

Brain Machine kit

Hack Your Brain With Sound & Light

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Inventor of **TV-B-Gone** universal remote controls

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Pioneer of **VR** (in the mid-1980s)

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Co-founder of **Noisebridge** (San Francisco hackerspace)

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THE BUNNY IS A LIE
EASTERHEGG 2026 | EH23



CORNFIELD ELECTRONICS

Brain Machine kit

Hack Your Brain With Sound & Light



open source
hardware



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CORNFIELD ELECTRONICS

What is a Brain Machine?



Photo by Sam Murphy

“Entrains” your brain to a desired brainwave sequence through light and sound.

“Entrain” – definition:



Photo by Sam Murphy

“Entrain”: When your brain synchronizes to external brainwave frequencies

Brainwave Types

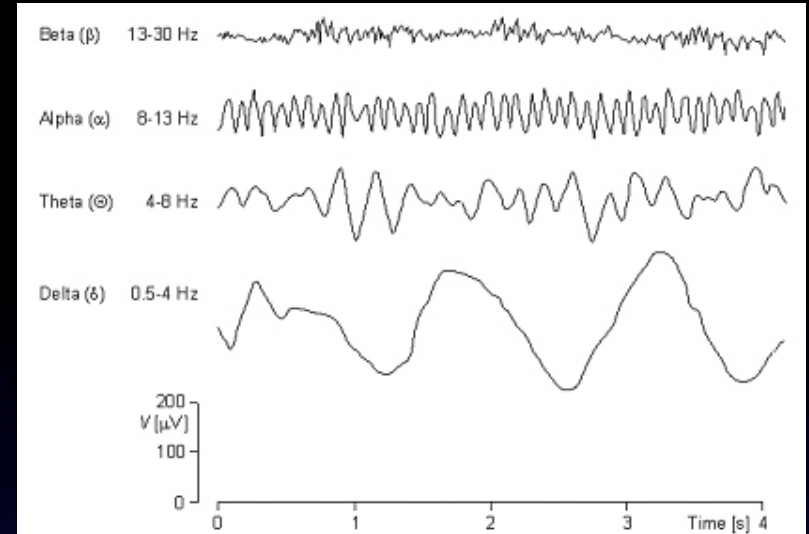
Beta: 13 to 30Hz
Conscious, External Focus

Alpha: 8 to 13Hz
Spacey, Dreamy, Receptive, Passive

Theta: 4 to 8Hz
Subconscious, Deep Relaxation, Creativity

Delta: ½ to 4Hz
Unconscious, Intuition, Insight

Gamma: 30 to 100Hz
Not well understood, linked to Perception, Alertness, Anxiety



Brainwave Sequences

Essentially the same for all healthy adults

Such as

Awake → Sleep

or

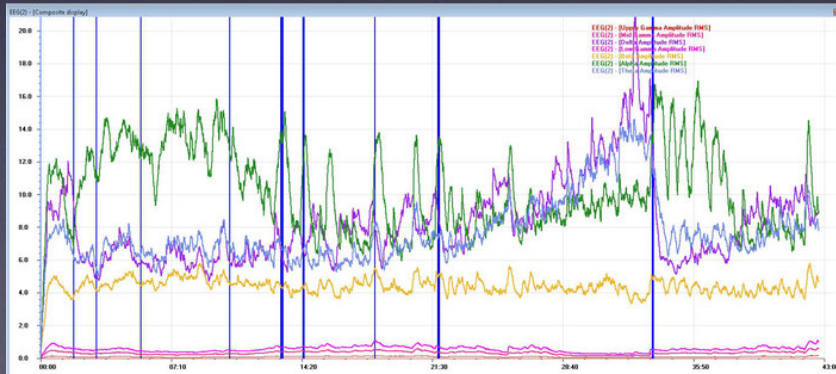
Awake → Meditation

Measurable with EEG
(brainwave monitor)

Brainwave Sequences

Essentially the same for all healthy adults

Example – Awake → Meditation:



- Beta (awake)
- add Alpha (spacey, dreamy)
- less Beta (less awake)
- add Theta (subconscious)
- Delta (unconscious, insight)
- hang out here awhile
- reverse process
(come up feeling fabulous)

Genesis of My Idea (1993)

Questions popped up while meditating:

What would happen if you played back a
brainwave sequence?

Would your brain synch up?

Would you be in the associated state?

Brief history

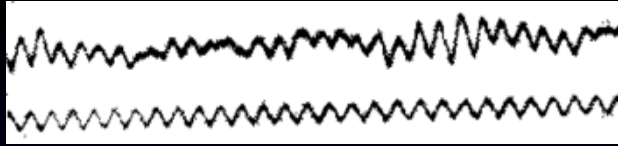


Pulsing Sound in Ancient times:
Alpha and Theta
induced by ritual drum rhythms

Pulsing Light in the 2nd Century:
Ptolemy



Brief history (cont'd)



1920s:

Invention of EEG

Hans Berger categorizes
brainwave types

1930s:

W. Grey Walter first to knowingly
play brainwaves

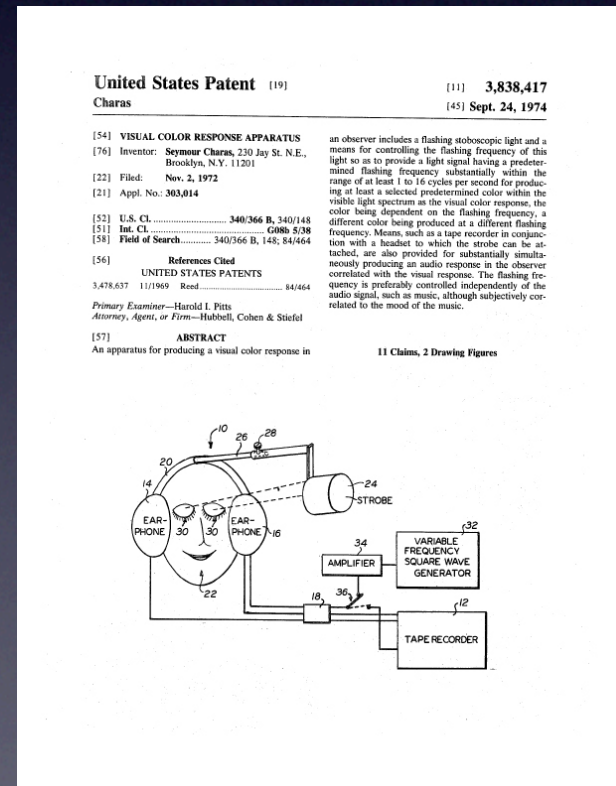


Brief history (cont'd)



1950s:
Invention of Dream Machine

1970s:
Research, first patent,
recordings of brainwave
sequences, Monroe Institute



Brief history (cont'd)

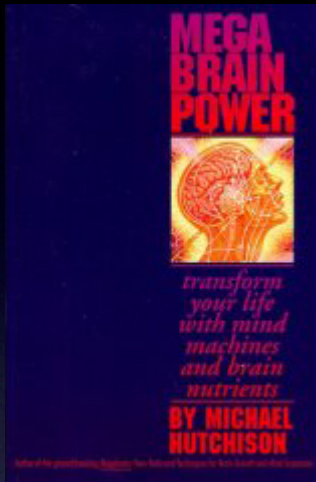


1950s:
Invention of Dream Machine

1970s:
Research, first patent,
recordings of brainwave
sequences, Monroe Institute,
Disco



Brief history (cont'd)



1980s & 1990s:

Medical studies

“Megabrain Power” by Hutchison

Popularity in mass culture

Beneficial claims

Are claims real?

Maybe some?

Certainly not all.

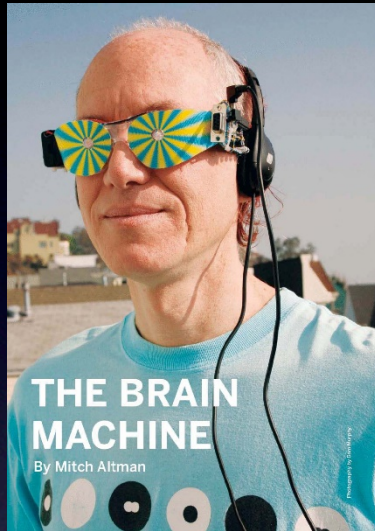
But why not try and see for yourself?

Cautionary Note:



Light and Sound Machines, such as this one, can be fun for many of us, but may be seriously dangerous for those prone to seizures or who are photosensitive.

Brief history (cont'd)



2007:

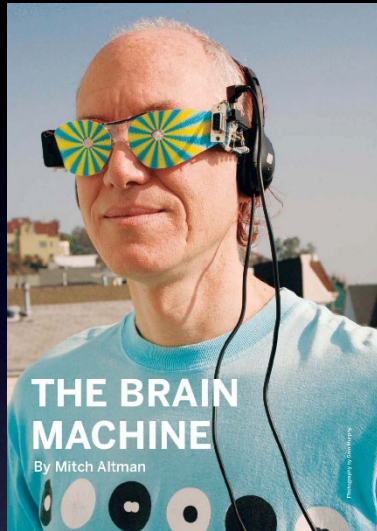
Make your own Brain Machine
article in MAKE #10

Brief history (cont'd)



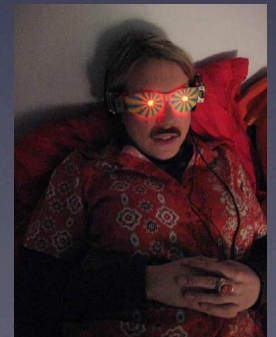
“Weekend Projects” video by Bre Pettis, 2007

Brief history (cont'd)



2007:
Make your own Brain Machine
article in MAKE #10

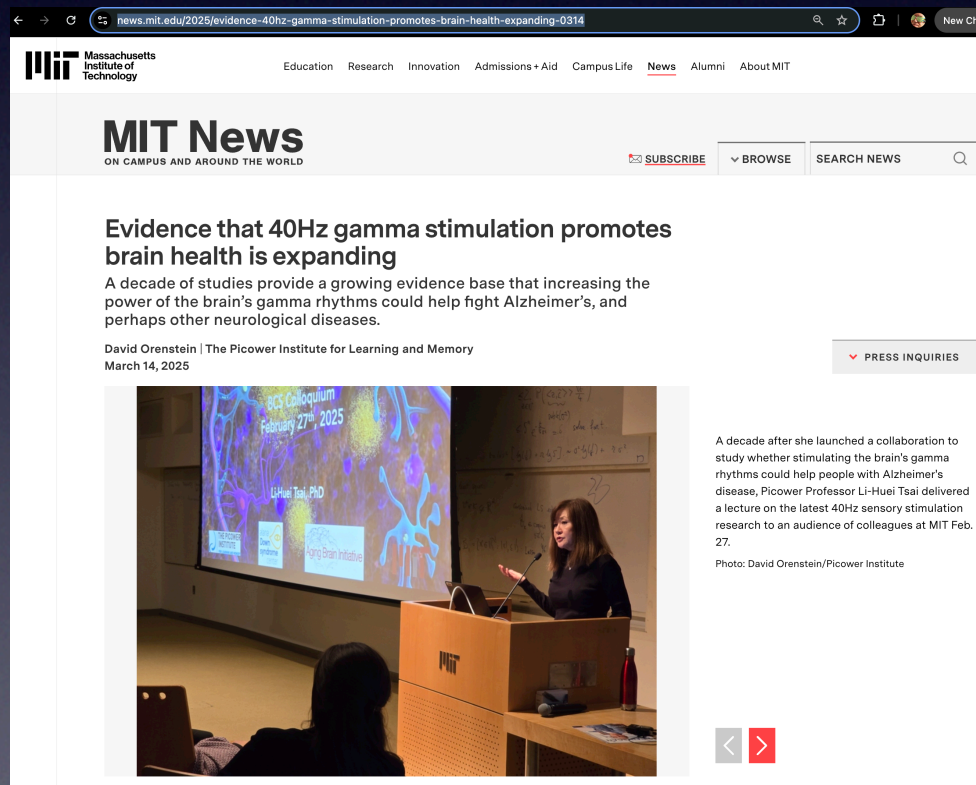
Popular at parties



Brief history (cont'd)

2025:

MIT publishes evidence of 40Hz gamma stimulation helping fight Alzheimer's



The screenshot shows a web browser displaying an MIT News article. The URL in the address bar is news.mit.edu/2025/evidence-40hz-gamma-stimulation-promotes-brain-health-expanding-0314. The MIT News logo is at the top left, with the tagline "ON CAMPUS AND AROUND THE WORLD". Navigation links for Education, Research, Innovation, Admissions + Aid, Campus Life, News, Alumni, and About MIT are visible. The article title is "Evidence that 40Hz gamma stimulation promotes brain health is expanding". The sub-headline reads: "A decade of studies provide a growing evidence base that increasing the power of the brain's gamma rhythms could help fight Alzheimer's, and perhaps other neurological diseases." The author is David Orenstein, from The Picower Institute for Learning and Memory, dated March 14, 2025. A "PRESS INQUIRIES" button is on the right. The main image shows Professor Li-Huei Tsai at a podium during a lecture. The screen behind her displays "ACS Colloquium February 27th, 2025" and "Li-Huei Tsai, PhD". To the right of the image, a text block states: "A decade after she launched a collaboration to study whether stimulating the brain's gamma rhythms could help people with Alzheimer's disease, Picower Professor Li-Huei Tsai delivered a lecture on the latest 40Hz sensory stimulation research to an audience of colleagues at MIT Feb. 27." Below this is the photo credit: "Photo: David Orenstein/Picower Institute". Navigation arrows are at the bottom right of the image area.

<https://news.mit.edu/2025/evidence-40hz-gamma-stimulation-promotes-brain-health-expanding-0314>

Brief history (cont'd)

2026:



* Many studies corroborate gamma helping Alzheimer's
(search for: "40Hz gamma Alzheimers")

* Try searching for:
"40Hz gamma therapy"
and see what you find

** Long Covid / Brain Fog?

** CFS/ME?

Promising? Or, wishful thinking?



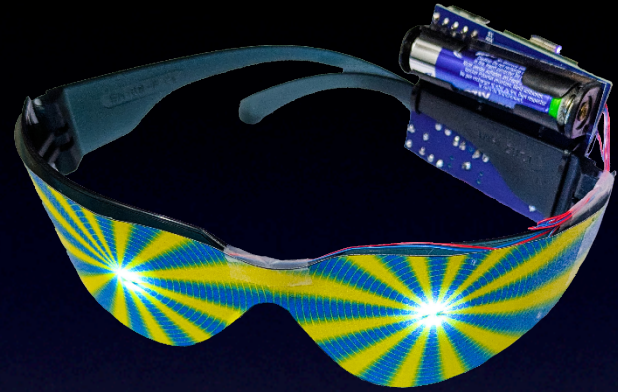
Motivation for MAKE Brain Machine

- Cheap (commercial “Mind Machines” cost \$\$\$)
- Beginner’s project
- Show how fun microcontrollers are
- Hallucinate wildly without side-effects
- Trick people into meditating



Hack of
Ladyada’s
MiniPOV kit

New Version of the Brain Machine kit



- Way easier to solder
- Uses Arduino – way easy to re-program and hack on
- Very well documented – easy to modify, great to learn from
- Easily add Gamma waves to a Brainwave sequence
- Easily to add alternate blinking LEDs (left/right)
- Runs on one AAA battery – light-weight / more comfortable

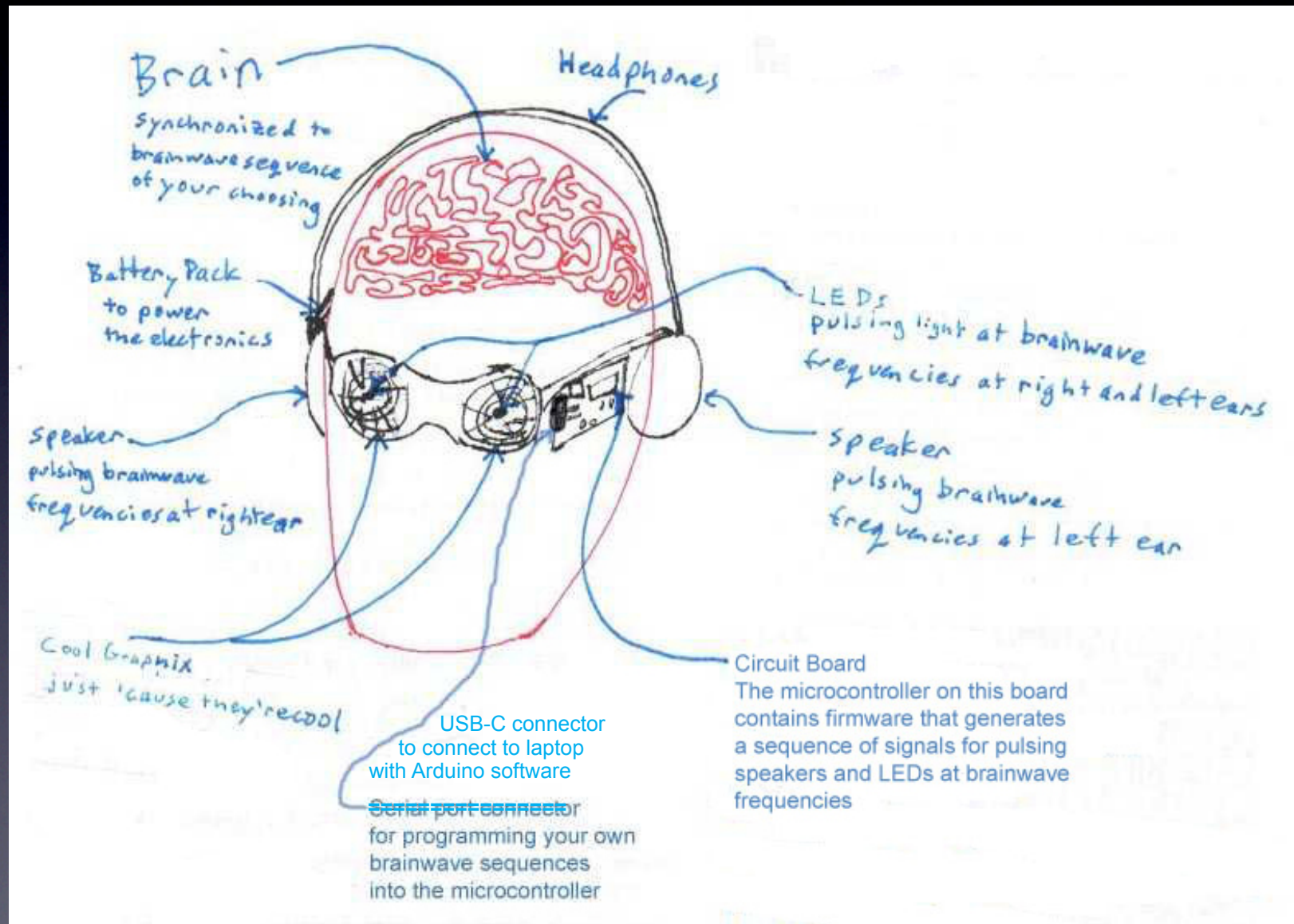
Brain Machine Theory

Sound & Light together
to entrain (non-invasively)
your brain to a brainwave sequence

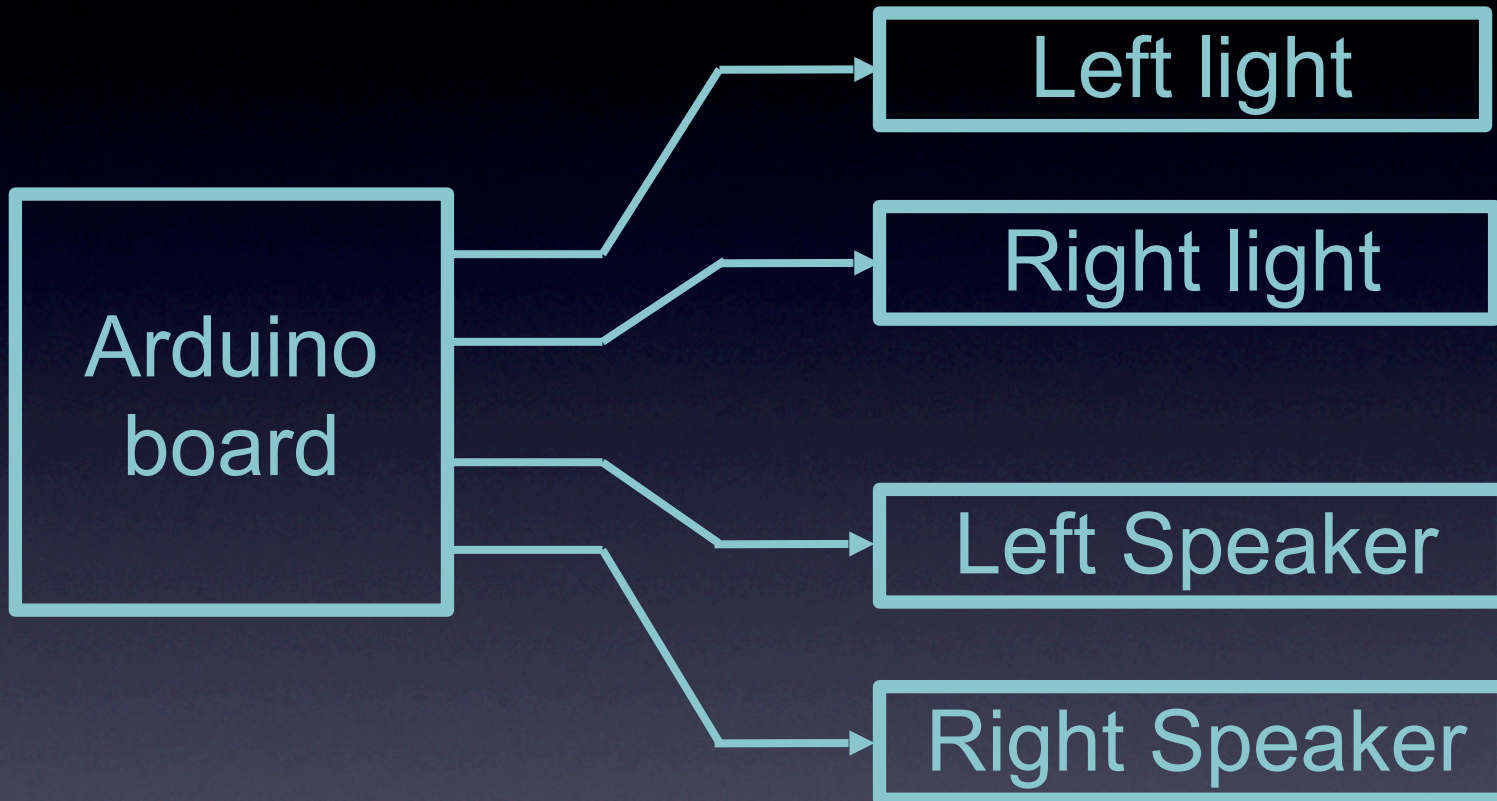
Simplified model for a brainwave sequence:
only one brainwave frequency at a time

Brain Hacking:

By pulsing sound & light at brainwave frequencies you can make your brain track any sequence you like



Hardware



Program / Firmware / “Sketch”

Brainwave Table

Play
each entry
in the
Brainwave Table

- Start with lots of Beta
(awake / conscious)
- Add Alpha
(dreamy / trancy)
- Reduce Beta
(less conscious)
- Start adding Theta
(more subconscious)
- Pulse in some Delta
(creativity)
- Then reverse
the above
(to come up refreshed)

Program / Firmware / “Sketch”

Brainwave Table (detailed)

```
} const brainwaveTab[] PROGMEM = {  
  { 'b', 600000 }, ← Beta waves for 60 seconds  
  { 'a', 100000 }, ← Alpha waves for 10 seconds  
  { 'b', 200000 },  
  { 'a', 150000 }, (divide by 10,000 to get seconds)  
  { 'b', 150000 },  
  { 'a', 200000 },  
  { 'b', 100000 },  
  { 'a', 300000 },  
  { 'b', 50000 },  
  { 'a', 600000 },  
  { 't', 100000 },  
  { 'a', 300000 },  
  { 't', 200000 },  
  { 'a', 300000 },  
  { 't', 300000 },  
  { 'a', 150000 },  
  { 't', 600000 },  
  { 'a', 150000 },  
  { 'b', 10000 },  
  { 'a', 150000 },  
  { 't', 600000 },  
  { 'd', 10000 },
```

```
  { 't', 100000 },  
  { 'd', 10000 },  
  { 't', 100000 },  
  { 'd', 10000 },  
  { 't', 300000 },  
  { 'a', 150000 },  
  { 'b', 10000 },  
  { 'a', 150000 },  
  { 't', 300000 },  
  { 'a', 150000 },  
  { 'b', 10000 },  
  { 'a', 200000 },  
  { 'b', 50000 },  
  { 'a', 200000 },  
  { 'b', 150000 },  
  { 'a', 150000 },  
  { 'b', 200000 },  
  { 'a', 100000 },  
  { 'b', 250000 },  
  { 'a', 50000 },  
  { 'b', 600000 },  
  { '0', 0 } ← last entry is always {'0', 0}  
};
```

- use Upper-Case for alternating blinking Left/Right (instead of simultaneous blinking in both eyes)
example: { 'B', 600000 }, -- Blink lights alternately at Beta for 60 seconds
- use 'g' or 'G' for Gamma waves
example: { 'g', 6000000 }, -- Blink lights at Gamma for 600 seconds (10 minutes)

Binaural Beats

An effective means for entraining
your brain to sound

Somewhat like beat frequencies:



Base tone



Alpha Offset tone



Alpha Beat Frequency

Binaural Beats

An effective means for entraining
your brain to sound

Somewhat like beat frequencies:



Base tone



Alpha Offset tone



Alpha Beat Frequency

Except it's just in your head!
(not physical – only perceived)

Meditation

Here are just a few different ways to meditate:

- breathe
- follow thoughts
- ignore thoughts
- focus on an intention (like a problem)
- make up your own way

What's It Like?

