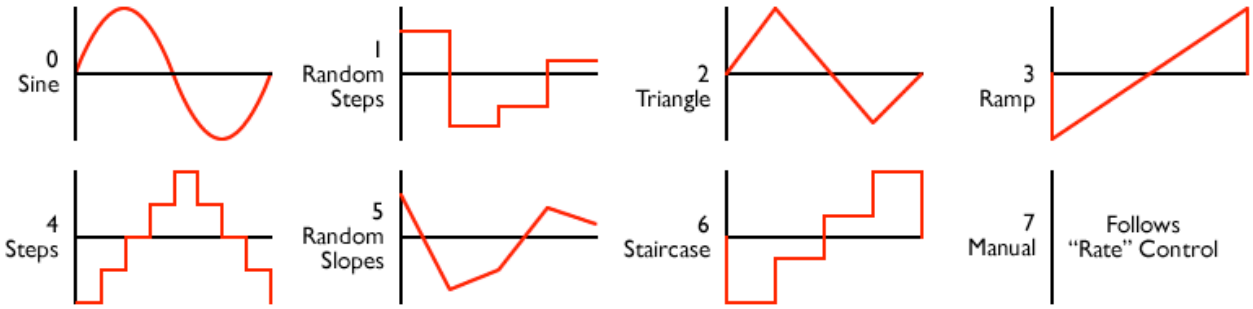
The table below shows the range of delay times expected with some common lengths of BBD.

Clock Freq.	2048 stages	1024 stages	512 stages	256 stages
25 - 500KHz	40 - 2ms	20 - 1ms	10 - 0.5ms	5 - 0.25ms

The maximum delay length that the chip can drive depends on the capacitance of the BBD's clock pins. This varies by manufacturer, although it is always higher for longer BBDs. When it becomes too high, the clock pulses become rounded and the delay line stops working correctly.

