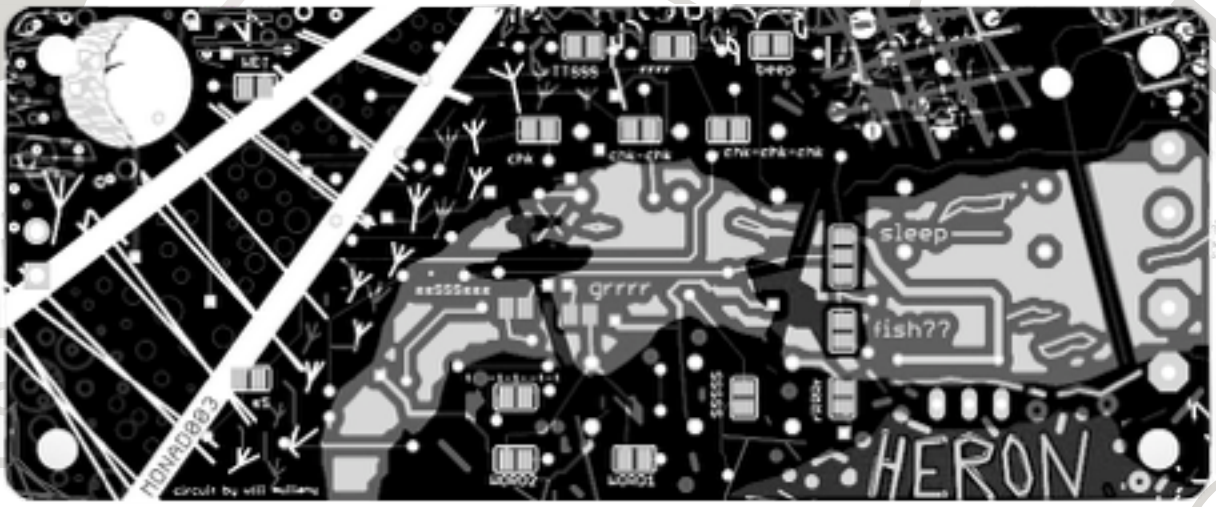

MONAD



MONAD003: HERON – WILL MULLANY

Heron is a solar powered semi-modular synth sketch of the Great Blue Herons lingering in the James river beneath the train tracks in Richmond, Virginia.

The **HERON** call is determined by activating interlocking cycles of control, the period of which is determined by user-selected components during assembly and through patching the solder jumpers on the back of the board. Some times chirpy and songful, others guttural and noisy, **HERON** by the **TRACKS** paints a sonic image of a mighty and still bird wading in the rapids on a summer afternoon beneath the thundering trains moving things from inland to the coast.

HERON is a beginner level project for solderers, powered by a small solar panel and sounded through a loudspeaker. Programming of the bird is completed through selection of **7 capacitors** and simple connection of **9 solder jumpers** on the board. A small on-board **trim pot** can be adjusted to move the birds appetite for current.

Each kit comes with instructions, a mouser Bill of Materials, and a schematic. ByoB (Bulld your own Box)—Future models will come with lasercut/CNC cutlists for DIY solar sounder boxes!

Credit due to Peter Bussigel for introducing me to hacked CMOS synthesis and electronics more broadly, User “Slacker” on electro-music.com for the melody generator division circuit which this board contains an adaptation of, Nic Collins for writing the Bible of this stuff and Texas Instruments for continuing to produce affordable through hole packages of obsolete electronic components.

BUILD NOTES:

PARTZ LIZT:

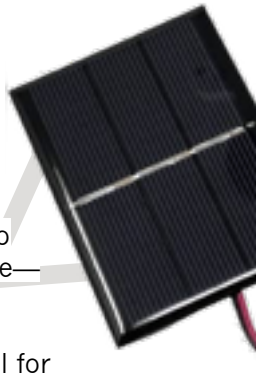
-3 10uf Electrolytic capacitors
-a handful of small capacitors (.1uf - .47uf)
-a handful of larger capacitors (1uf - 47uf and above)
-100k Trim Potentiometer
-Hookup wire
-Speaker
-Solar panel

Trim Pot: We designed this board to use top adjust multi-turn pots, but you can use any type so long as you can get the leads into the footprint. Get one of **these ,** but one of **these** will work as well!

Speaker: Any works! Here are few we like at MONAD:

https://www.parts-express.com/Visaton-FR7-4-2-1-2-Full-Range-Driver-4-Ohm-292-638
https://www.parts-express.com/Visaton-FR10-8-4-Full-Range-Speaker-292-513 https://www.parts-express.com/Visaton-R10SC-4-4-Fullrange-Speaker-4-Ohm-292-602 https://www.parts-express.com/Visaton-FX10-4-Coaxial-Speaker-292-674
You can of course, use whatever!