What's It Like?

A few photos

from my

Brain Machine workshop

at Chaos Communications Camp 2007:

What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



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What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



What's It Like?



Further Study

Books:

“Megabrain Power: New Tools and Techniques for Brain Growth and Mind Expansion.” by Michael Hutchison, Ballantine Books, 1996

“The High-Performance Mind” by Anna Wise, Tarcher, 1997

“Dreamachine Plans” by Brion Gysin, Temple Press, 2006

“The Living Brain” by W. Grey Walter, Penguin, 1967

Websites:

Anna Wise:

<http://www.annawise.com>

– *Unfortunately, Anna Wise died in 2010, and since then not much has happened with her technology*

“Clinical Guide to Light and Sound” by Thomas Budzynski, PhD:

<http://sica.stanford.edu/events/brainwaves/theclinicalguidetosoundandlight.pdf>

– *Unfortunately, this link no longer works, and the PDF seems to have disappeared from the internet*

Seymour Charas’ 1974 patent (first SLM patent):

<https://ppubs.uspto.gov/pubwebapp/static/pages/ppubsbasic.html>

Quick lookup: 3838417

The Monroe Institute:

<http://www.monroeinstitute.com/>

– *Unfortunately, the founder, Robert Monroe, died in 1995, and since then the website has lost its repository of useful information*

Wikipedia has some interesting pages. A good starting place is the “Mind Machine” page:

http://en.wikipedia.org/wiki/Mind_machine

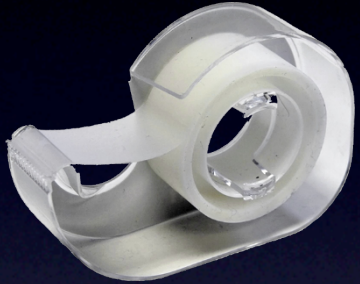
MIT article on evidence of 40Hz gamma helping Alzheimer’s:

<https://news.mit.edu/2025/evidence-40hz-gamma-stimulation-promotes-brain-health-expanding-0314>

Questions?

Tools

(Don't bring these home)



Tools

Available for
donation

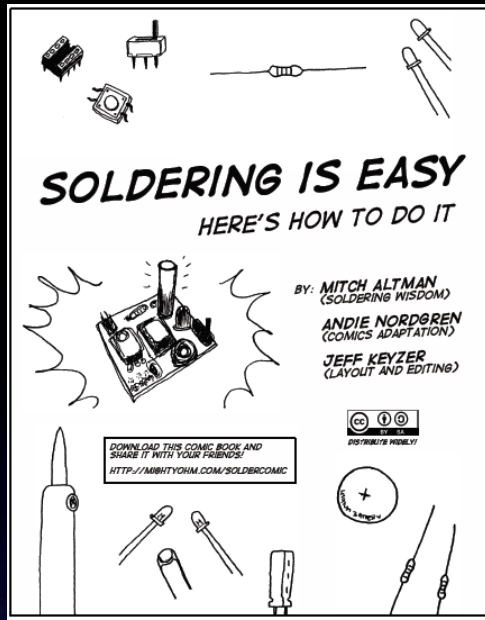


Your Brain Machine

Yours to bring home !



Learn To Solder



The following photos will show you how to solder.

But feel free to download the “Soldering Is Easy” comic book for free!

(In many different languages.)

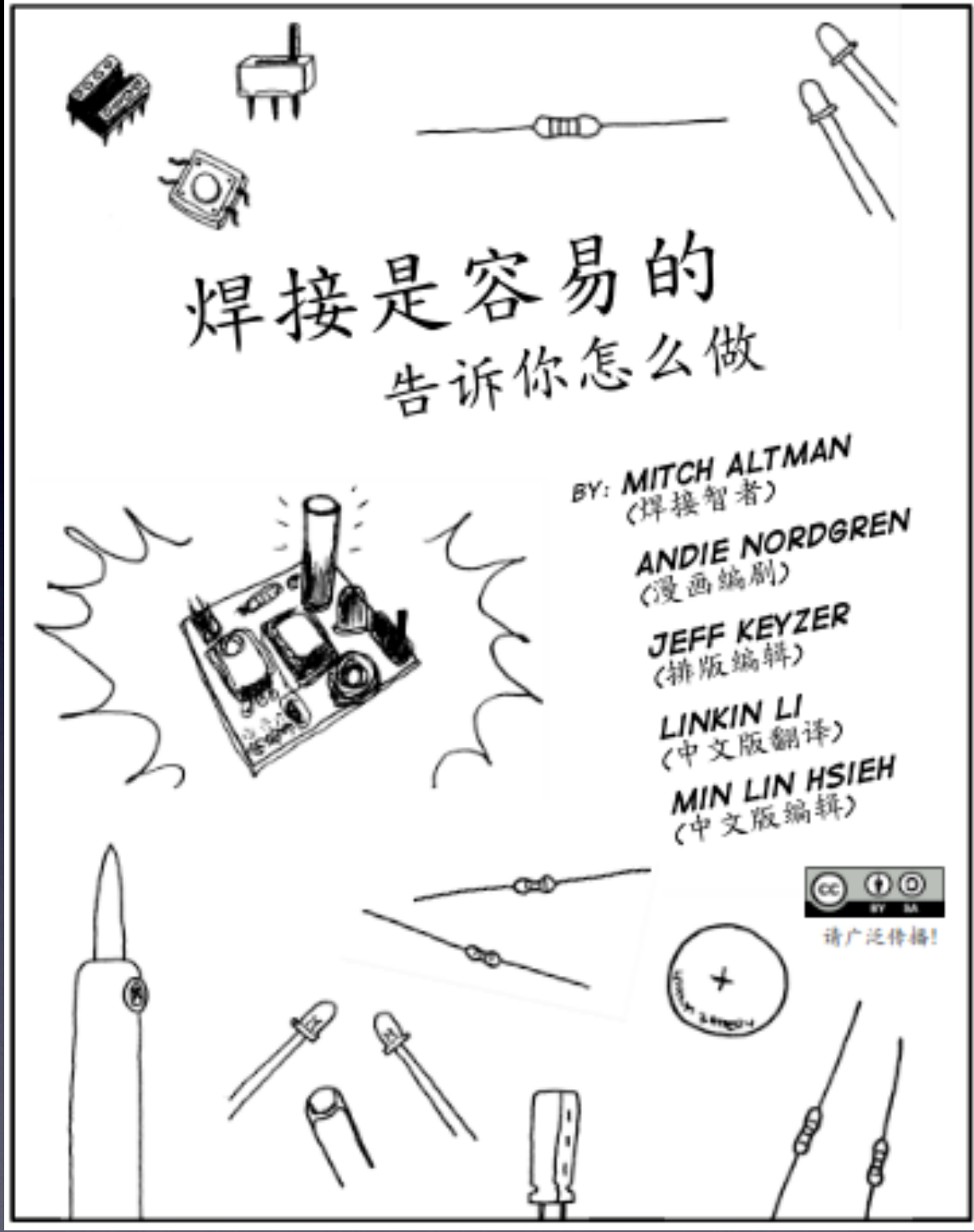
download for free at:
<http://mightyohm.com/soldercomic>

Learn To Solder



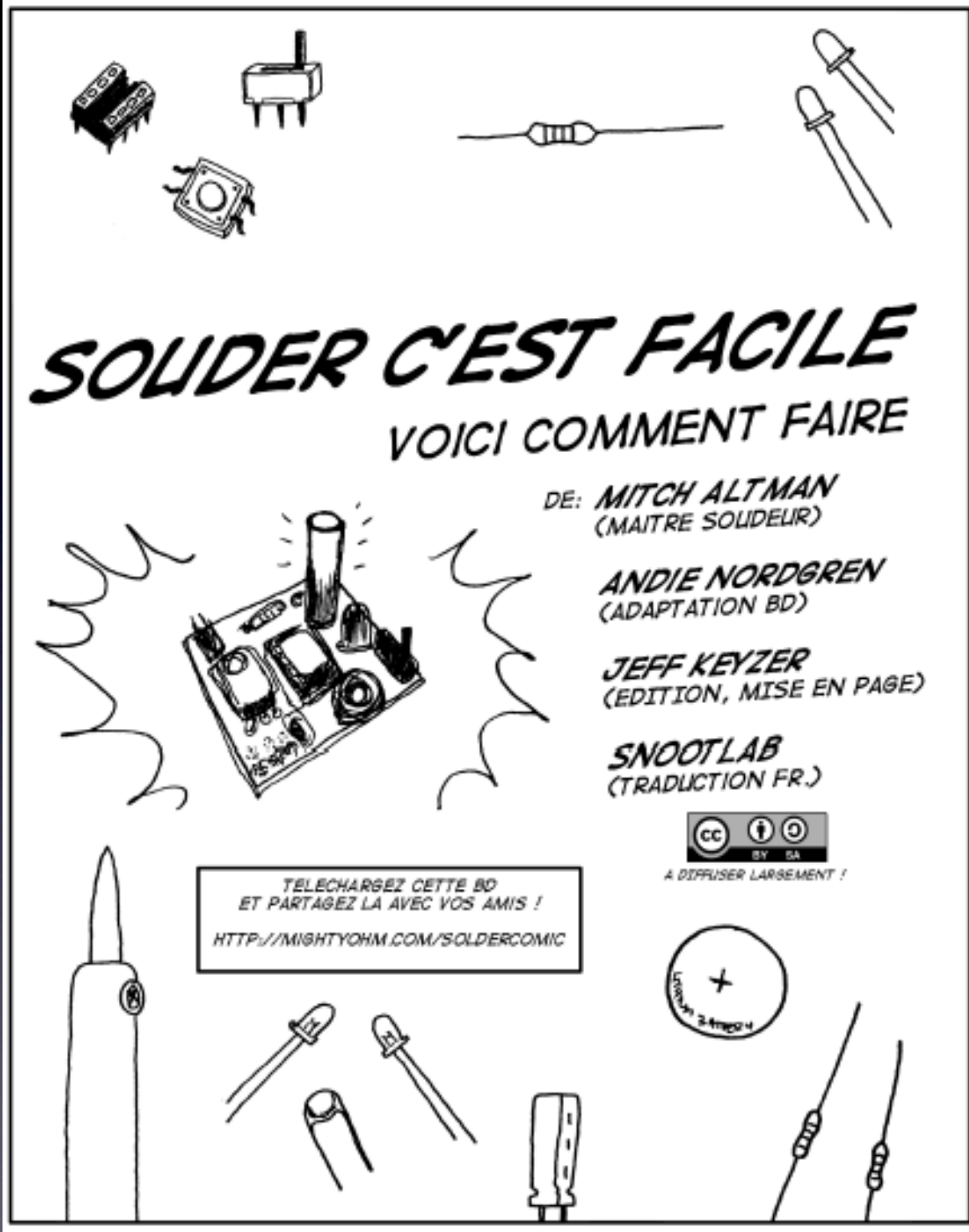
download for free at:
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(In many different languages.)

Learn To Solder



download for free at:
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(In many different languages.)

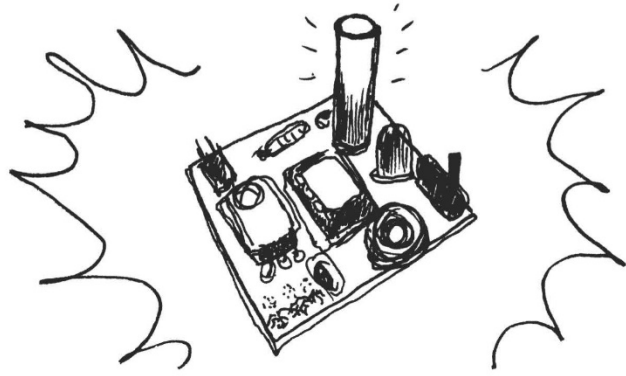
Learn To Solder



download for free at:
<http://mightyohm.com/soldercomic>
(In many different languages.)

Learn To Solder

SOLDAR ES FÁCIL! APRENDE CÓMO HACERLO



POR: **MITCH ALTMAN**
(SABIDURÍA EN SOLDADO)

ANDIE NORDGREN
(ADAPTACIÓN A COMIC)

JEFF KEYZER
(DISEÑO Y EDICIÓN)



DISTRIBUYE AMPLIAMENTE!



download for free at:
<http://mightyohm.com/soldercomic>
(In many different languages.)

Learn To Solder



LÖTEN IST EINFACH SO WIRD ES GEMACHT

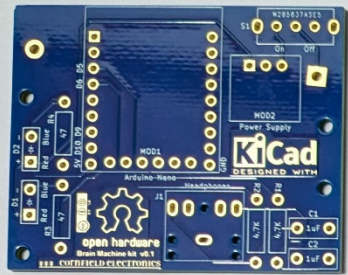
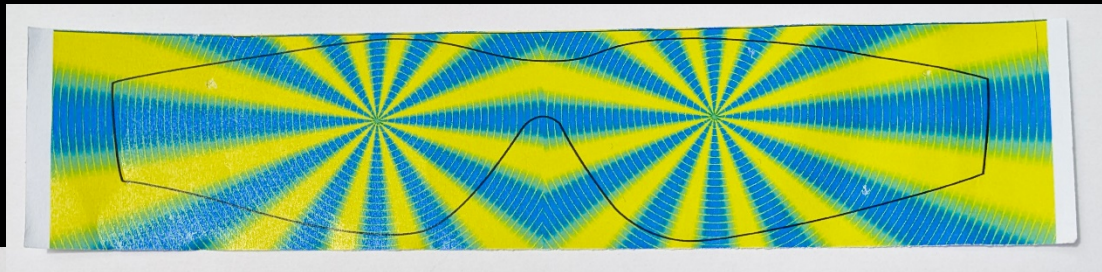
VON: MITCH ALTMAN
(LÖTWEISHEITEN)
ANDIE NORDGREN
(KOMIK-UMSETZUNG)
JEFF KEYZER
(LAYOUT UND BEARBEITUNG)
ALEXANDER BODORA
(ÜBERSETZUNG UND BEARBEITUNG)
RICHARD MEINSEN
(ÜBERARBEITUNG UND KORREKTUR)



WEITER
VERTEILEN!

download for free at:
<http://mightyohm.com/soldercomic>
(In many different languages.)