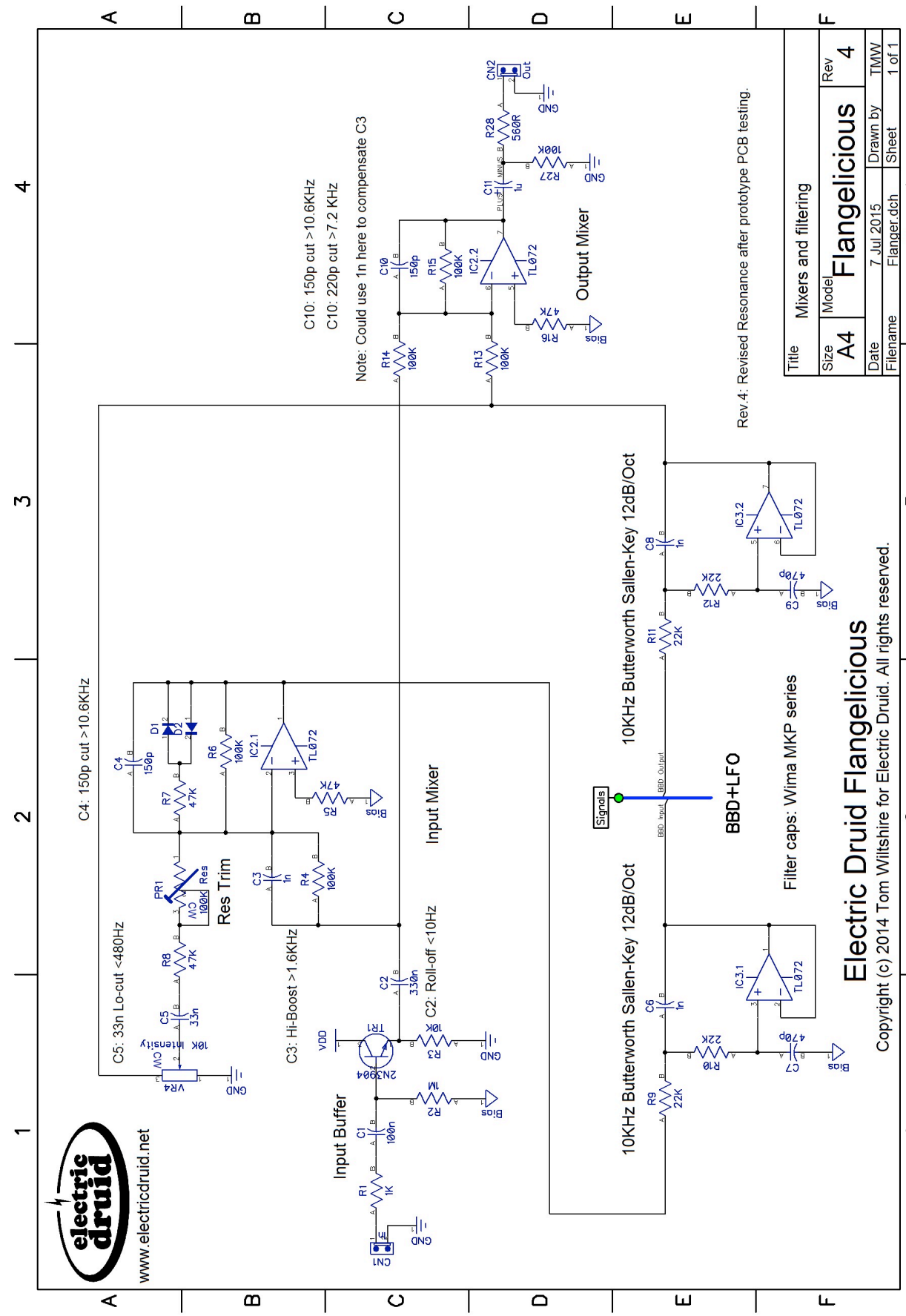
Waveforms

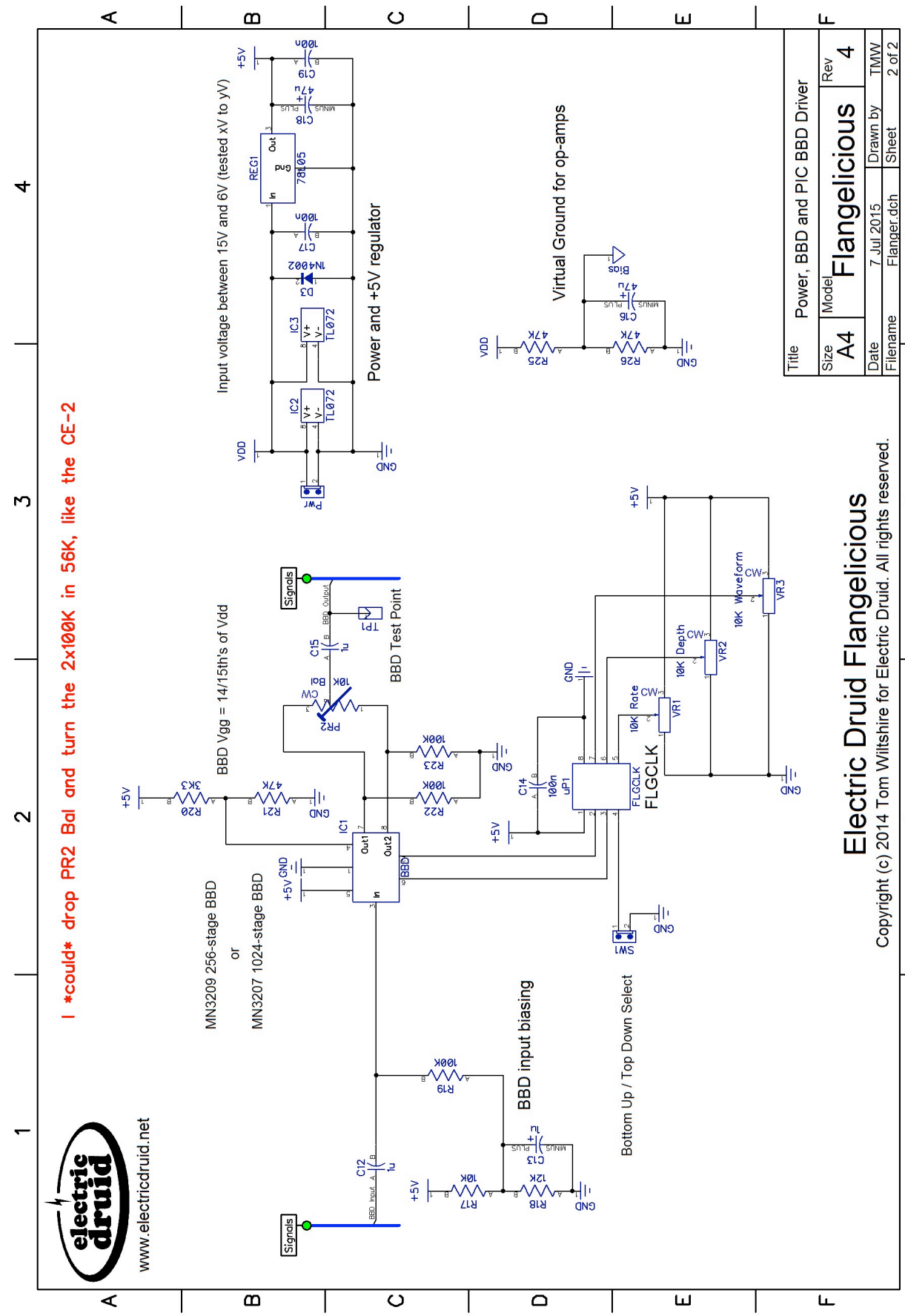
The WAVE CV input reads a 0-5V control voltage as a value from 0-7. This value is then used to select one of eight waveforms.



Demonstration circuit

This demonstration circuit on the following two pages shows of the features of the chip and can generate many different effects, from the lush to the loopy. PCBs for this circuit are available at http://electricdruid.net/shop


Electric Druid Flangelicious
Copyright (c) 2014 Tom Wiltshire for Electric Druid. All rights reserved.
Title Mixers and filtering
Size A4
Model Flangelicious
Rev 4
Date 7 Jul 2015
Drawn by TMW
Filename Flanger.dch
Sheet 1 of 1
Rev.4: Revised Resonance after prototype PCB testing.
C10: 150p cut >10.6KHz
C10: 220p cut >7.2 KHz
Note: Could use 1n here to compensate C3
Output Mixer
C4: 150p cut >10.6KHz
C5: 33n Lo-cut <480Hz
Res Trim
C3: Hi-Boost >1.6KHz
Input Mixer
C2: Roll-off <10Hz
Input Buffer
10KHz Butterworth Sallen-Key 12dB/Oct
10KHz Butterworth Sallen-Key 12dB/Oct
BBD+LFO
Filter caps: Wima MKP series
www.electricdruid.net


I *could* drop PR2 Bal and turn the 2x100K in 56K, like the CE-2
Power and +5V regulator
Input voltage between 15V and 6V (tested xV to yV)
Virtual Ground for op-amps
BBD Vgg = 14/15th's of Vdd
MN3209 256-stage BBD
or
MN3207 1024-stage BBD
BBD Test Point
BBD input biasing
Bottom Up / Top Down Select
FLGCLK
Title Power, BBD and PIC BBD Driver
Size A4
Model Flangelicious
Rev 4
Date 7 Jul 2015
Drawn by TMW
Filename Flanger.dch
Sheet 2 of 2
Electric Druid Flangelicious
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