Capacitors: A nice range of different values of capacitors is essential to any budding electronicians supply set. Heron will work with a lot of different values, but start out with a few in the 1-4.7uf range, a few of each value 10uf - 60uf and then one or two in the .1-.22uf range.



Solar Panel:
Solar Panels are available from multifarious sellers. This is the juice that makes your circuit go—different panels will produce different results. 9 Volts 3 Watts is the best starter panel to use—look on on ebay or amazon!

300ma is the golden number, but if you have two 200ma panels, you can wire them in parallel for higher capacitor solar panel.

https://voltaicsystems.com/2-watt-panel/ These work beautiful but are expensive. (You need to wire them in series to get 12v)

Hookup wire:
You know what really ruins DIY kits? Shitty wire. Your shit breaks in the middle of testing and kills the mood. https://www.mcmaster.com/9564T3 We love this fancy wire at MONAD. You can strip it with your fingernail, and it has so many strands inside that it's unlikely to break when you're throwing around your solar panel and speaker.

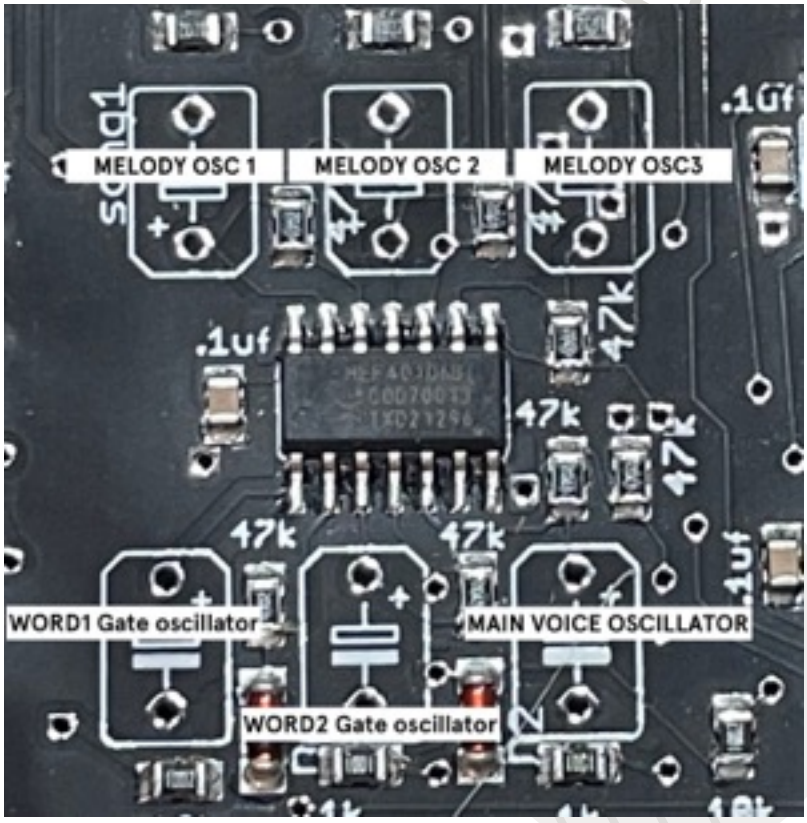
Box:
Get creative!
Keep in mind, this circuit will be much louder when you enclose its speaker in a hollow cavity!

Begin:

Starve Circuit: Start by soldering the group of 10uf capacitors on the right side of the board.

These capacitors determine the rate of the oscillator that controls the power starve for the rest of the board. 10uf will produce a slow and steady up and down oscillation, but you can choose three larger or smaller capacitors if you want to *experiment,* or don't have exactly 10uf.

THEN: Add the mini trim potentiometer directly below the 10uf caps. This will allow you to bias the power starve waveform toward positive or negative, allowing the board to stay in full powered mode for longer periods of time OR keeping it in starvation for longer. We used these top adjustment mulit-turn potentiometers, but you can use any type that fits (plus some that don't fit by bending legs). You could even wire a full size potentiometer to this spot with wires if you wanted!



MAIN CAPACITOR SECTION:

The six capacitor slots in the center of the board will provide you with the largest opportunity to change the sound of the board:

Starting from the bottom right, the MAIN VOICE OSCILLATOR capacitor will choose the pitch of the birds voice. We recommend starting with a small value cap, something like .1uf-.22uf, but you can vary that to your hearts desire.