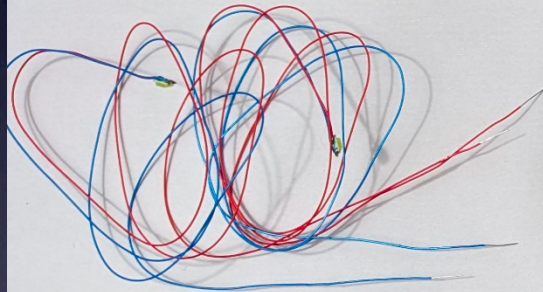
Trippy Graphix



LED1, LED2

Earbuds

Glasses



Arduino Nano



Power Supply

R1, R2 (4.7K) Yellow, Violet, Red, Gold



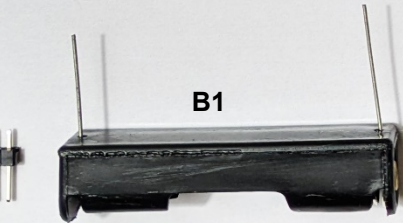
R3, R4 (47) Yellow, Violet, Black, Gold



J1



C1, C2



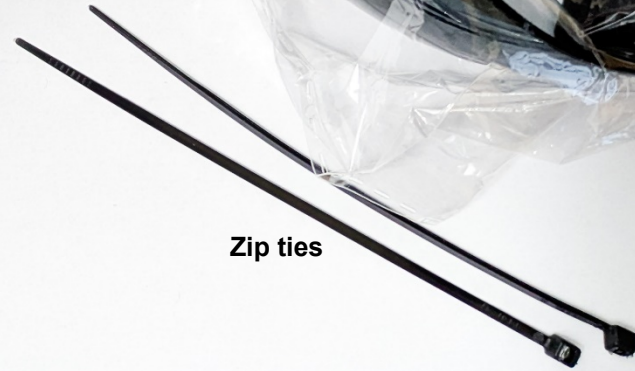
B1



S1

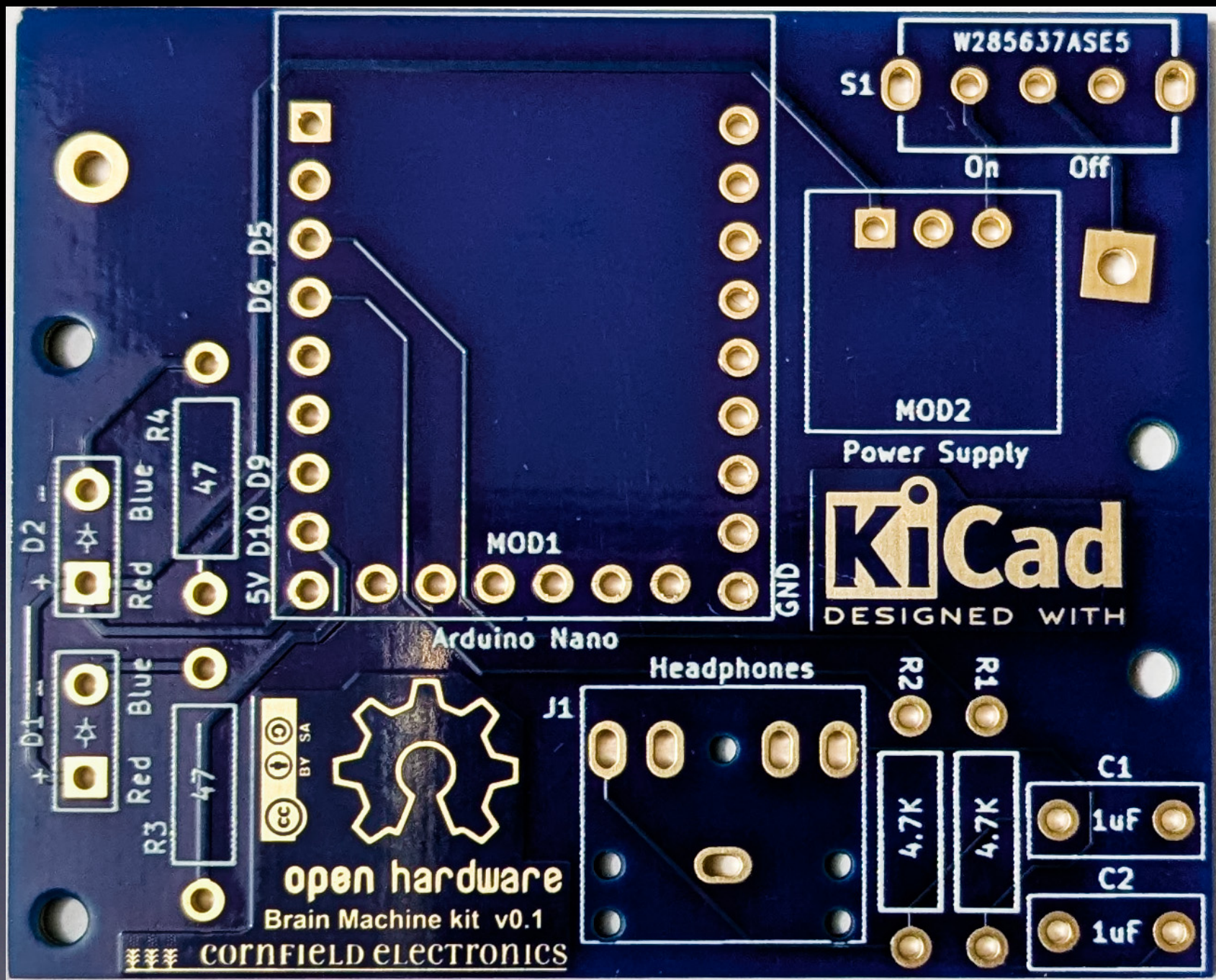


Header pins

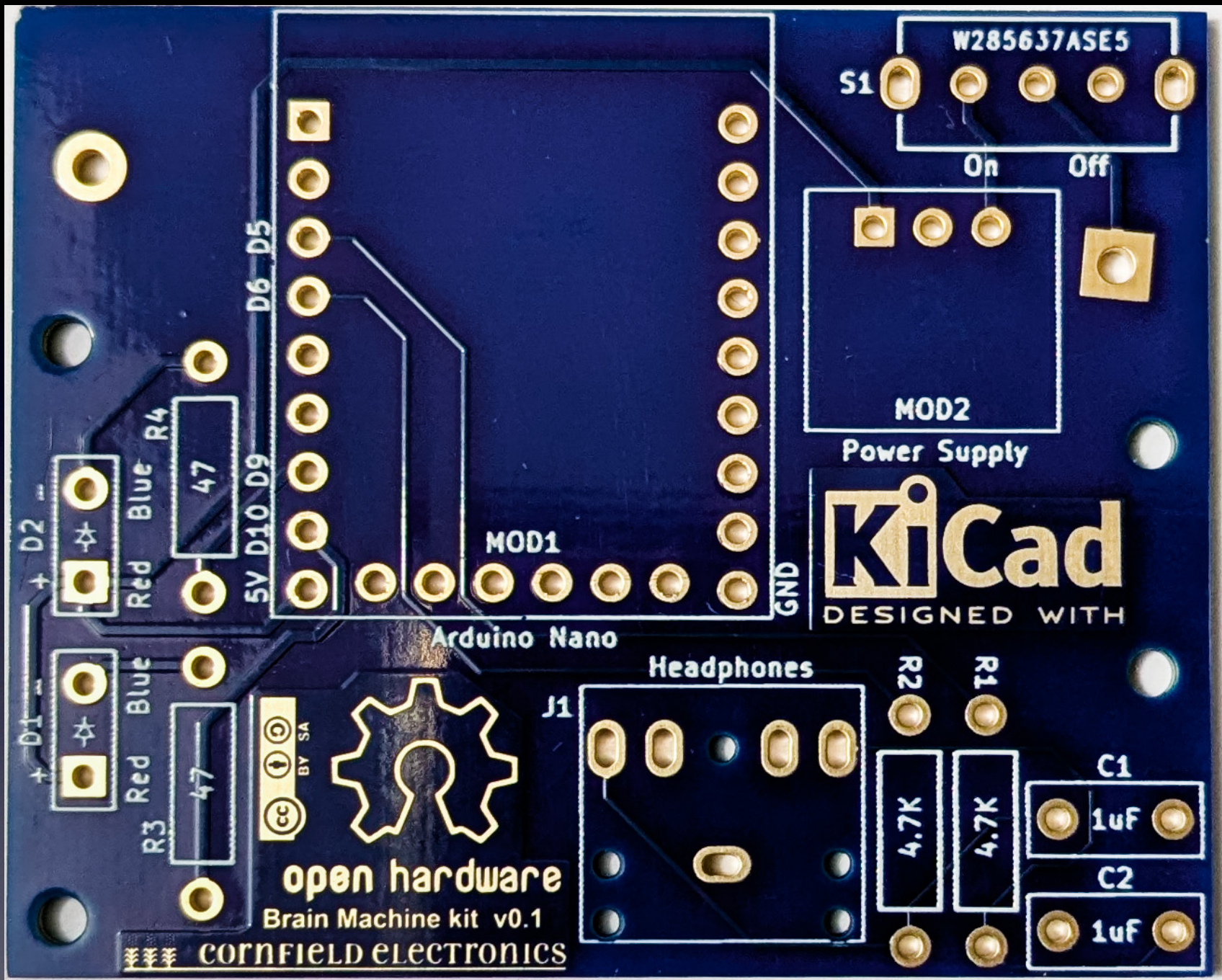


Zip ties

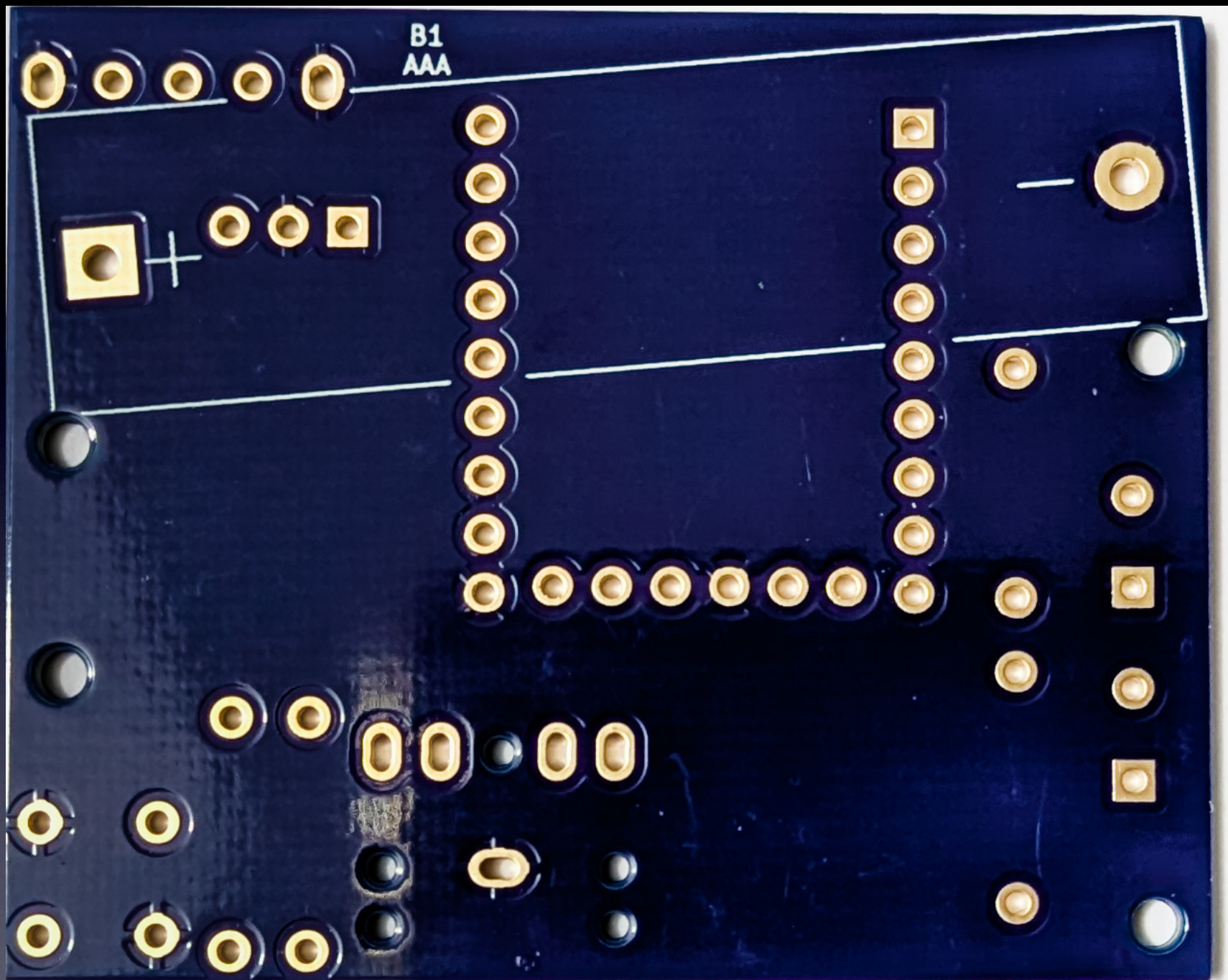
All of the parts



The board we'll solder the parts to



Front/Top of board

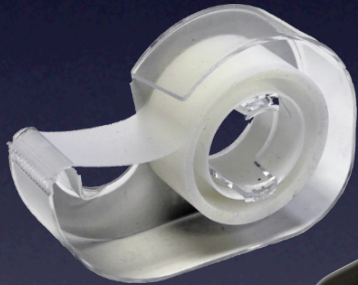


Back/Bottom of board



Note:

Since we will use **Lead-Free** solder it is helpful to also have **flux paste in a syringe** and **Isopropyl Alcohol**



The tools you'll need:

- soldering Iron (35W or less)
- solder (*more details coming*)
- soldering iron stand
- cellulose kitchen sponge (*not plastic!*)
- *small* wire cutter

- tape
- felt-tip pen
- scissors

Our first part



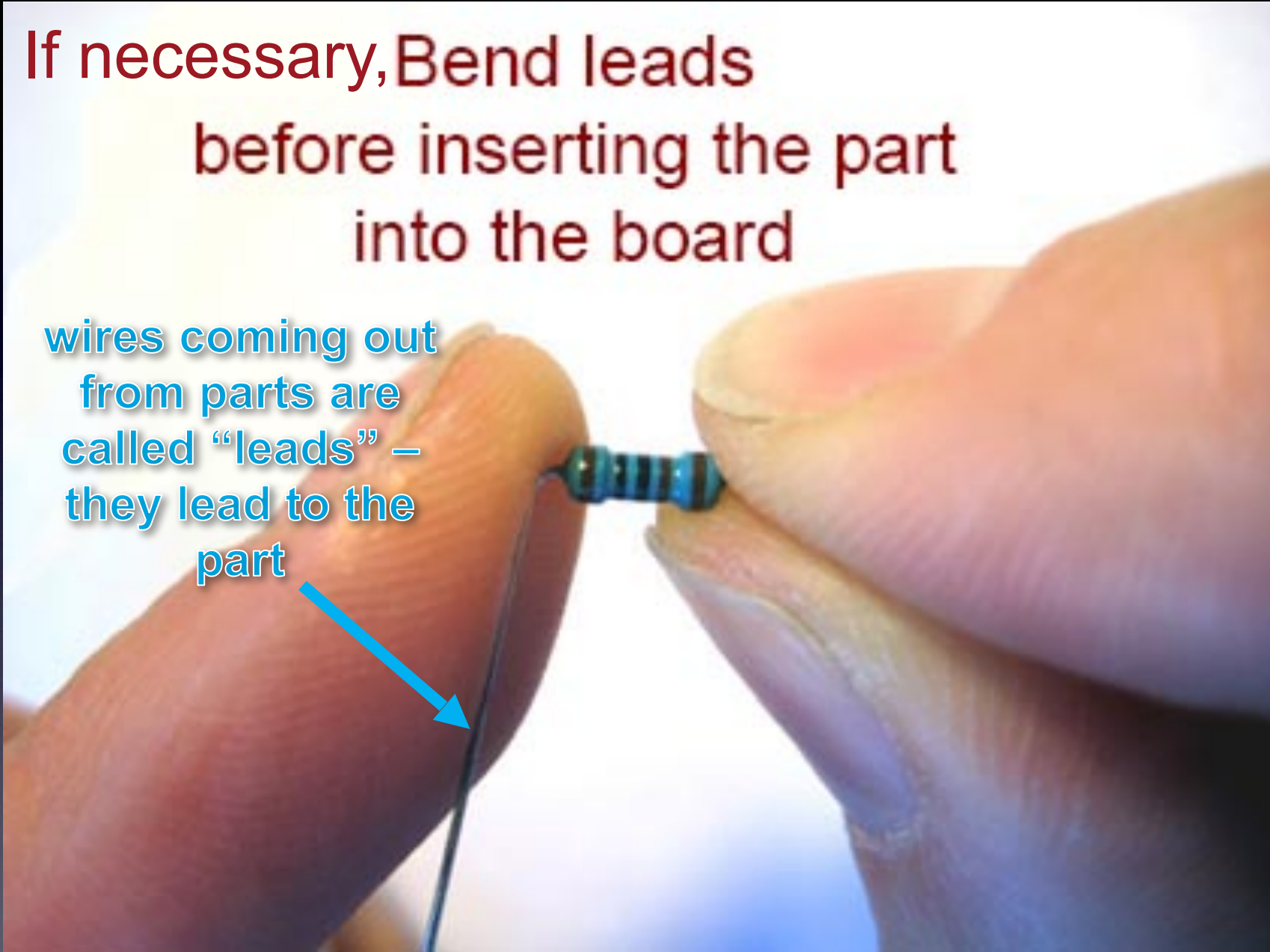
R1: Yellow, Violet, Red

(not: Yellow, Violet, ~~Black~~)

Some parts, such as resistors, need their leads bent first

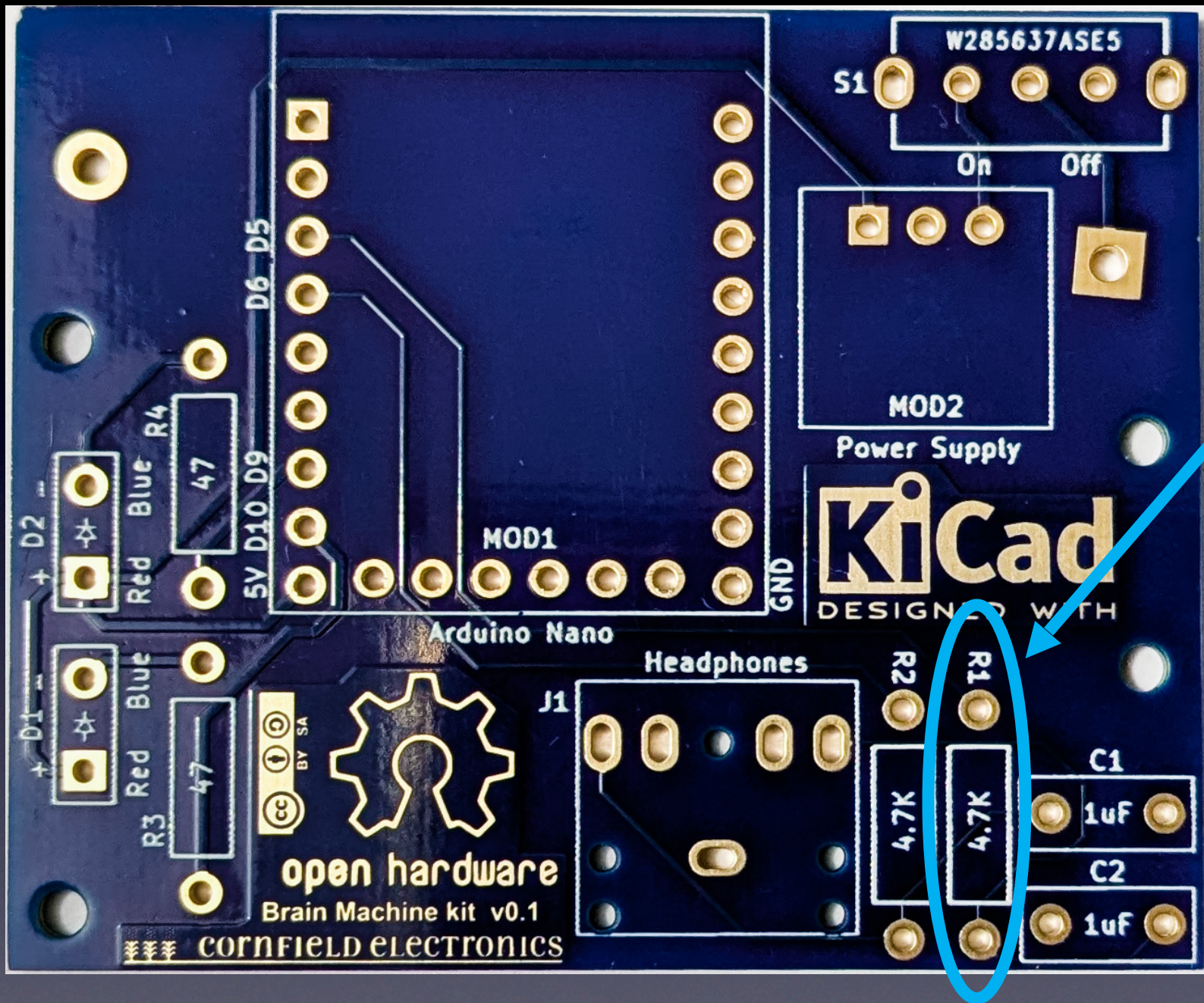
If necessary, Bend leads
before inserting the part
into the board

wires coming out
from parts are
called “leads” –
they lead to the
part





R1 – this is how it will look *before* inserting it into the board



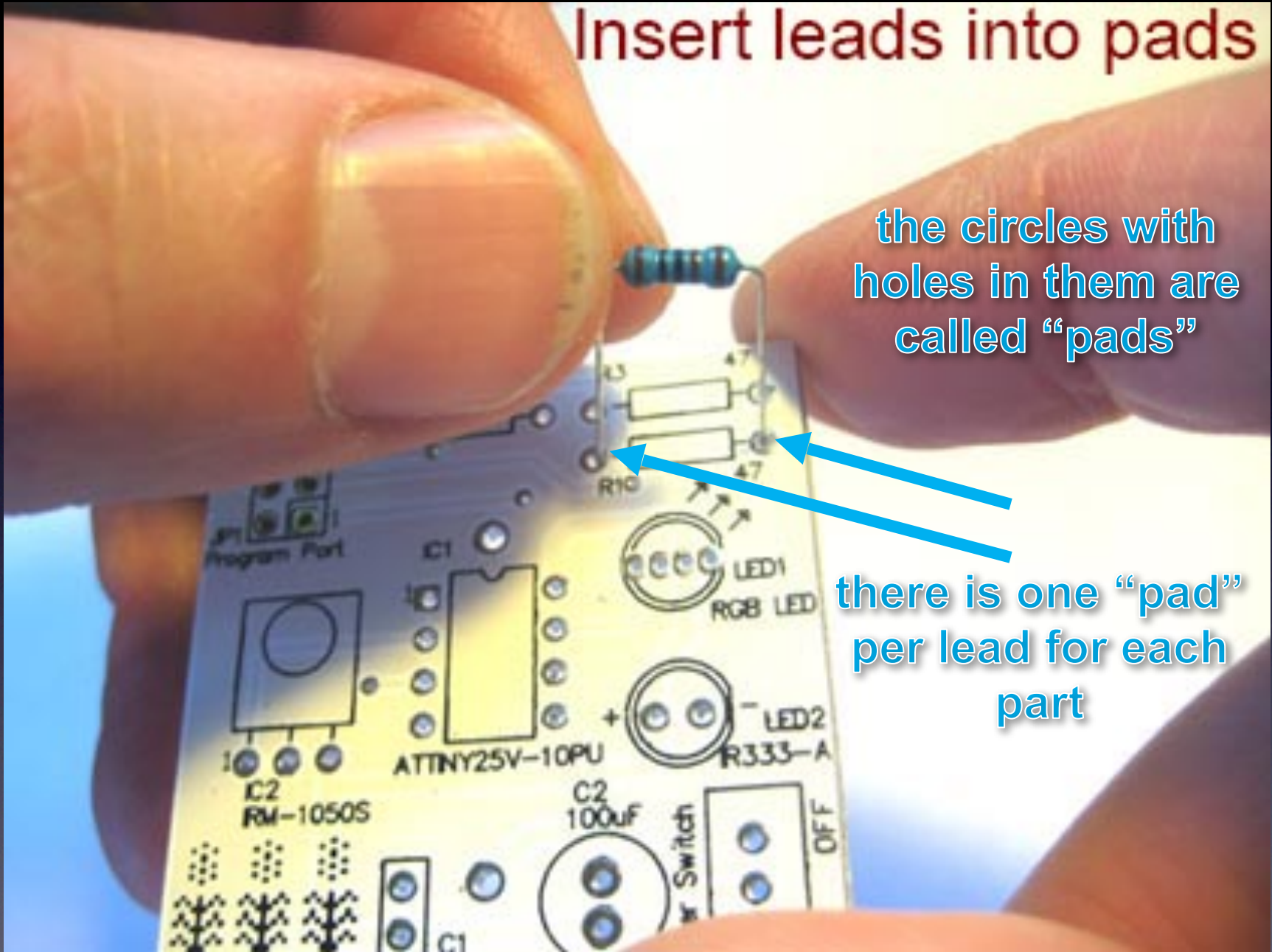
R1

R1 – this is where it goes

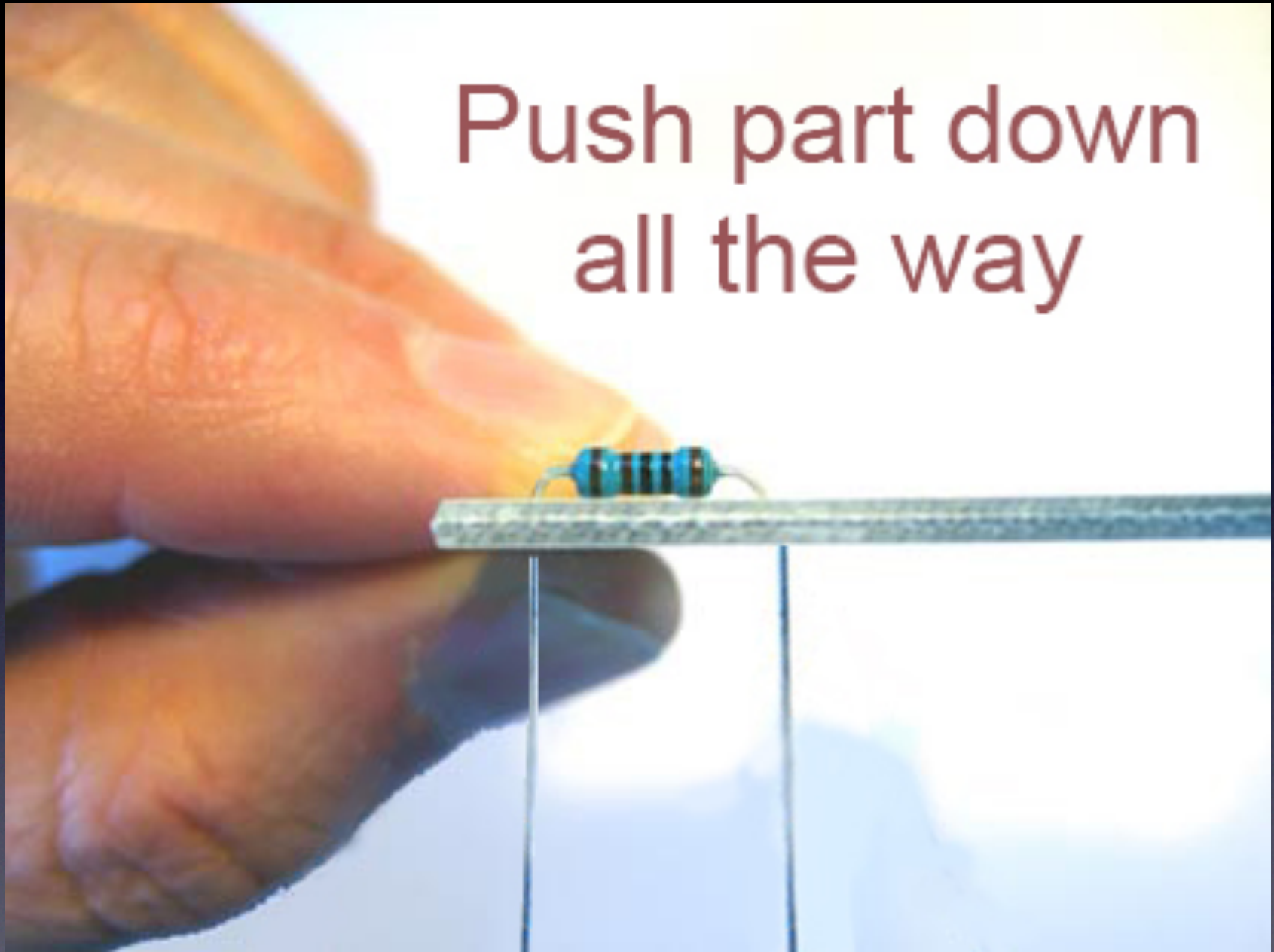
Insert leads into pads

the circles with holes in them are called "pads"

there is one "pad" per lead for each part



Push part down
all the way



A close-up photograph of a person's hand holding a thin metal wire. A small resistor with four color bands (blue, black, orange, brown) is attached to the wire. The wire is bent into a V-shape at the resistor. The background is a bright, slightly blurred sky. Text is overlaid on the image.

