

Dead-Bug Dragonfly

A CD4046 VCO - AND A PLL THAT CHASES WHATEVER YOU FEED IT // DEAD-BUG BUILD WORKSHEET // MESS O' PEDALS

Turn a CD4046 phase-locked loop into a proper voltage-controlled oscillator, built dead-bug with no breadboard and no PCB. Pinout, a pin-by-pin netlist, a CV input, and how to make the PLL chase whatever you feed it.

Parts

	1× CD4046 (CD4046B / HEF4046) phase-locked loop, 16-pin DIP - spot it: CD4046 printed on top, notch marks pin 1; count the pins (16, two wider than the last builds)
	1× 0.01 μ F ceramic - C1 , the timing cap (sets the range). Spot it: a non-polar disc printed 103 (= 10nF = 0.01 μ F)
	1× 100K resistor - R1 , the range resistor (bands brown-black-yellow, or meter it). A 100K pot + 1K series resistor here gives a coarse/range knob instead
	1× 100K linear pot - the pitch knob (feeds CV into pin 9). Spot it: marked B100K - B = linear taper (not A/log)
	1× 0.1 μ F ceramic - supply decoupling (printed 104)
	1× 10 μ F electrolytic - output DC-blocker. Spot it: a little can; stripe = minus leg , long leg is +
	1× SPST toggle for on/off - a 2-lug switch
	Output: a jack to an amp, or an LM386 (8-pin DIP) + speaker - same as the 40106 box
	A power source - at least two vape cells in series (7.4V; three gives you 11.1V), or a 9V battery
	Optional, for the PLL half: a 0.1 μ F coupling cap (printed 104), a 10K-100K resistor, and an input jack
	Solid-core hookup wire, enclosure, soldering iron, cutters, multimeter

The chip, from above

PH PULSE	1	16	V+ (VDD)
PC1 OUT	2	15	ZENER
COMP IN	3	14	SIG IN
VCO OUT	4	13	PC2 OUT
INHIBIT	5	12	R2
C1A	6	11	R1
C1B	7	10	DEM0D
GND	8	9	VCO IN

The only pins the VCO needs: 16, 8, 5, 6, 7, 11, 9, 4. Notch marks pin 1. Dead-bug (legs up) mirrors the map left-to-right.

Build

STEP 1 - PIN THE BUG DOWN

Same drill as always: flatten the legs out sideways and lock the chip in the helping hands, label-up , notch where you can see it.

STEP 2 - POWER - AND THE PIN THAT CATCHES EVERYONE

Hook up the power pins - red V+ lead, black ground lead, soldered straight on - and decouple right at the chip.

Power & housekeeping

	CONNECT	TO	WHY
	Pin 16	V+	Supply positive (VDD)
	Pin 8	Ground	Supply negative (VSS)
	0.1 μ F	Pin 16 -> Pin 8	Decoupling, right at the chip
	Pin 5	Ground	Enables the VCO. Floating = silence

	Pin 3	Ground	Unused input (VCO mode only)
	Pin 14	Ground	Unused input (VCO mode only)

STEP 3 - SET THE RANGE - C1 AND R1

Two parts decide what octave this thing lives in.

Range setting

	CONNECT	TO	PART
	Pin 6	Pin 7	C1 = 0.01 μ F (the timing cap)
	Pin 11	Ground	R1 = 100K fixed
	Pin 12	-	R2 - leave open (optional 1M-10M floor)

Optional: a range knob in place of the fixed R1

	CONNECT	TO	PART
	Pin 11	Range pot wiper (middle lug)	100K, replaces the fixed R1
	Range pot outer lug	1K resistor	Required, not optional
	1K far end	Ground	-
	Range pot third lug	nothing	Left empty

STEP 4 - GIVE IT A VOICE YOU CAN PLAY

Here's the whole reason for this chip.

Pitch / CV input

	CONNECT	TO	PART
	Pot end 1	V+	100K linear
	Pot end 2	Ground	-
	Pot wiper	Pin 9	= your pitch knob
	optional CV jack tip	Pin 9	~100K series resistor; sleeve to ground

STEP 5 - TAKE THE OUTPUT

Pin 4 is the VCO output - a square wave swinging nearly rail to rail.

Output stage

	CONNECT	TO	PART
	Pin 4	Volume pot (top)	10 μ F (+ toward pin 4)
	Volume wiper	1K -> jack tip / LM386 in	sleeve to ground

STEP 6 - POWER UP

Toggle it on and sweep the pitch knob.

STEP 7 - IF IT WON'T SING

- Dead silent? Pin 5 . It's pin 5. Tie INHIBIT to ground. This is the number-one CD4046 bug and it has eaten many evenings.
- Still silent? Confirm C1 actually bridges pins 6 and 7 (not 6-to-ground), and that R1 goes from 11 to ground .
- One fixed pitch, knob does nothing? Your pot isn't wired as a divider. It needs V+ on one end and ground on the other, wiper to pin 9. Two-lug wiring won't work here - unlike the 40106, this pot makes a voltage , not a resistance.
- Pitch only covers a sliver of the knob? Normal-ish - the response isn't linear-to-your-ear. Try a bigger R1, or run a higher supply for more range.

- Screaming way too high? C1 too small. Go up to 0.1 μ F.
- Buzzy, unstable, or weird? Floating input (pins 3/14), or you skipped the decoupling cap.