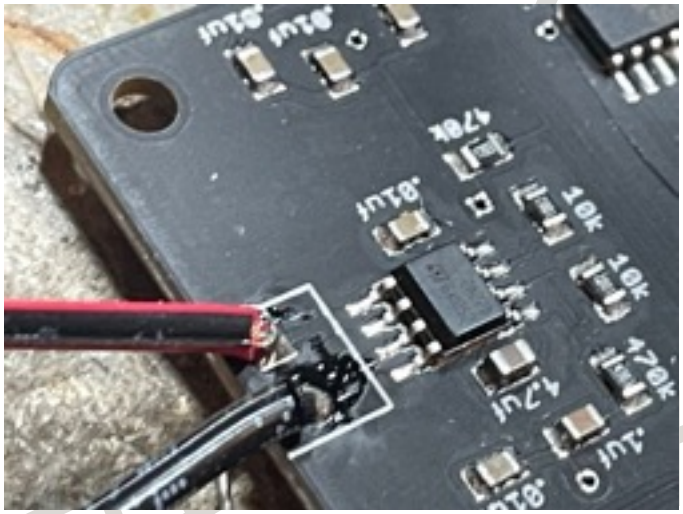
WORD1 and WORD2 oscillators gate the main voice, cutting silent chunks out of the endless drone, and allowing the bird to “chirp.” Start with one large value capacitor (4.7uf - 10uf) and one small (~.22uf), and try patching that in.

The three melody oscillators will take the main voice oscillator and rhythmically produce harmonically related notes from it. Sky is the limit with these capacitor values: larger and larger capacitors will result in longer and more complex melodic patterns. Very small capacitors will make a harsher and more noisy textured chirp. Make sure to pick different values for all three or they will get locked in sync.

now solder the power wires and the large reserve capacitor, paying close attention to the polarity indicated on the board. 680uf and up will work swell.

then solder wires for your speaker to the other side of the board. The square pad indicates the positive terminal.

But since this circuit is "off the grid", speaker polarity doesn't matter as much as u think.



PATCHING:

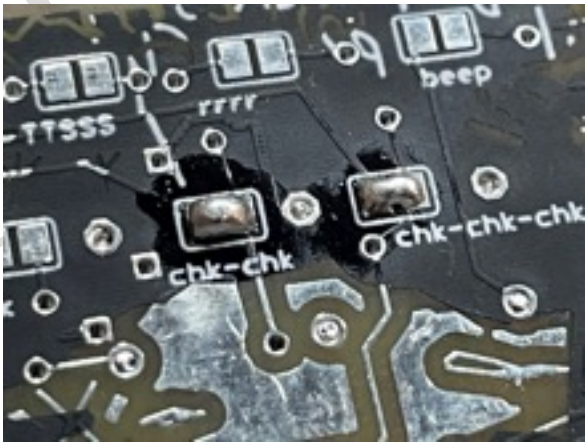
Now the fun part:

Once you have soldered everything on the top of the board, flip it over and look for the little solder jumpers scattered across the back. These solder jumpers connect the different parts of the circuits, so that you don't have to mess around with running wires.

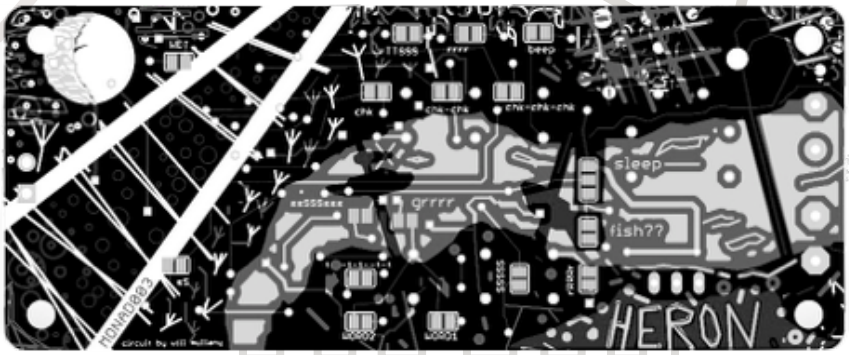
Solder-patching is easy. you can disconnect a jumper by swiping the soldering iron through the two pads—surface tension will pull the solder blob in twain, and it will instantly harden into two orbs. to reconnect, simply add more solder. It should be easy and not give you any difficulty at all. If things stop working well, use a little flux or fresh solder.

The world is your oyster here, and you should feel free to experiment (referring to this legend below), but there are a few things you should pay close attention to:

There is a two way pad labeled SLEEP. This selects the power source for the board. The center pad is the selector which should be connected to the top or bottom pad. Swiping the solder jumper down will source the board to the STARVE oscillator and up will source the power to the main power supply, creating more stability.



Additionally, to get any sound out of your board, you'll need to solder at least one of the “chk” pads. These patch in the melody oscillators and get the main voice popping.