Upside down

Wires bent
half way
out

(only half way)

like a "V"

so that the part won't fall out while soldering it

A close-up photograph of a person's hand holding a thin metal wire. A small resistor with four color bands (blue, green, yellow, brown) is mounted on the wire. The wire is bent into a 'V' shape at the resistor. The background is a bright, slightly blurred sky. Text overlays provide instructions on the wiring technique.

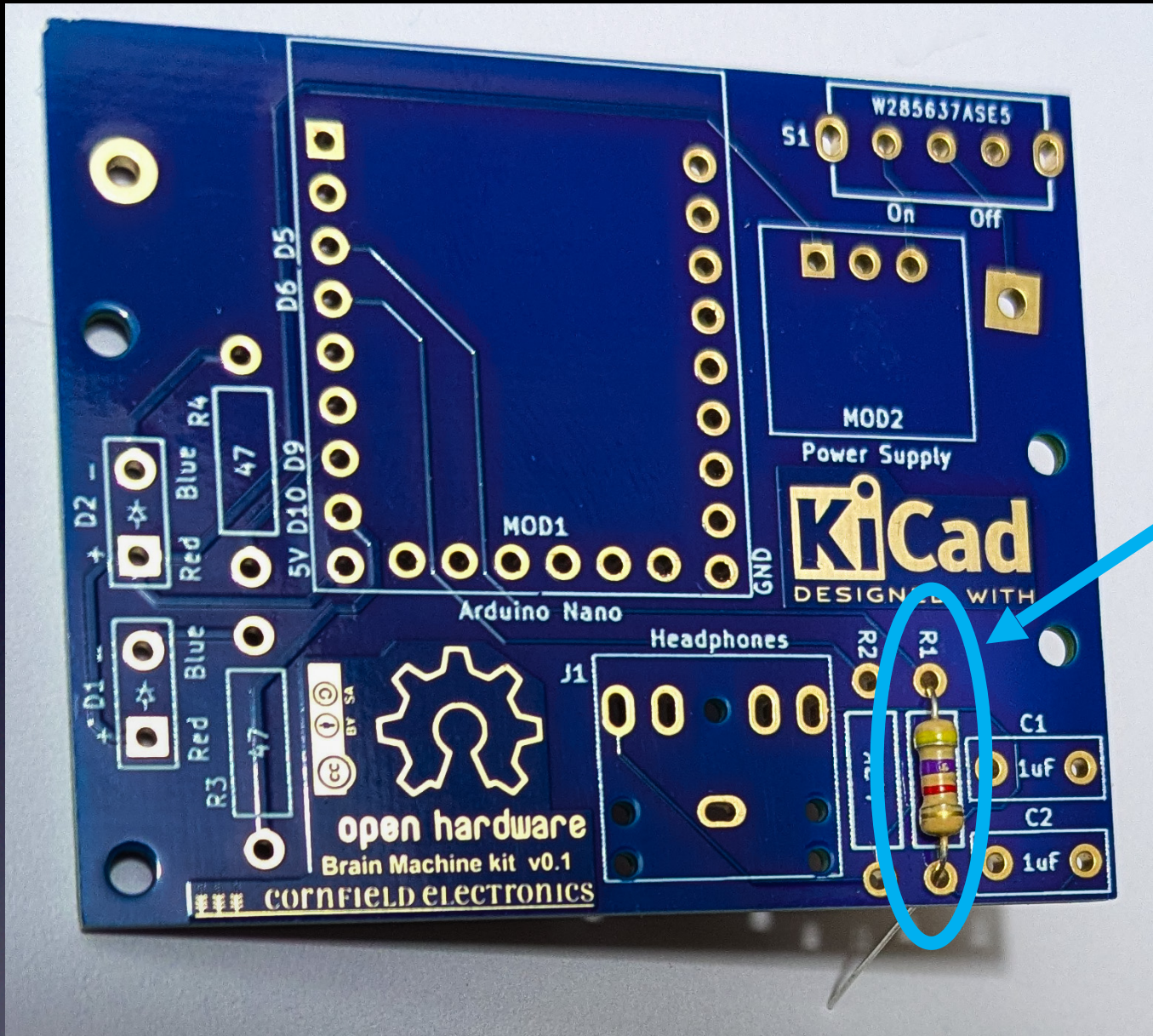
Upside down

Wires bent
half way
out

(only half way)

like a "V"

Ready to Solder !



Direction does not matter

R1 – inserted into the board



How to hold a soldering iron

(Like a pencil – held from underneath)

Important

The best kind of solder for DIY electronics:

(Sn – Tin / Pb – Lead)

63/37 rosin core,
0.031" (0.8mm) diameter (or smaller)

(60/40 is also good)

Note:

Most
Lead-Free solder
has poisonous fumes!

This is what we will use:

A good kind of solder for DIY electronics:

*This is the only good **Lead-Free** solder I have found!*
(after years of searching)



Kester
K100LD Rosin
(not "No Clean")
0.031" diameter (0.8mm)

This is what we will use:

A good kind of solder for DIY electronics:

*This is the only good **Lead-Free** solder I have found!*
(after years of searching)

Kester **K100LD Rosin** Solder
0.031" diameter (0.8mm)



Note:

Since we will use **Lead-Free** solder it is *helpful* to also have *flux paste* in a syringe and *Isopropyl Alcohol*



99%



Another good kind of solder for DIY electronics:

*This is another good **Lead-Free** solder I have found!*



**Duratool
D01685 Rosin**

0.7mm diameter

*(as good as the
Kester K100LD Rosin)*

Another good kind of solder for DIY electronics:

This is another good **Lead-Free** solder I have found!



**MG Chemicals
4900 Rosin (112g, 227g, 454g)**

0.8mm diameter

*(as good as the
Kester K100LD Rosin)*

Another good kind of solder for DIY electronics:

*This is another good **Lead-Free** solder I have found!*



iFixit
IF145-077-2 (12g)
1.0mm diameter

*(as good as the
Kester K100LD Rosin)*

3 Safety Tips...

Safety Tip #1:

Hot!!

(When you touch the tip,
you will let go quickly every time!)

Safety Tip #2:
Soldering chemicals
are toxic

But they easily wash off your hands
with soap and water

Safety Tip #3:

(coming soon...)

2 secrets
to good soldering...

Secret #1:

Clean the tip!

(before every solder connection)

Bang (lightly) 3 times,

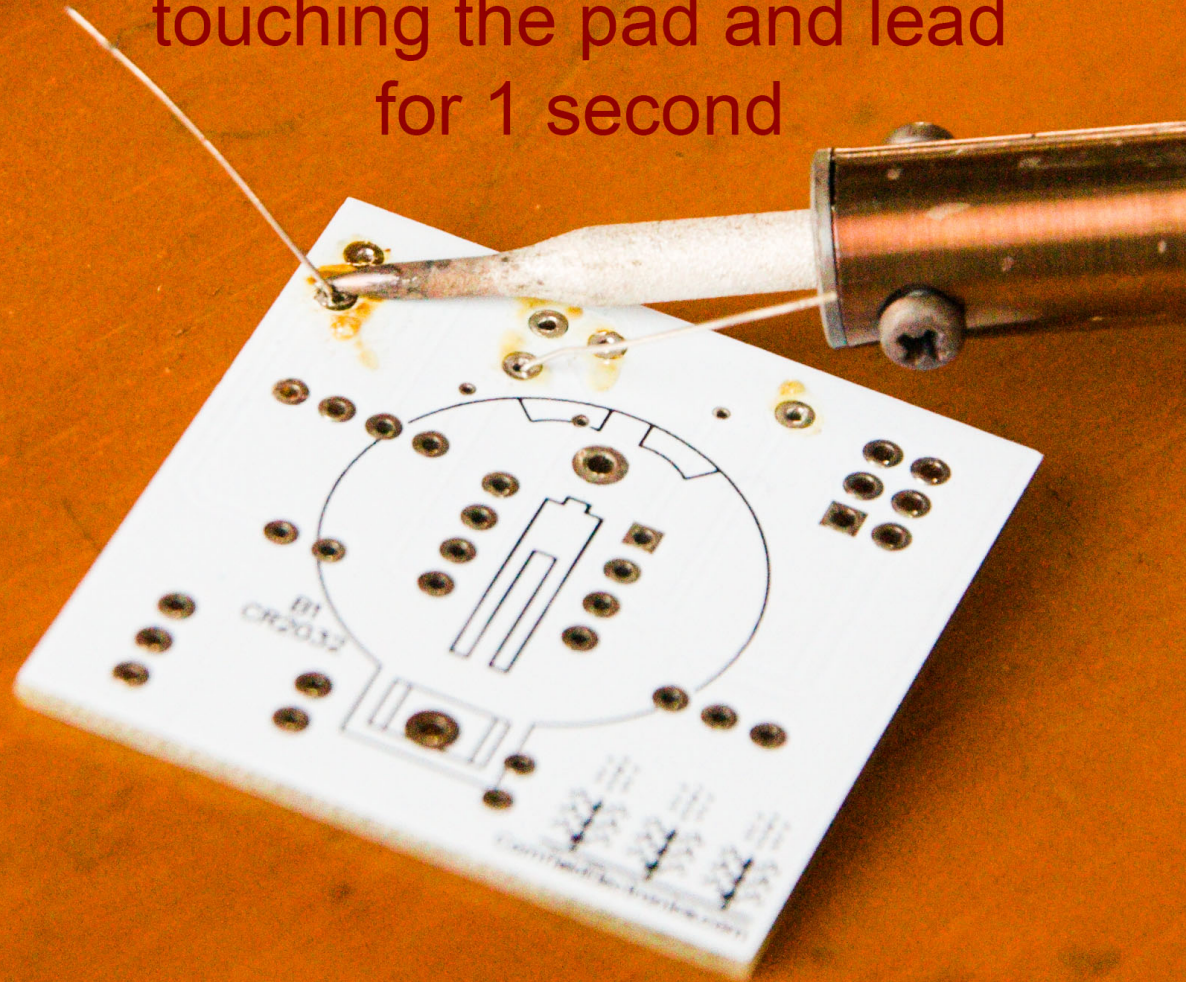
Swipe, Rotate, Swipe (on the sponge):

Keep the tip shiny silver!

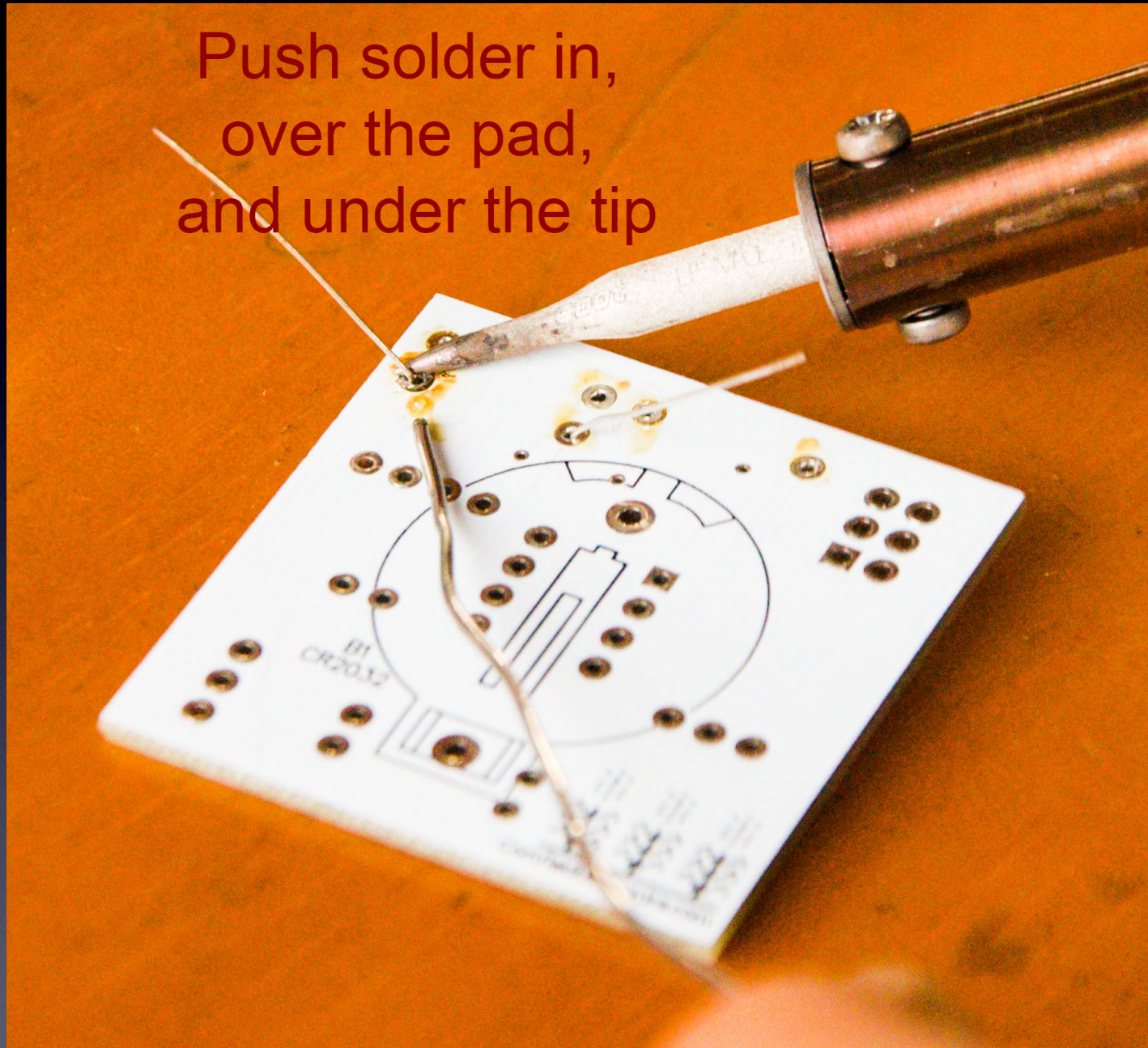
knock solder off the tip



Lay clean tip across half of the pad,
touching the pad and lead
for 1 second

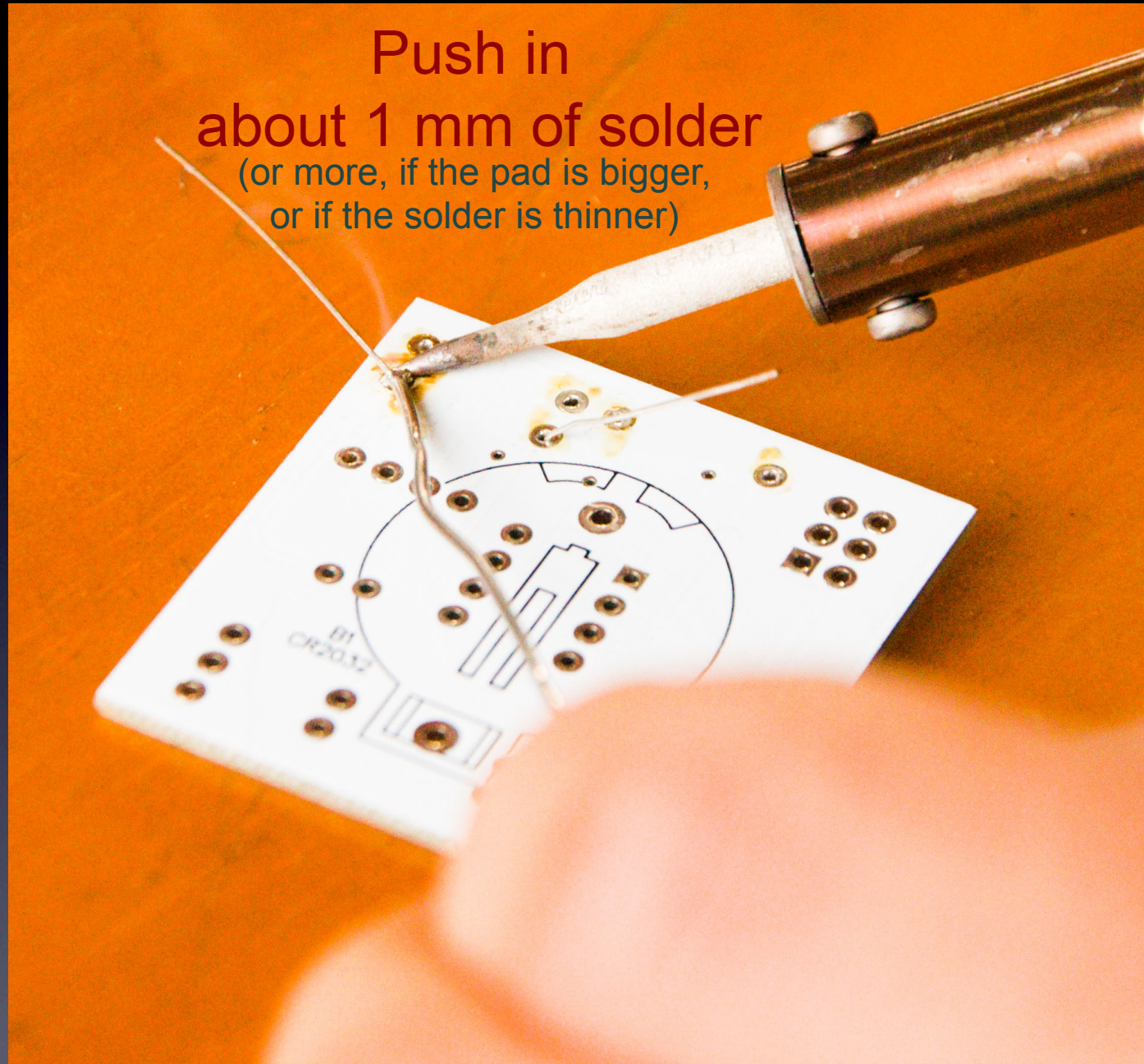


Do this quickly (slowly doesn't work well) – solder in & out in about 1 second



IMPORTANT: Make sure solder melts on the underside of the soldering iron tip (not the side or top of the soldering iron tip)!

Do this quickly (slowly doesn't work well) – solder in & out in about 1 second



Make sure solder melts on the underside of the soldering iron tip
(not the side or top of the soldering iron tip)!

HEY !!!

KEEP HOLDING TIP DOWN FOR 1 MORE SECOND !!



Pull solder away,
But keep holding soldering iron down
for 1 more second !!

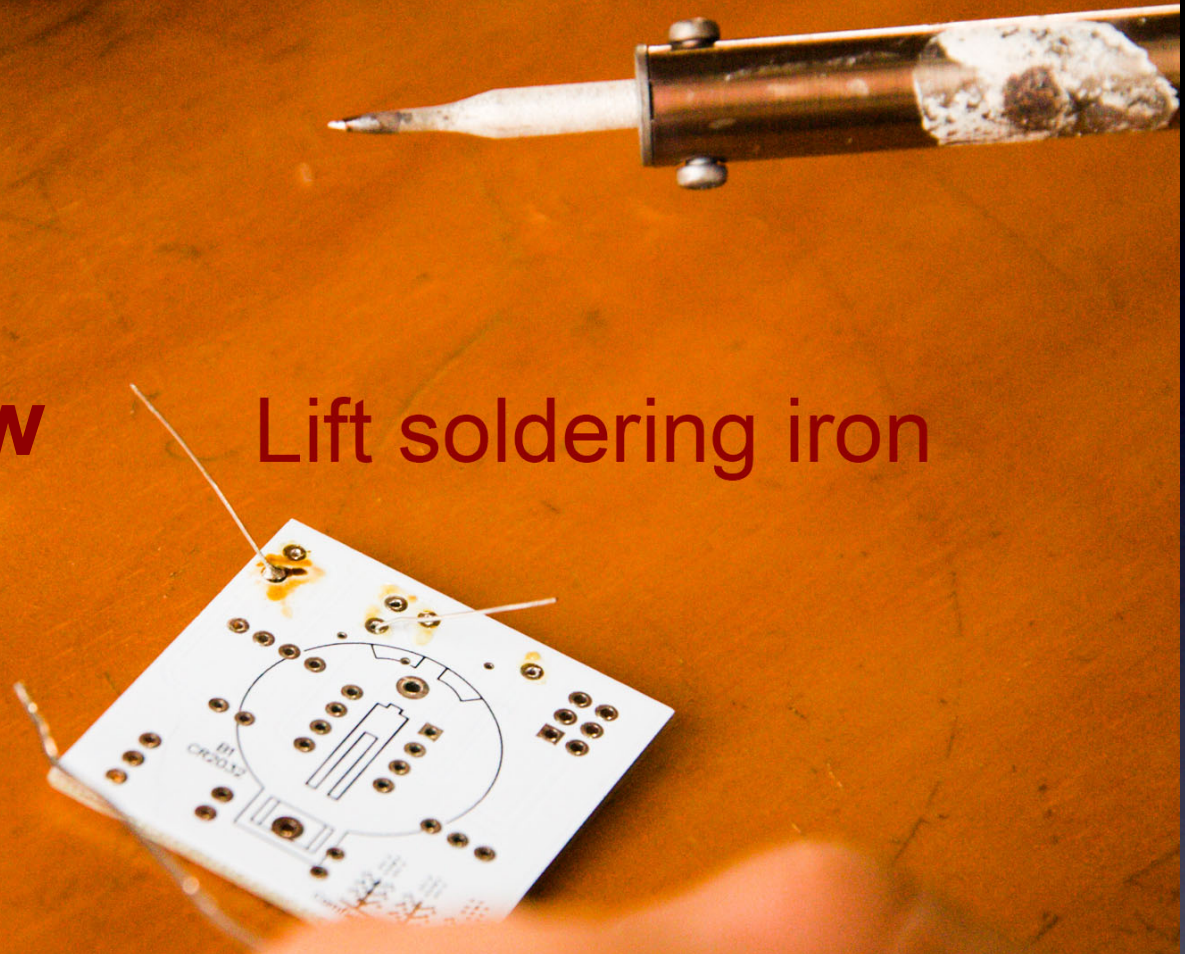
WAIT !!
Don't lift the tip !!

Secret #2:

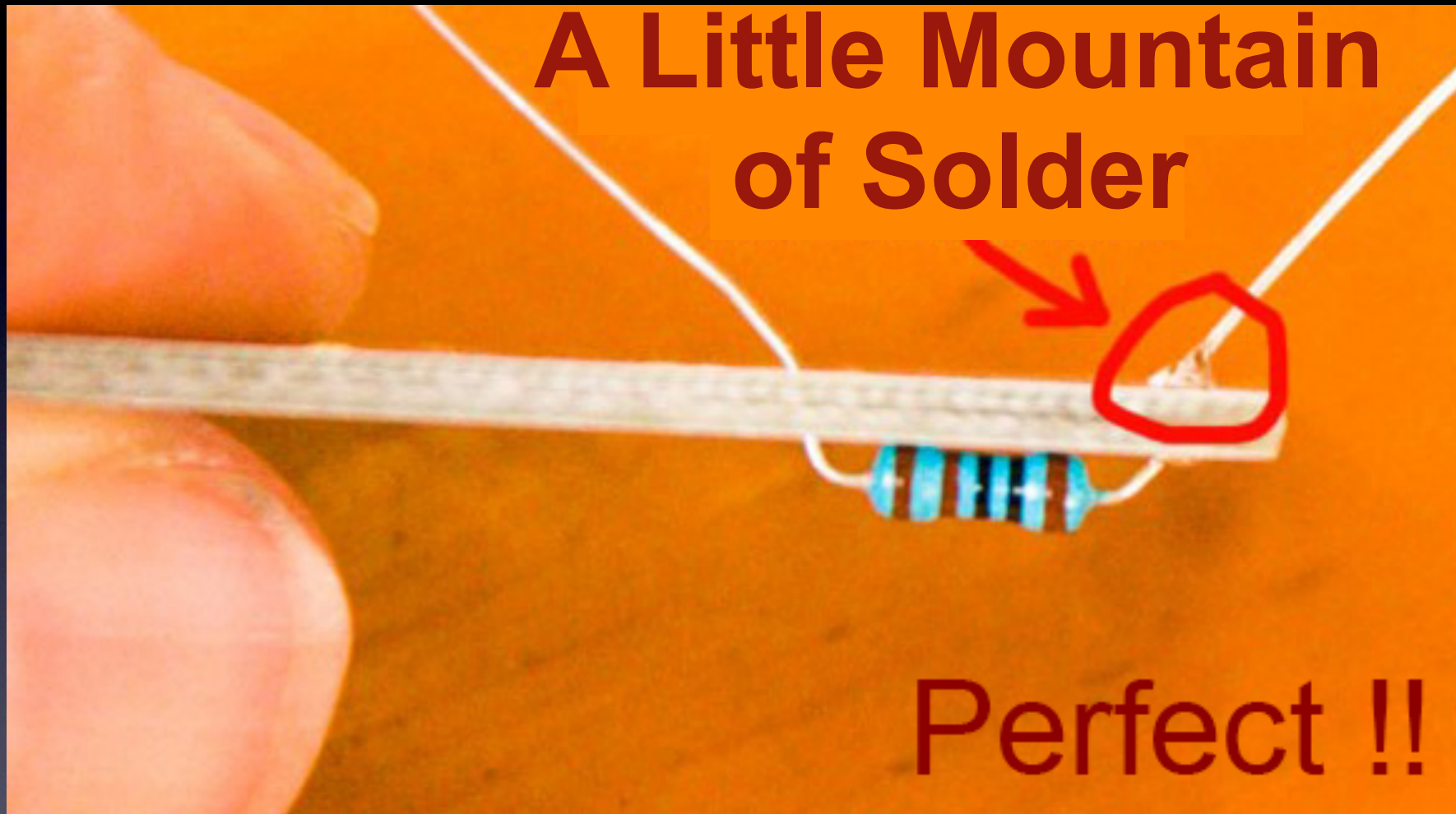
Keep hot tip down
1 second
For solder to flow !!

Now

Lift soldering iron



**A Little Mountain
of Solder**



Perfect !!

If you can see any of the pad, or the hole, you need more solder
– so, just do all the steps again to make it perfect.

The Rhythm !

is just as important as the preceding steps!

The Rhythm !

and speed (about 1 second per step)



The Rhythm !

and speed (about 1 second per step)

Clean the tip



The Rhythm !

and speed (about 1 second per step)



Tip **Down**

The Rhythm !

and speed (about 1 second per step)



Solder **In**

The Rhythm !

and speed (about 1 second per step)



Solder **Out**

The Rhythm !
and speed (about 1 second per step)



WAIT !

The Rhythm !

and speed (about 1 second per step)



Lift Tip

ONE MORE TIME



The Rhythm !

and speed (about 1 second per step)



The Rhythm !

and speed (about 1 second per step)

Clean the tip



The Rhythm !

and speed (about 1 second per step)



Tip **Down**

The Rhythm !

and speed (about 1 second per step)



Solder In

The Rhythm !

and speed (about 1 second per step)



Solder **Out**

The Rhythm !
and speed (about 1 second per step)



WAIT !

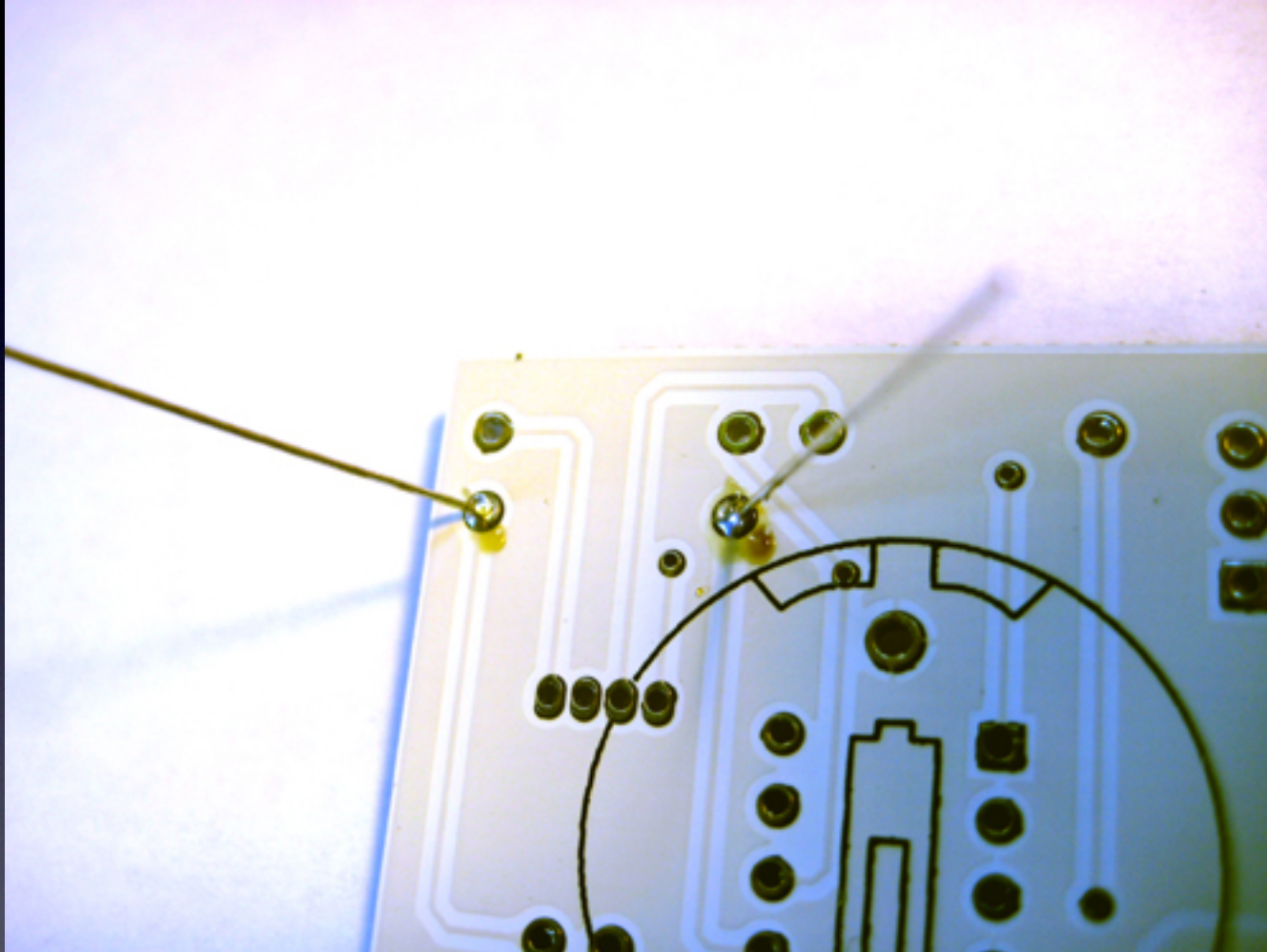
The Rhythm !

and speed (about 1 second per step)



Lift Tip

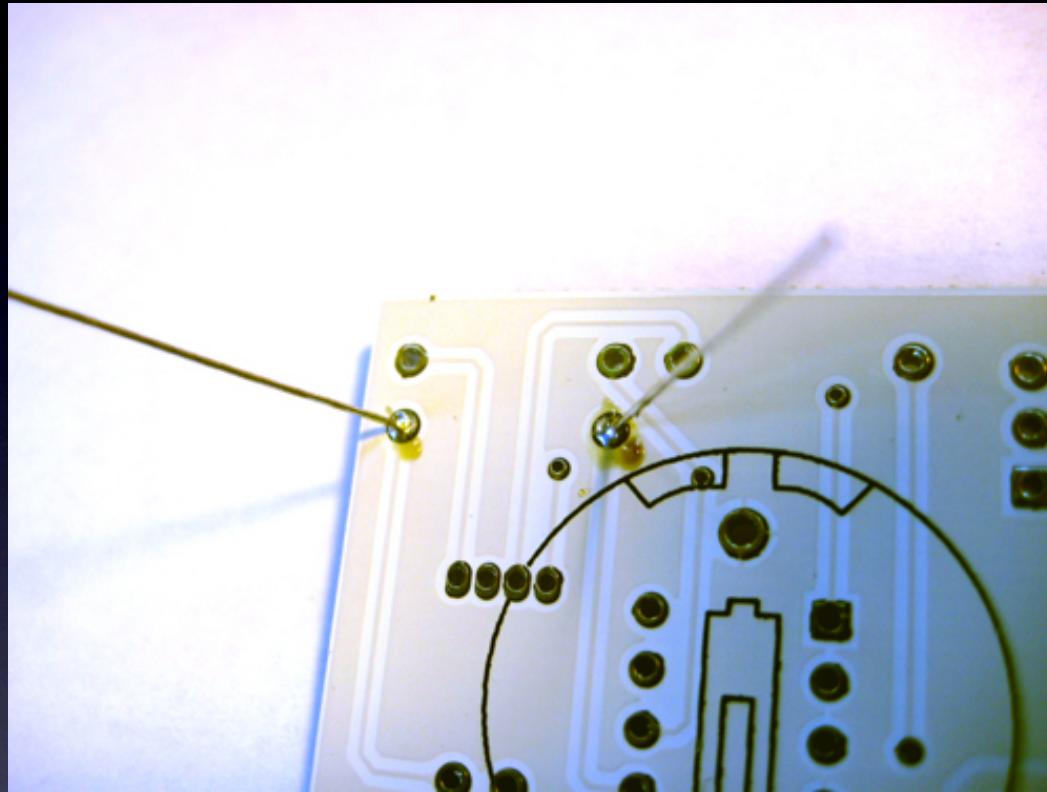
Solder all of the leads of the part to the board



For this part, there are two leads

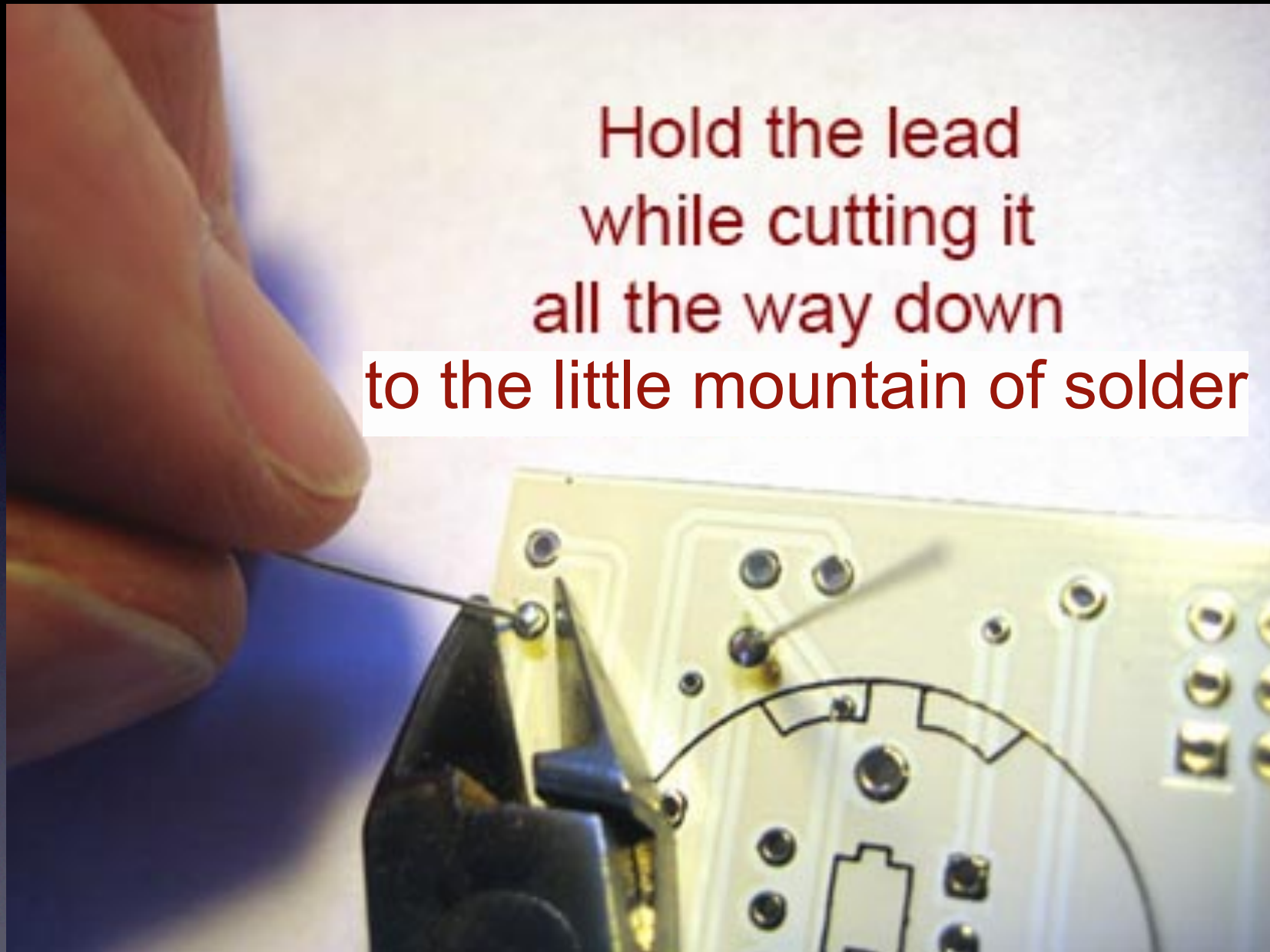
Here you can see two good solder connections

Two good solder connections



- Little mountains (not flat)
- Pads totally covered in solder
- Can't see the hole
- No connections to other pads

Now cut the leads short



Cutting with the tip of the wire cutter gives you more control

Safety Tip #3:

Hole or cover the lead !

(or it will fly into your eye!)

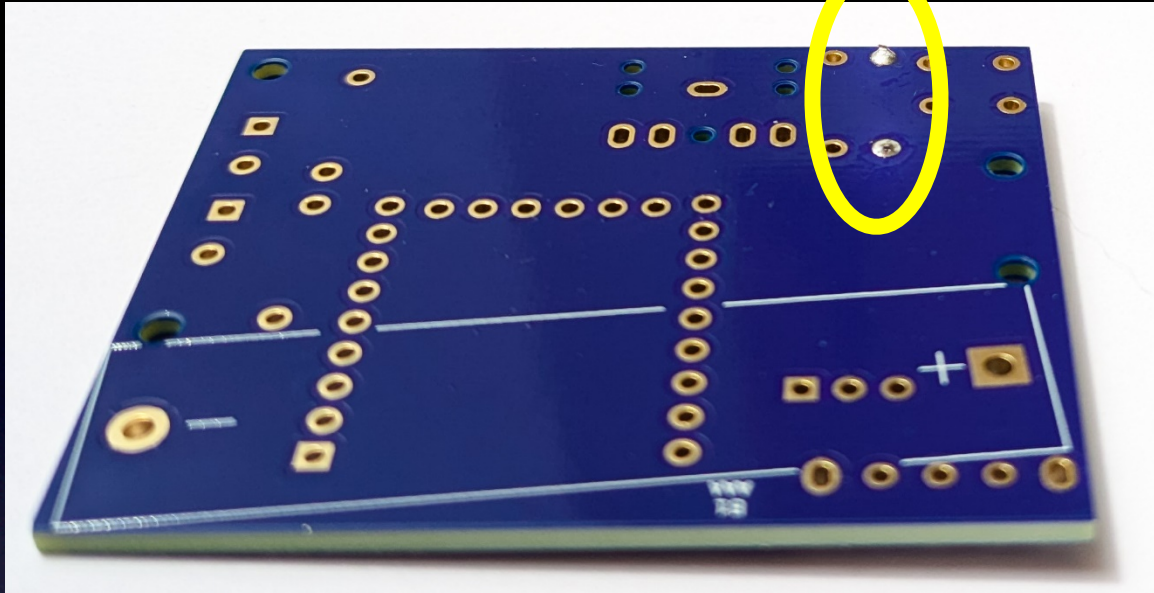
(They like doing that – so please hold or cover the lead when you cut.)



All done !

No wires sticking out

R1 soldered to the board



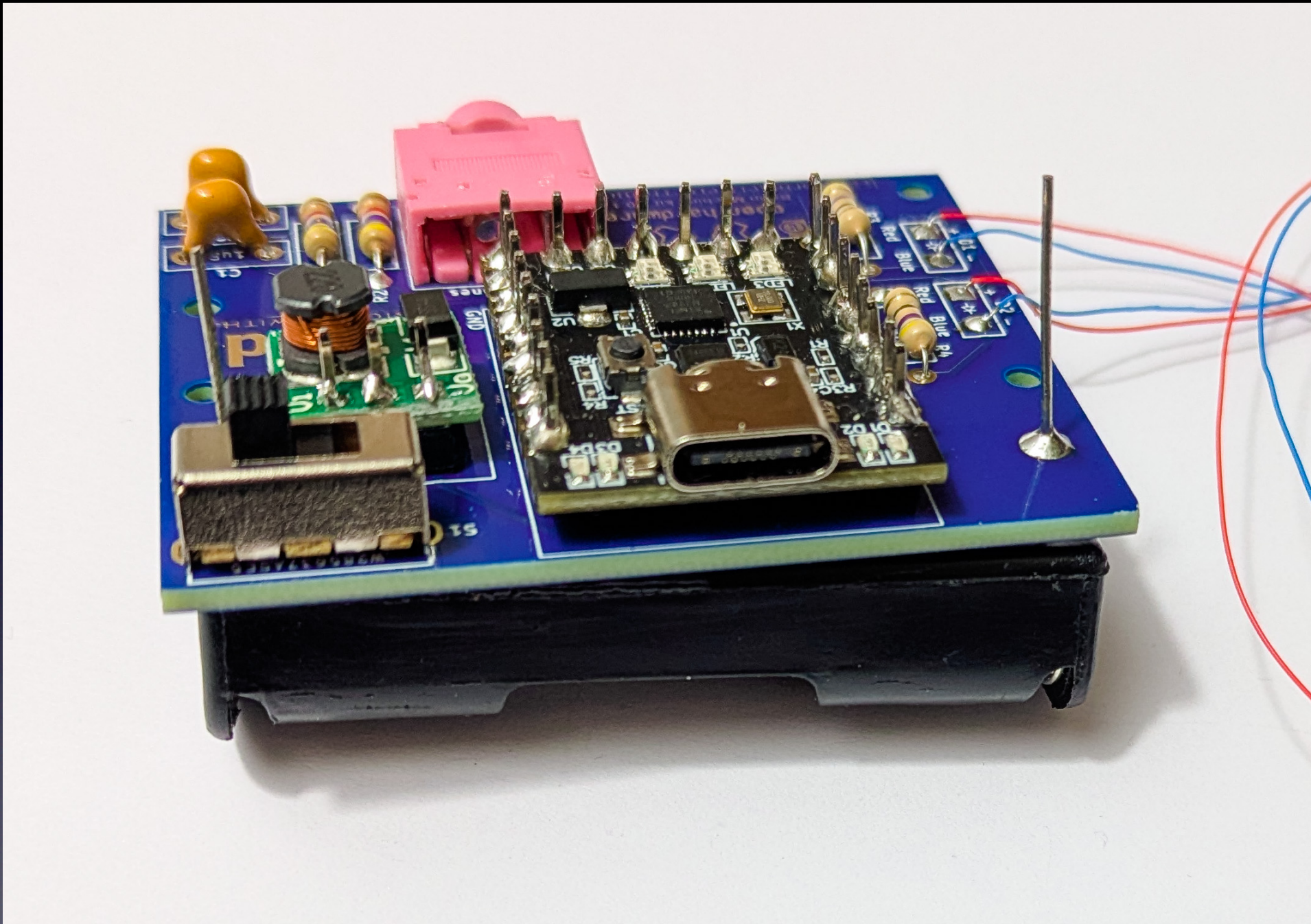
2 good solder connections

Notice that:

- Each connection is a small mountain (not flat)
- You cannot see any pad (they're totally covered with solder)
- You cannot see the holes (they're totally covered with solder)
- No connections to other pads

One part at a time

Till all the parts are soldered

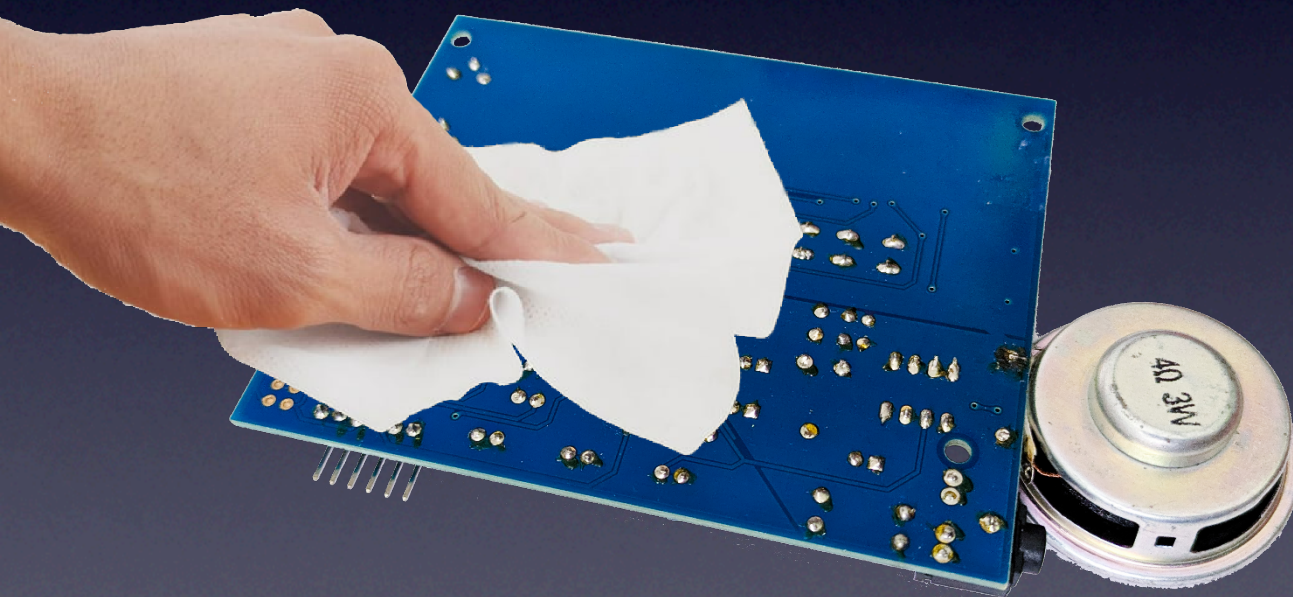


And it will look like this when you're done soldering.