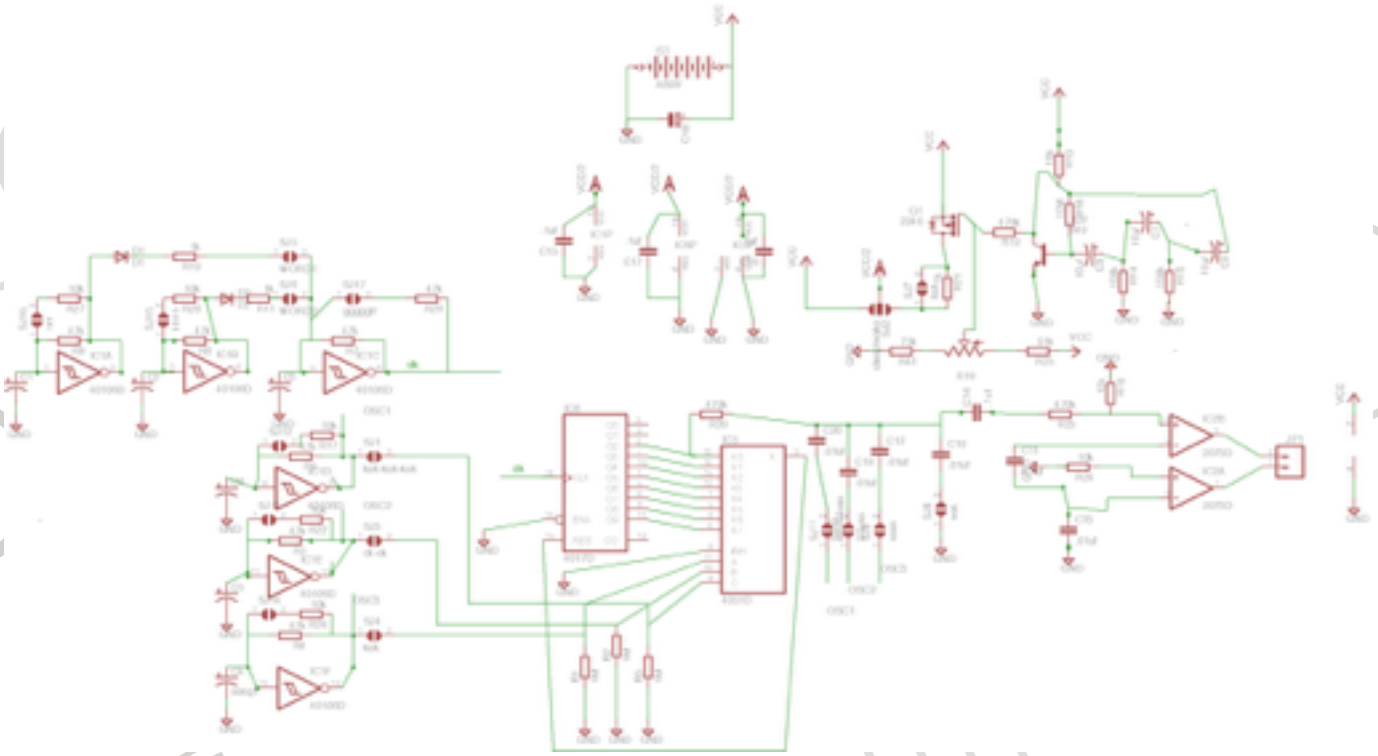


Legend Of Solder-Jumper Patches:

Sleep: *Starve setting. Middle pad connects to top or bottom. Top pad sources starve to the main board power. Bottom pad utilizes the oscillating control source*
fish???: *offsets the oscillating control source by a set amount*
chk: *patches oscillator 3 to melody generator*
chk-chk: patches oscillator 2 to melody generator
chk-chk-chk: patches oscillator 2 to melody generator
TTSSS: raises oscillator 3 rate
rrrr: raises oscillator 2 rate
beep: raises oscillator 1 rate
Word1: main voice oscillator gate 1
Word2: main voice oscillator gate 2
ggggrr: rases main voice oscillator pitch
rrrr: raises gate 1 oscillator rate
t—t-ttt-tt-t-t: raises gate 2 oscillator rate
wet: lowpass on output
sS, SSSSS, ssSSSssss: patches control oscillators directly to output
Wet: Lowpass filter on main output (sometimes too quiet for solar power)

We recommend getting your board built up and doing some tests by hooking it up to a 9 volt battery. This way, you can dial in the solder pads to an interesting sound and then attach it to your solar panel so you can hear it in the sun.

Solar power will change how the circuit behaves, but you can still get a general idea of how it's going to sound using a 9v.



The circuit is centered around the “Melody Generator,” a common CMOS recipe utilizing a 8 way switch and counter IC, fed by a square wave oscillator on the mighty 40106. Two other oscillators on the 40106 gate/mute the main oscillator, and three more oscillators control the inputs on the melody generator that choose how the main oscillator is divided.

Upstream from all of this, a Phasi-style sine wave oscillator controls the flow of power to the circuit through a MOSFET.