If you used any *flux paste* for re-working problems



The bottom of the PCB will be sticky from the flux



You can clean it with a cloth wet with *Isopropyl Alcohol*

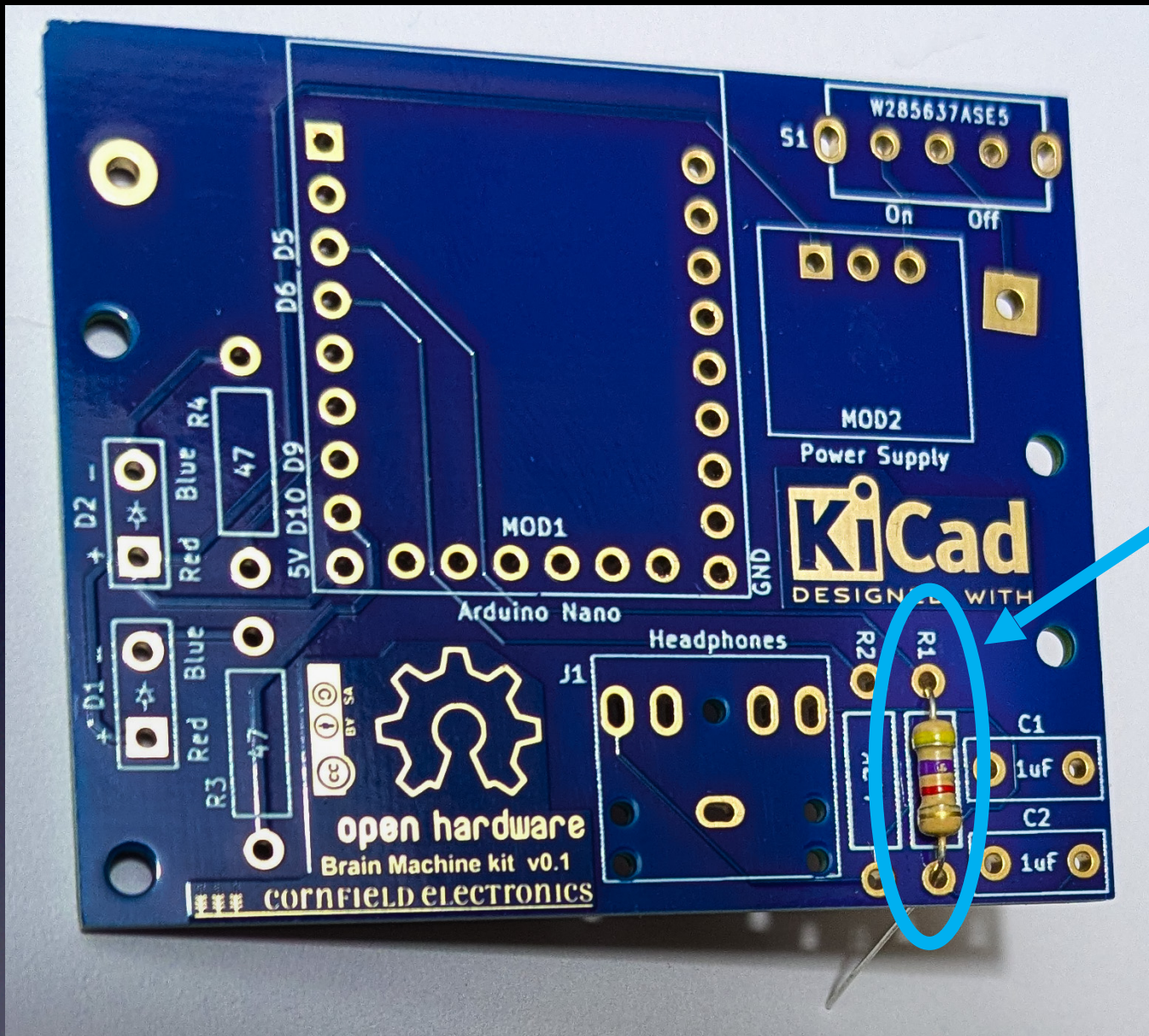
Then put in the batteries,

Turn it on,

And it works!

(Or you start debugging.)

Let's start!



Direction does not matter

If you haven't done so already, solder R1: Yellow, Violet, Red

R1, R2:

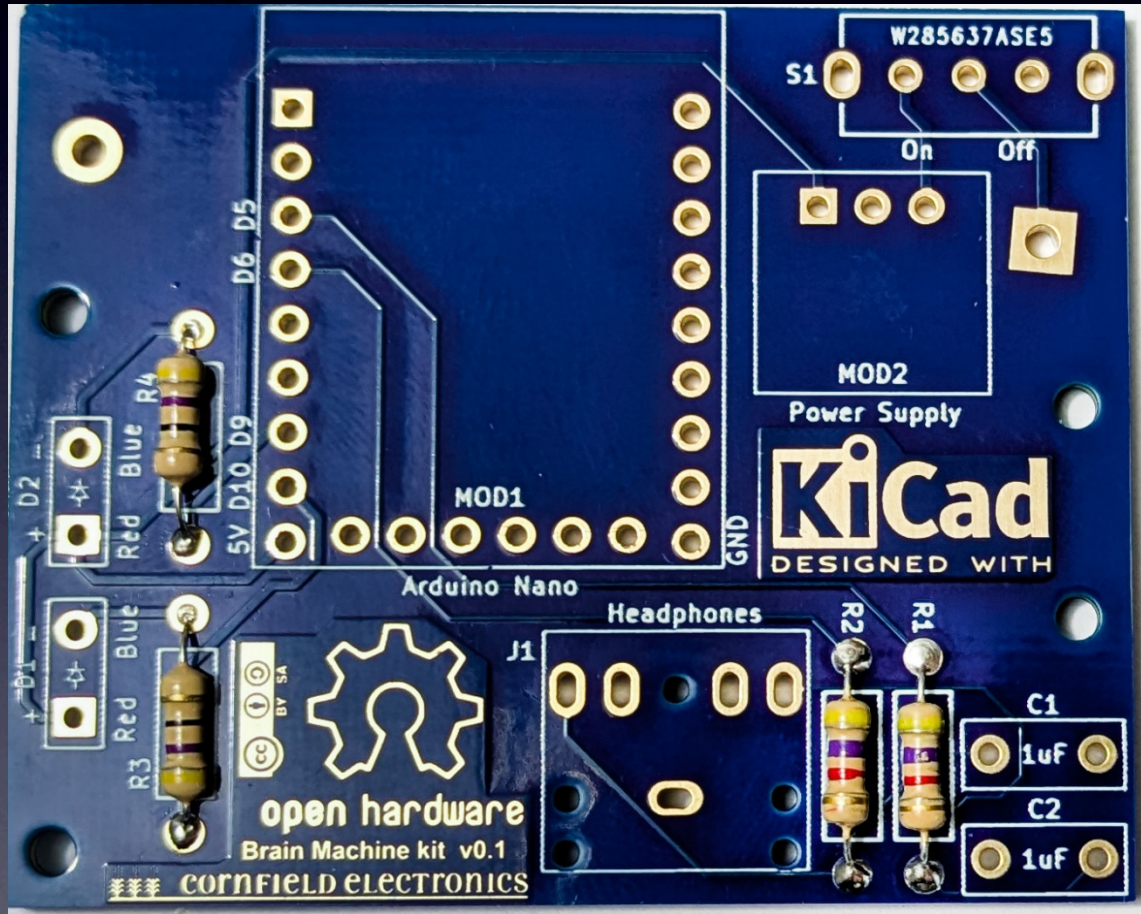


4.7K: Yellow, Violet, Red

R3, R4:



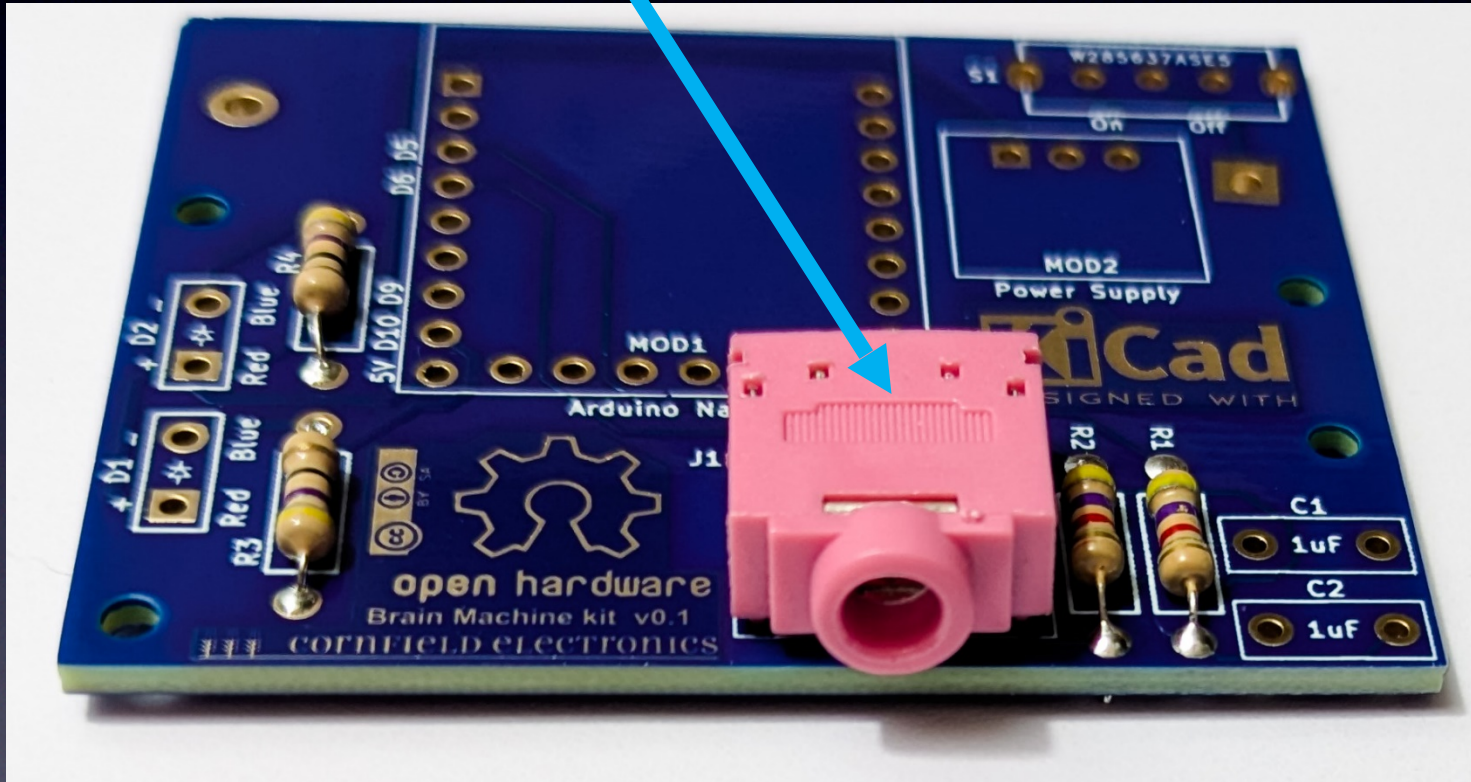
47: Yellow, Violet, Black



Direction does not matter

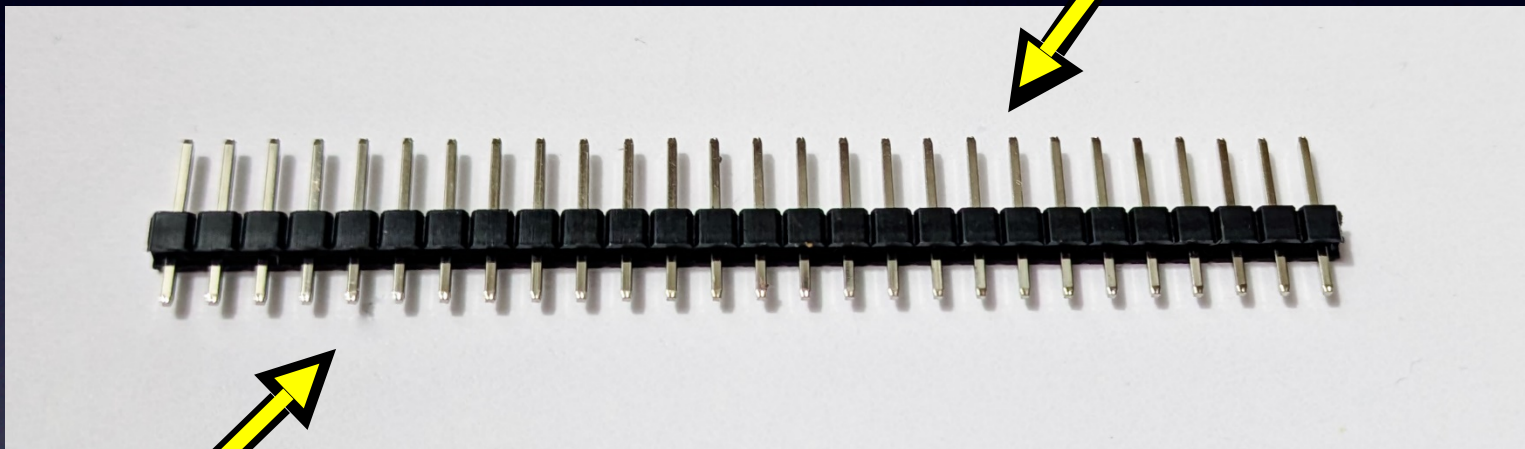
All 4 resistors

J1: Headphone Jack



Pin Headers

long pins



27 pins

short pins

Pin Headers

long pins



short pins

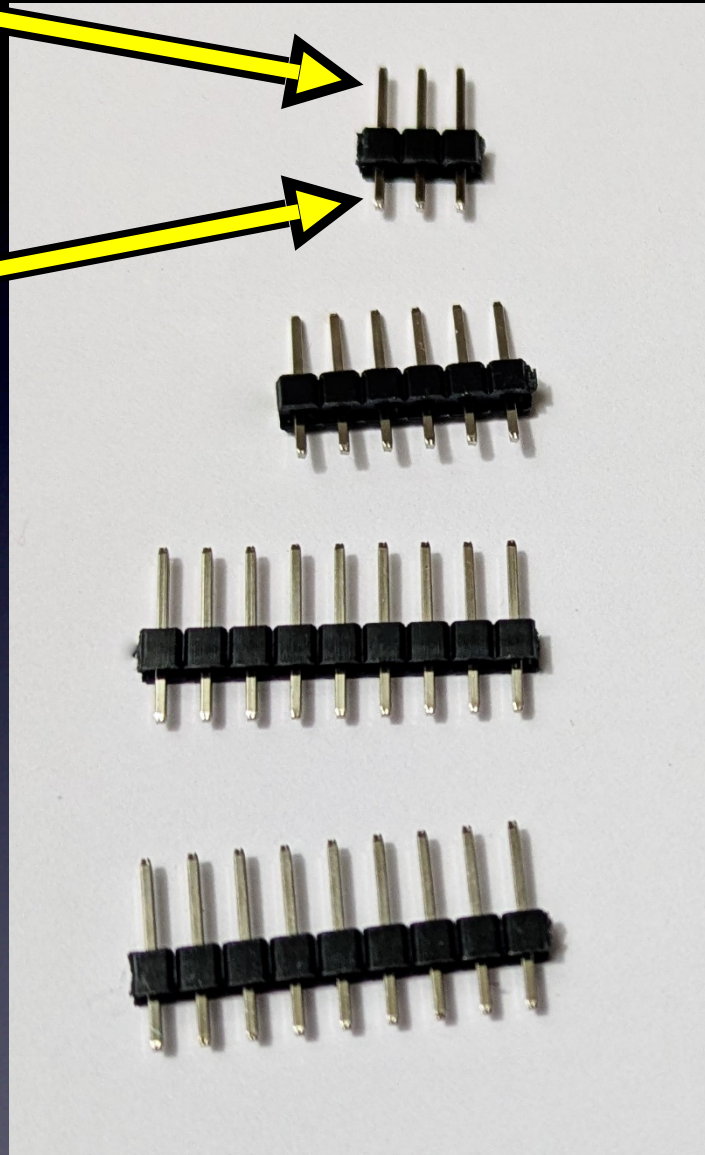


3 pins

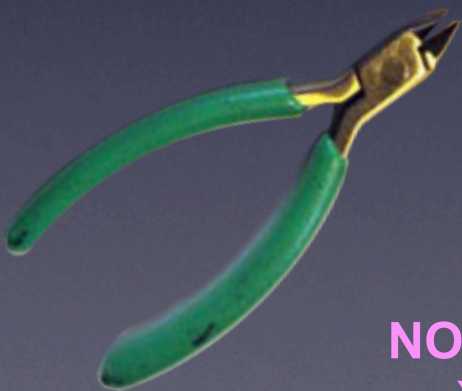
6 pins

9 pins

9 pins



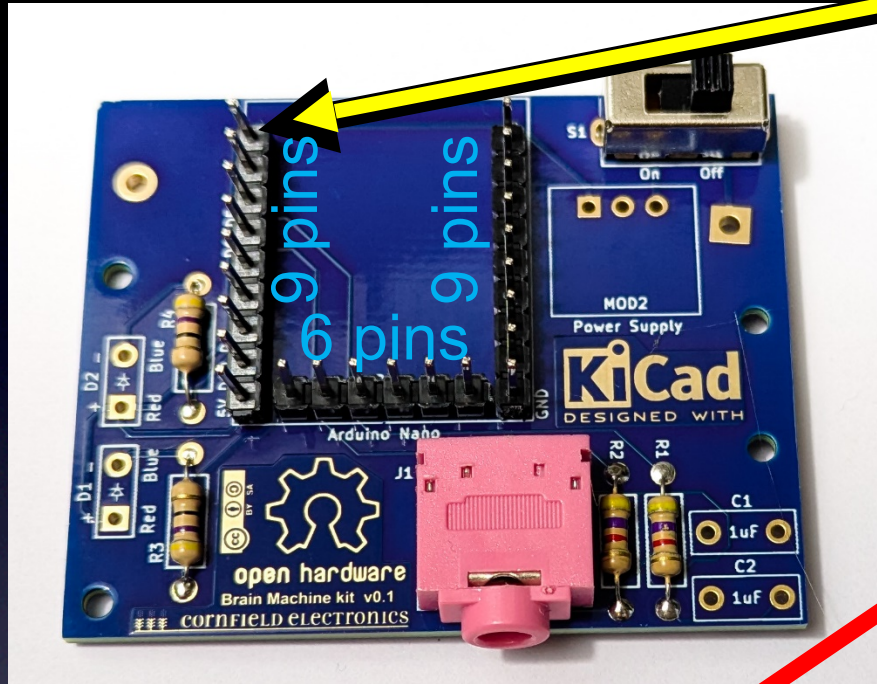
Use wire cutters



NOTE:

Your kit may have pins headers in the bag with the microcontroller

Pin Headers for Arduino Nano



long pins sticking up

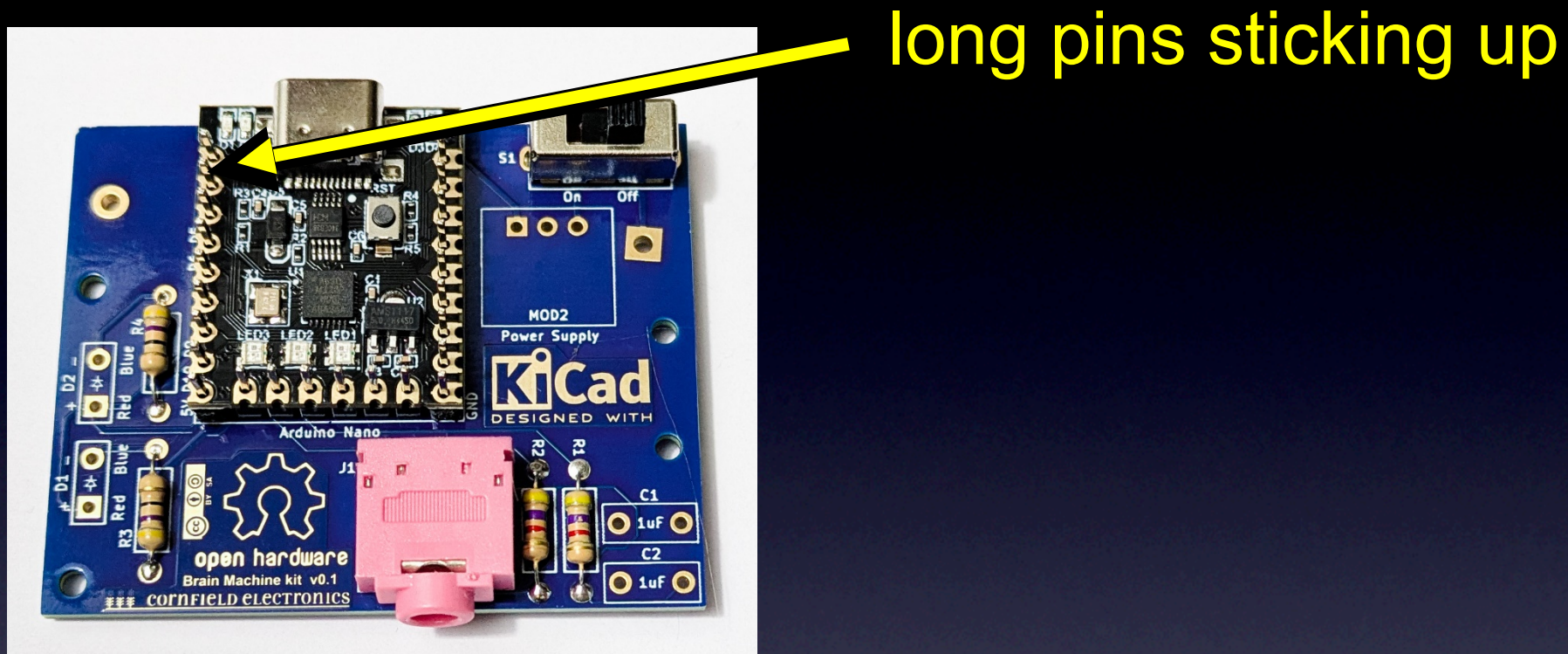
IMPORTANT!

→ Short pins go into the board ! ←

→ Do Not solder, yet ←

*NOTE: The next few photos show the switch soldered in place.
But it is easier to add it later — you will see the slide for it soon...*

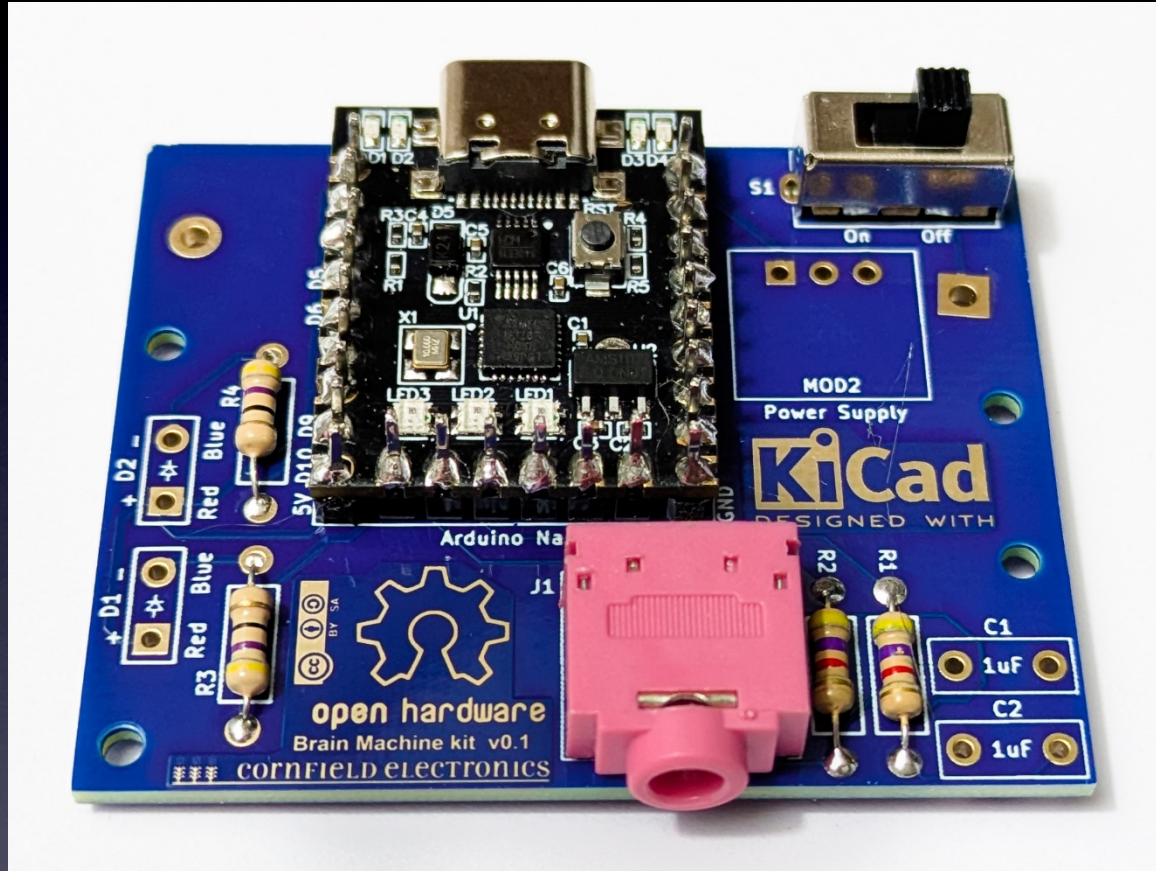
Arduino Nano placed on its pins



→ Short pins go into the board ! ←

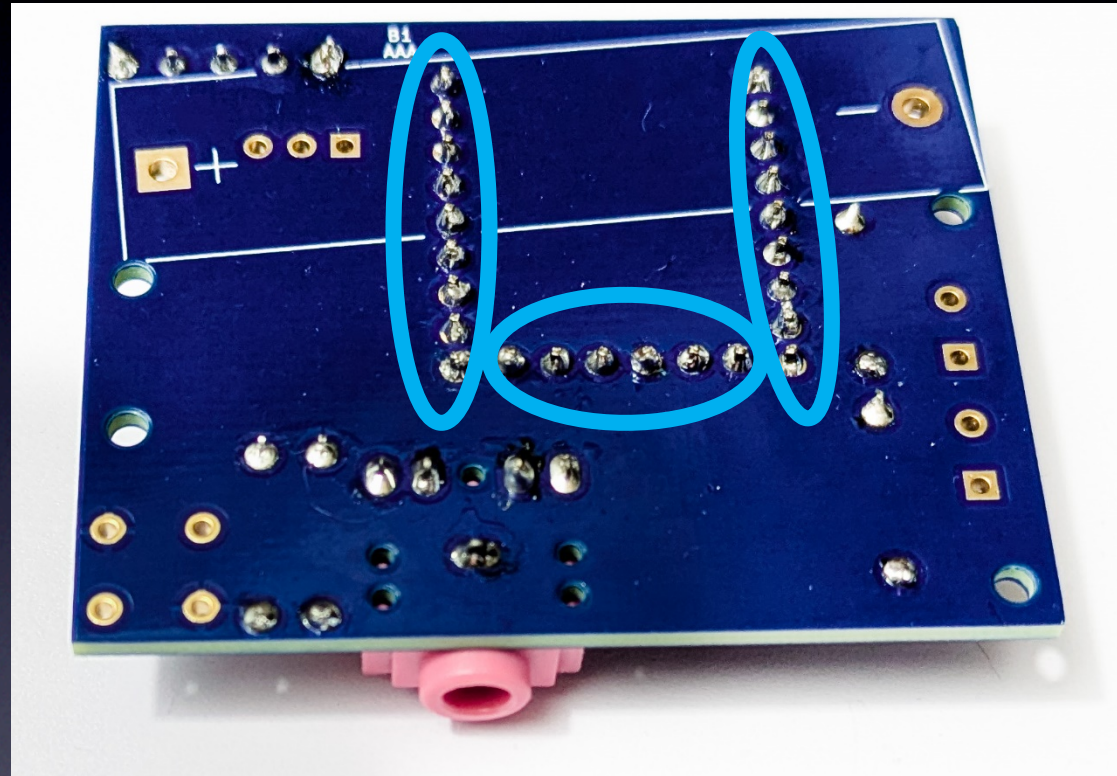
*NOTE: The next few photos show the switch soldered in place.
But it is easier to add it later — you will see the slide for it soon...*

Arduino Nano soldered to its pins

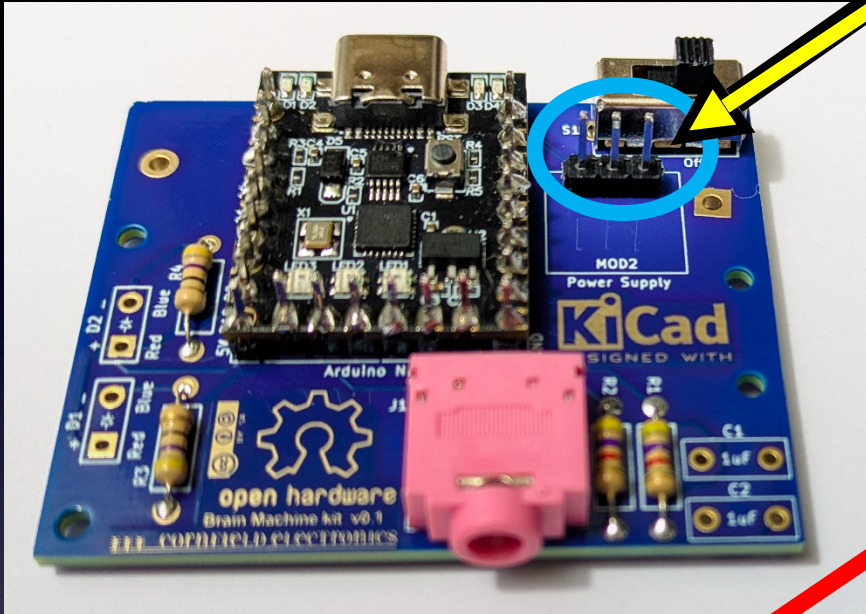


NOTE: The next few photos show the switch soldered in place.
But it is easier to add it later — you will see the slide for it soon...

Arduino Nano soldered to board



Pin Headers for Power Supply



long pins sticking up

3 pins

IMPORTANT!

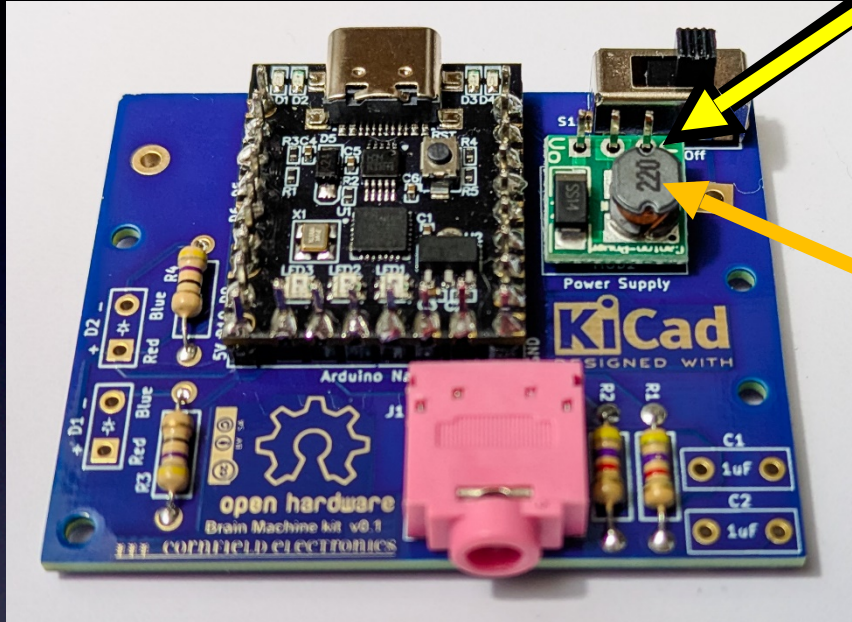
→ Short pins go into the board ! ←

→ Do Not solder, yet ←

*NOTE: The next few photos show the switch soldered in place.
But it is easier to add it later — you will see the slide for it soon...*

Power Supply placed on its pins

long pins sticking up



coil

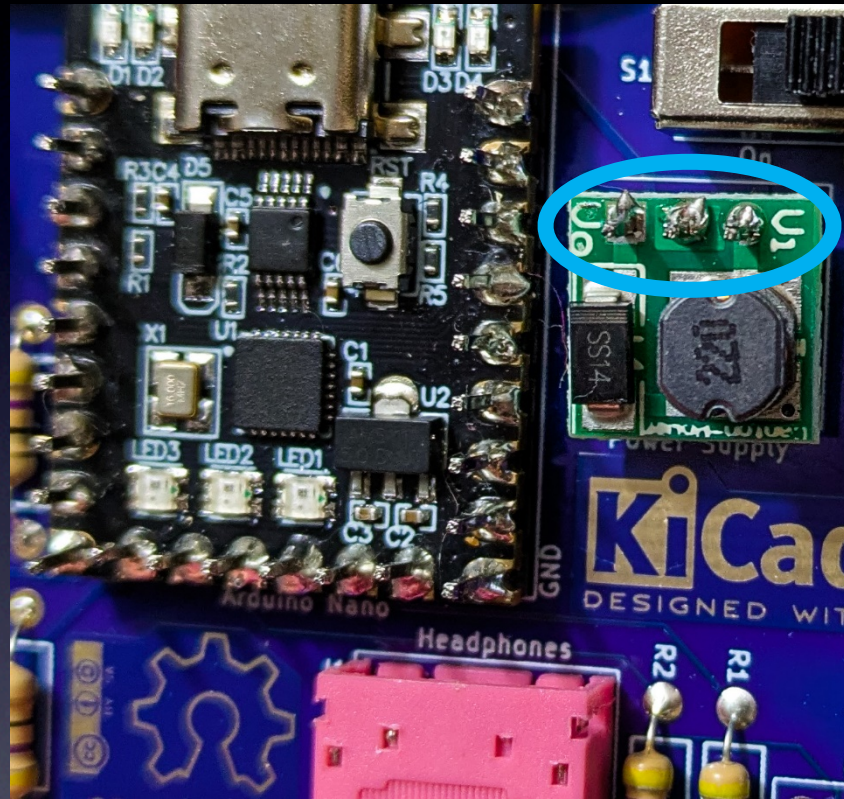
→ IMPORTANT: Power Supply must go in this way ! ←

(coil is facing up)

NOTE: The next few photos show the switch soldered in place.

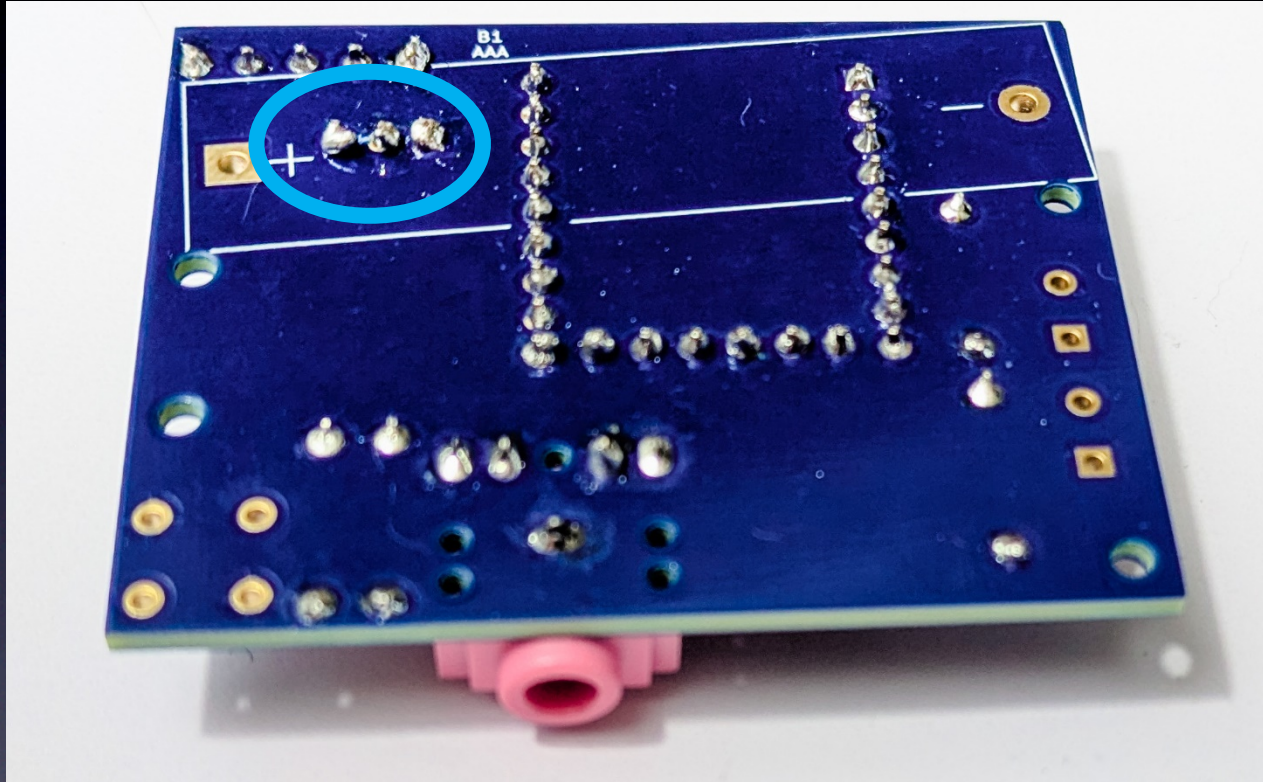
But it is easier to add it later — you will see the slide for it soon...

Power Supply soldered to its pins



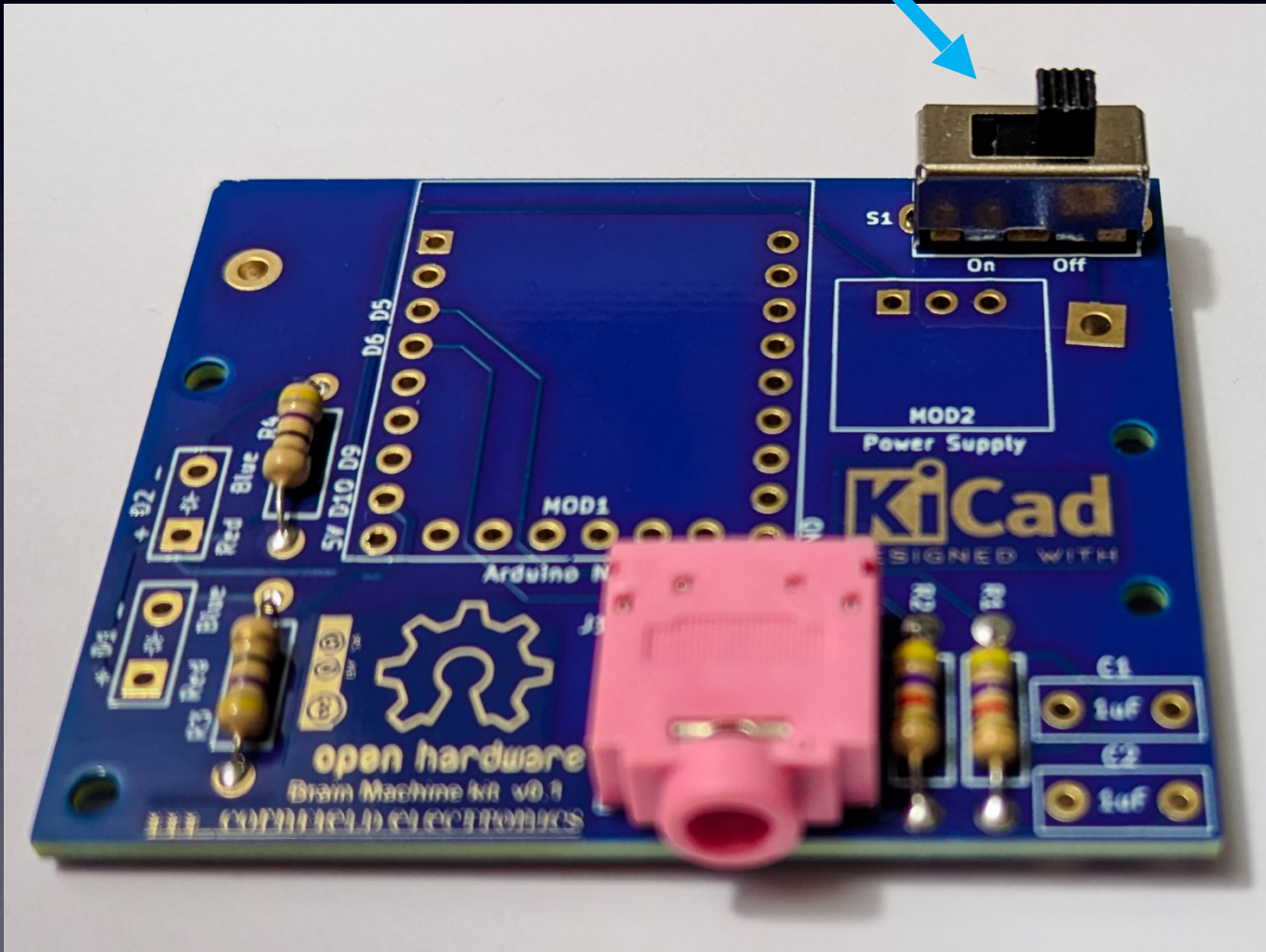
NOTE: The next few photos show the switch soldered in place.
But it is easier to add it later — you will see the slide for it soon...

Power Supply soldered to board

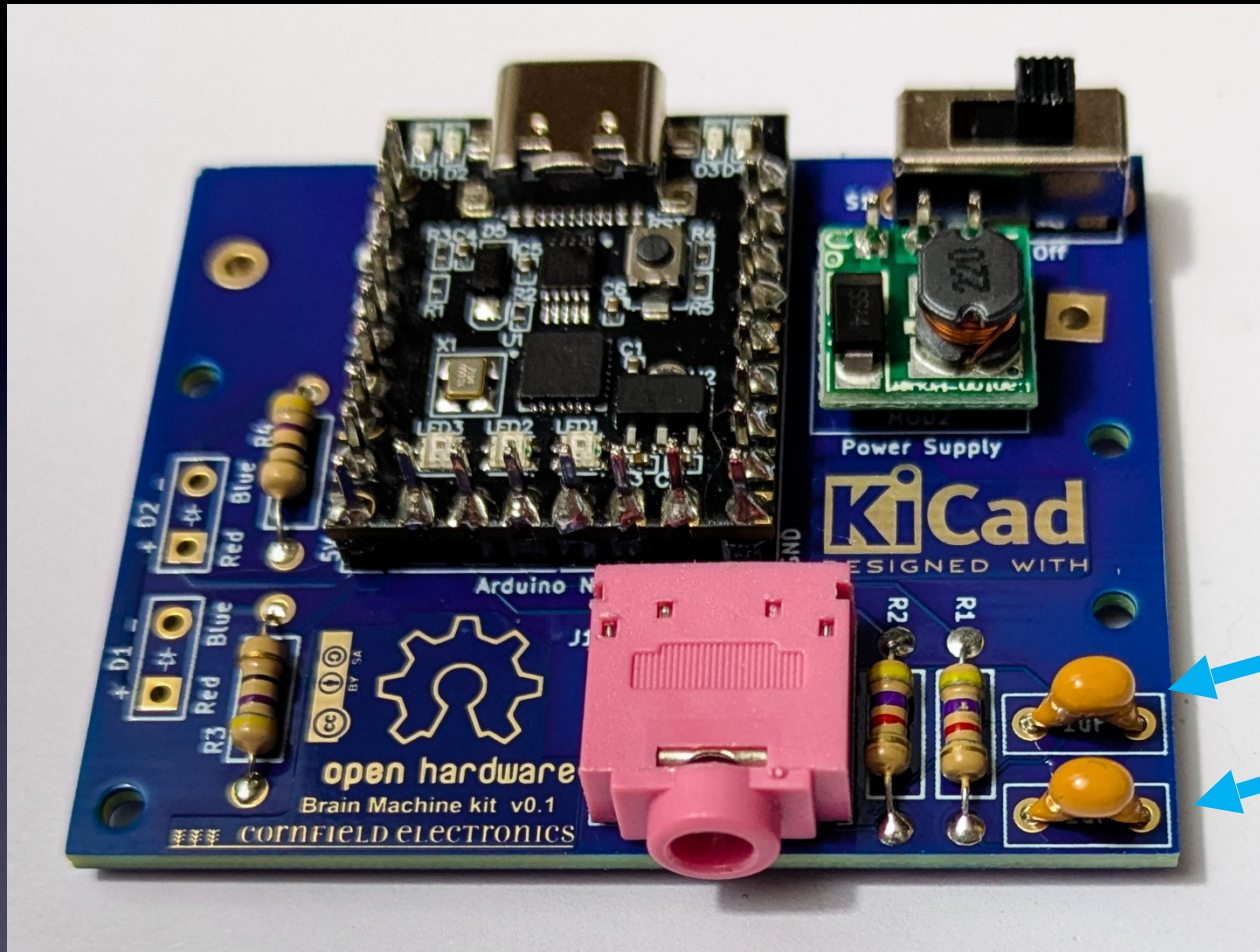


S1: On/Off switch

Now is the best time to solder in the switch



Direction does not matter



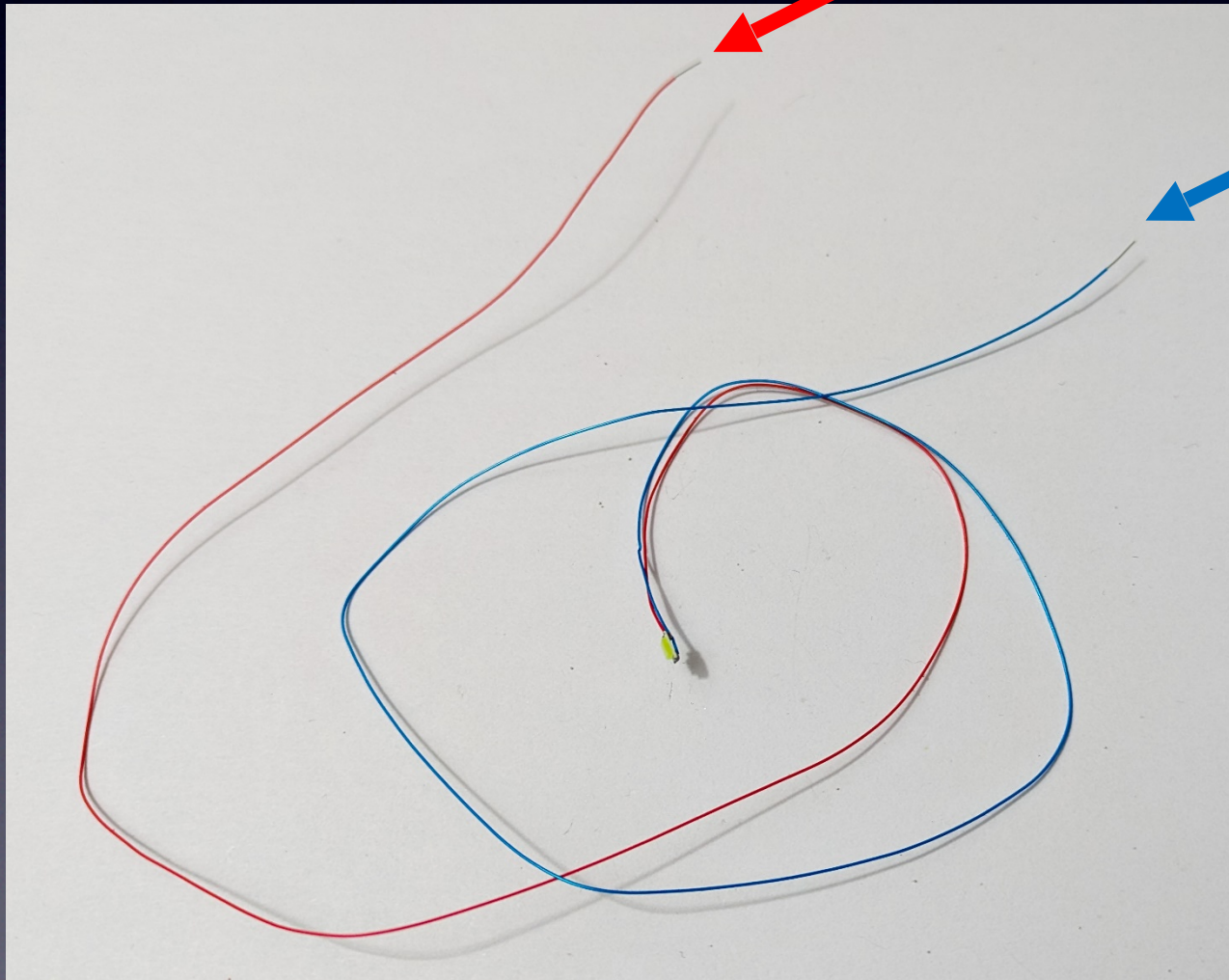
C1, C2

Direction does not matter

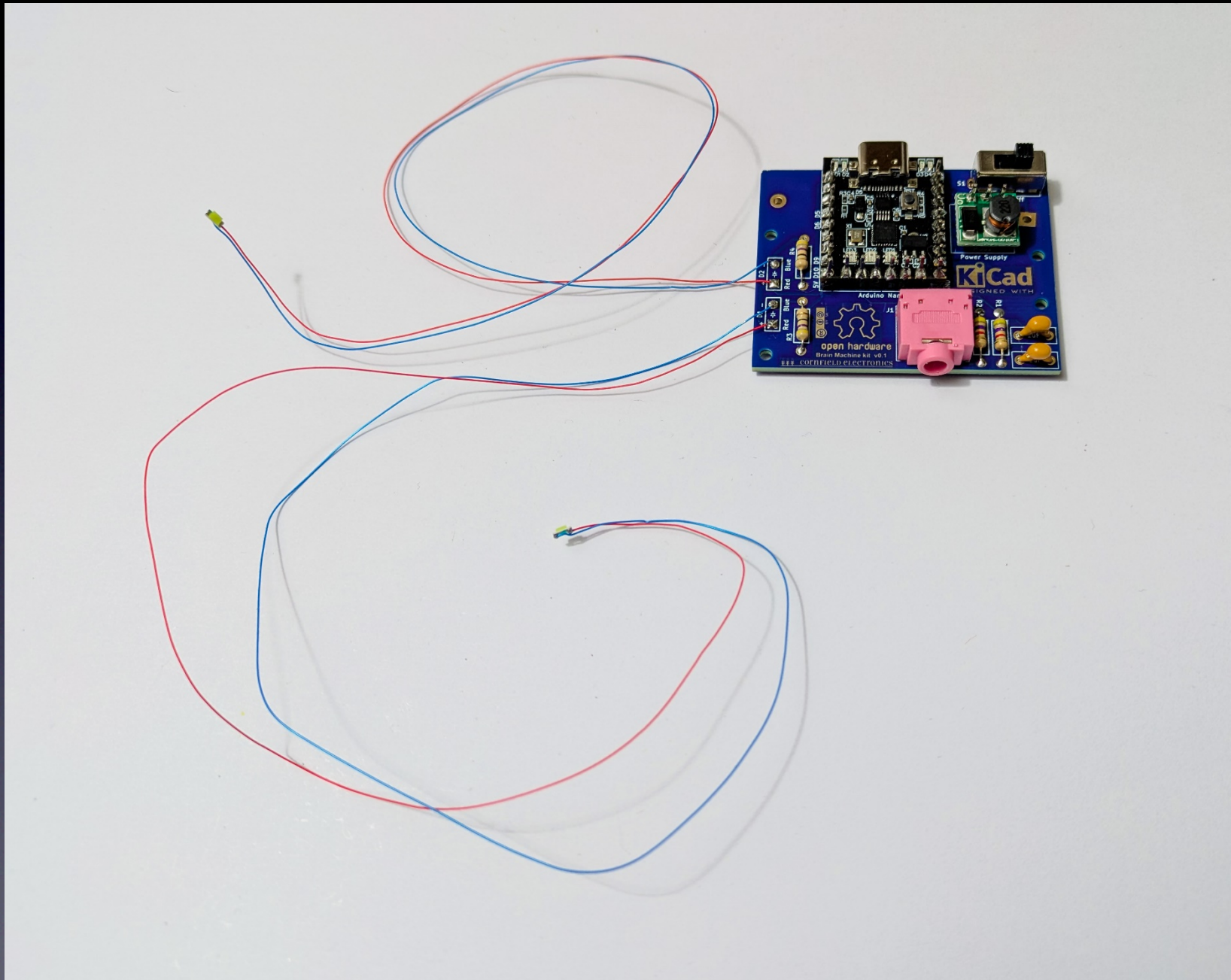
LED1 and LED2:

**Red wire
and
Blue wire**

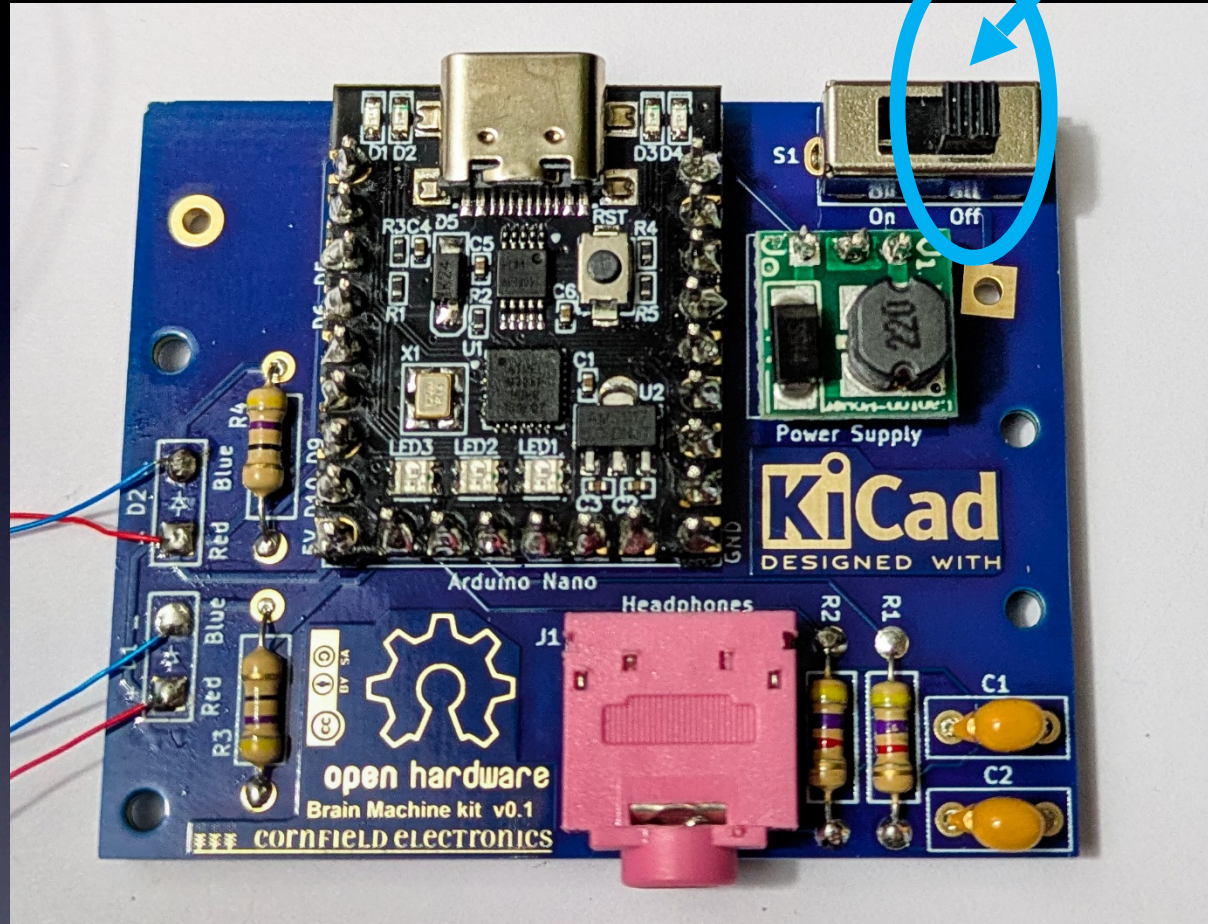
Blue wire



LED1, LED2 soldered to board



Let's Test !



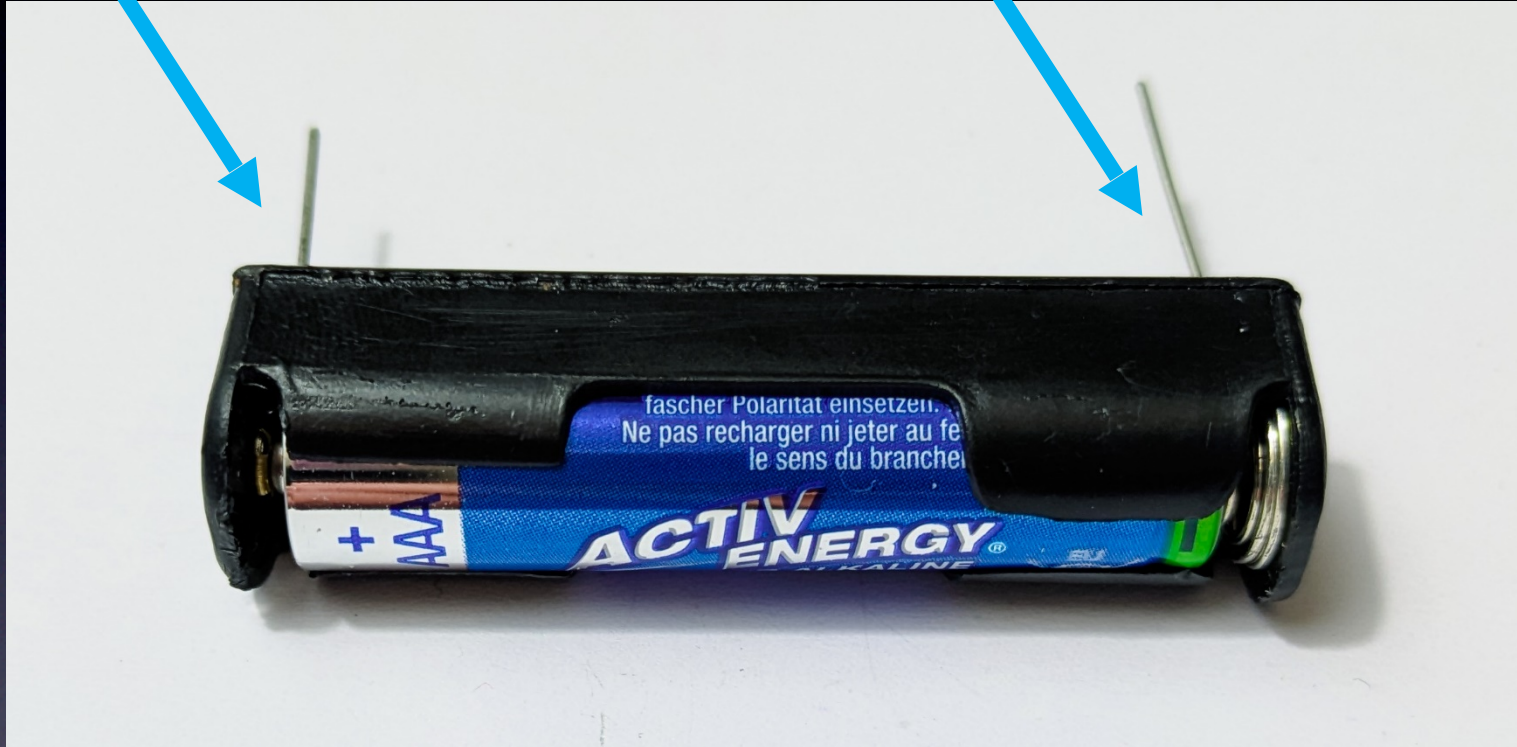
S1 in OFF position

Let's Test !

“+”

“-”

(spring)

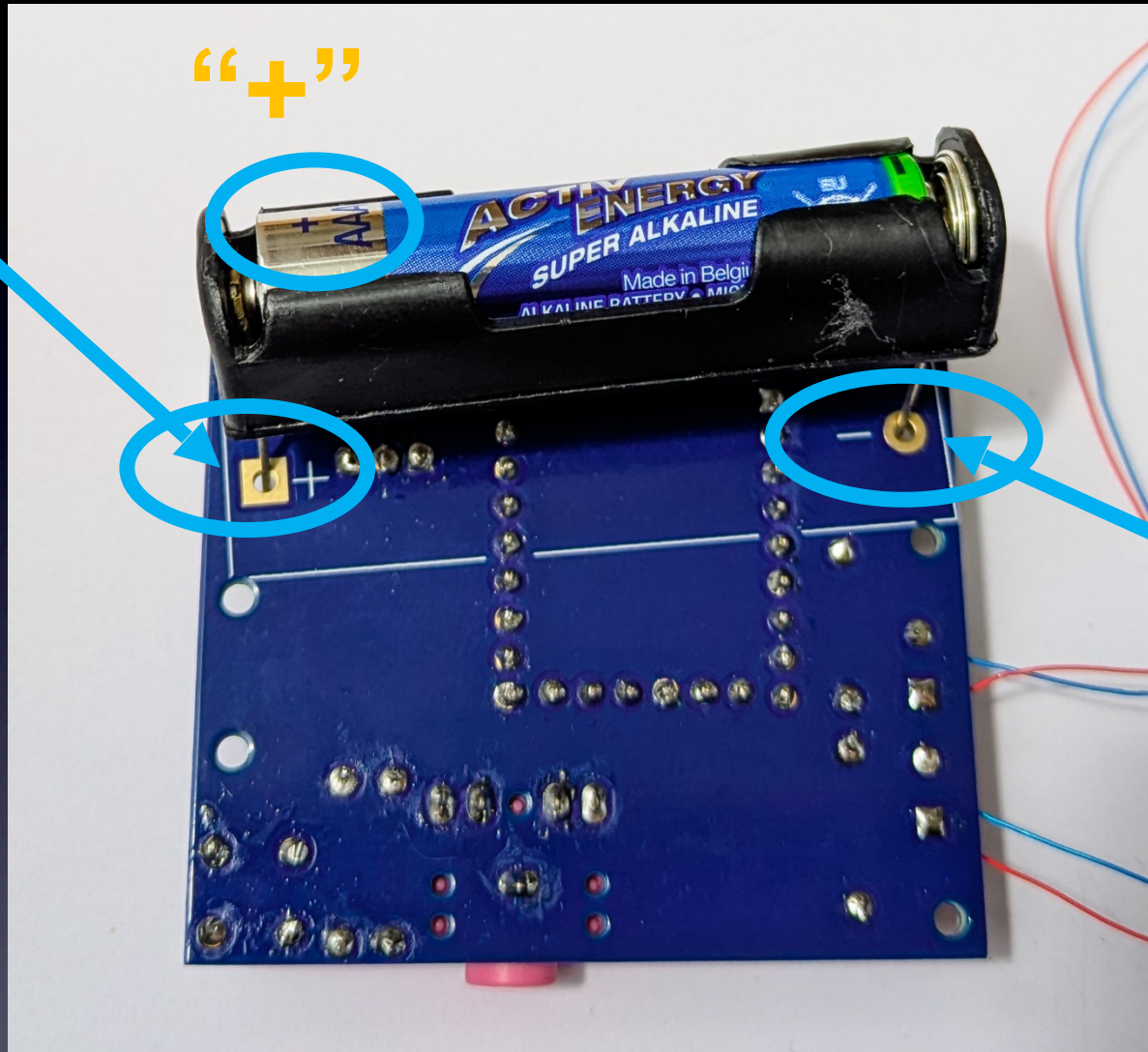


AAA Battery in its holder

Let's Test !

“+”

“+”

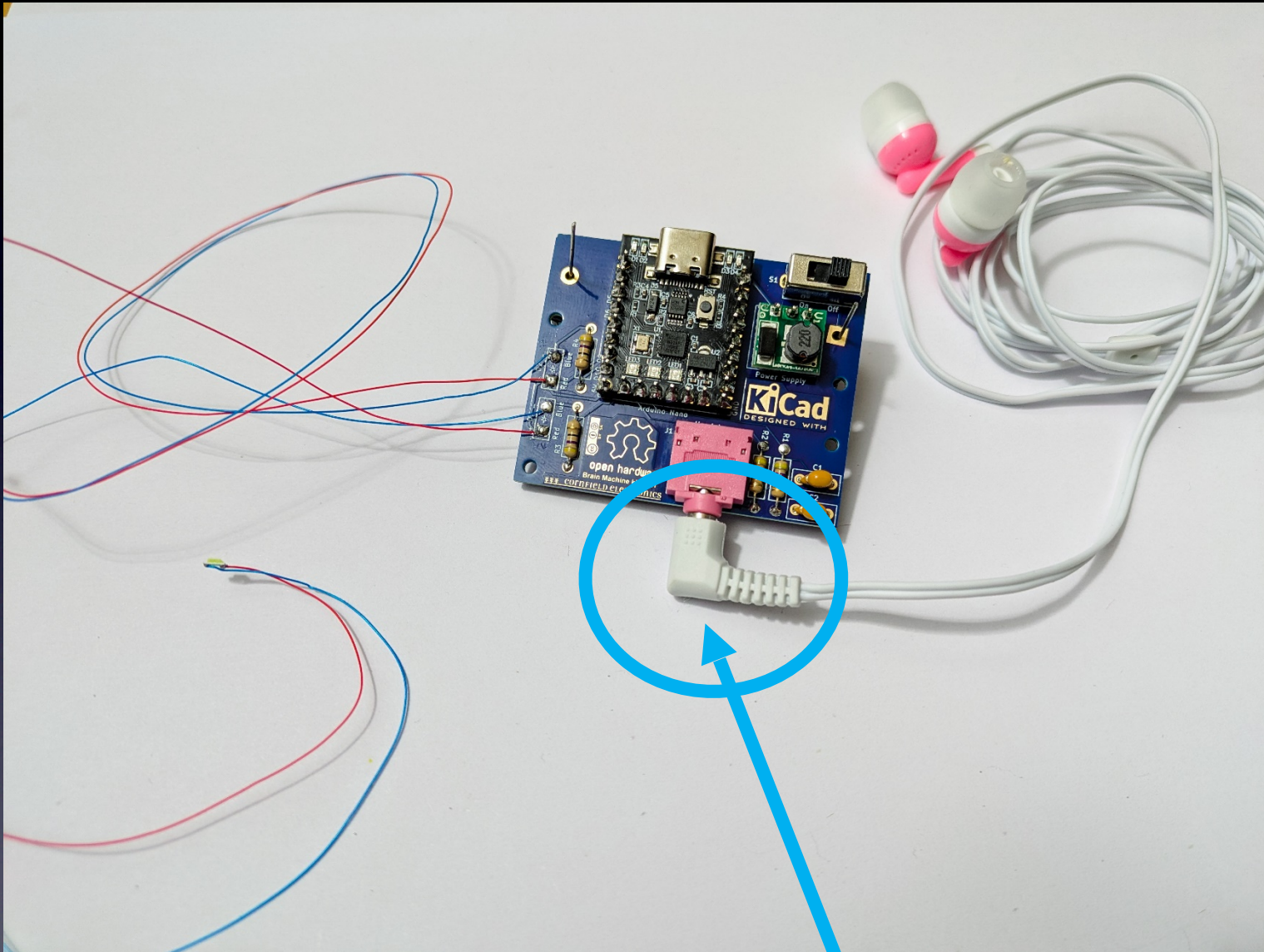


“-”

Place AAA Battery holder in place

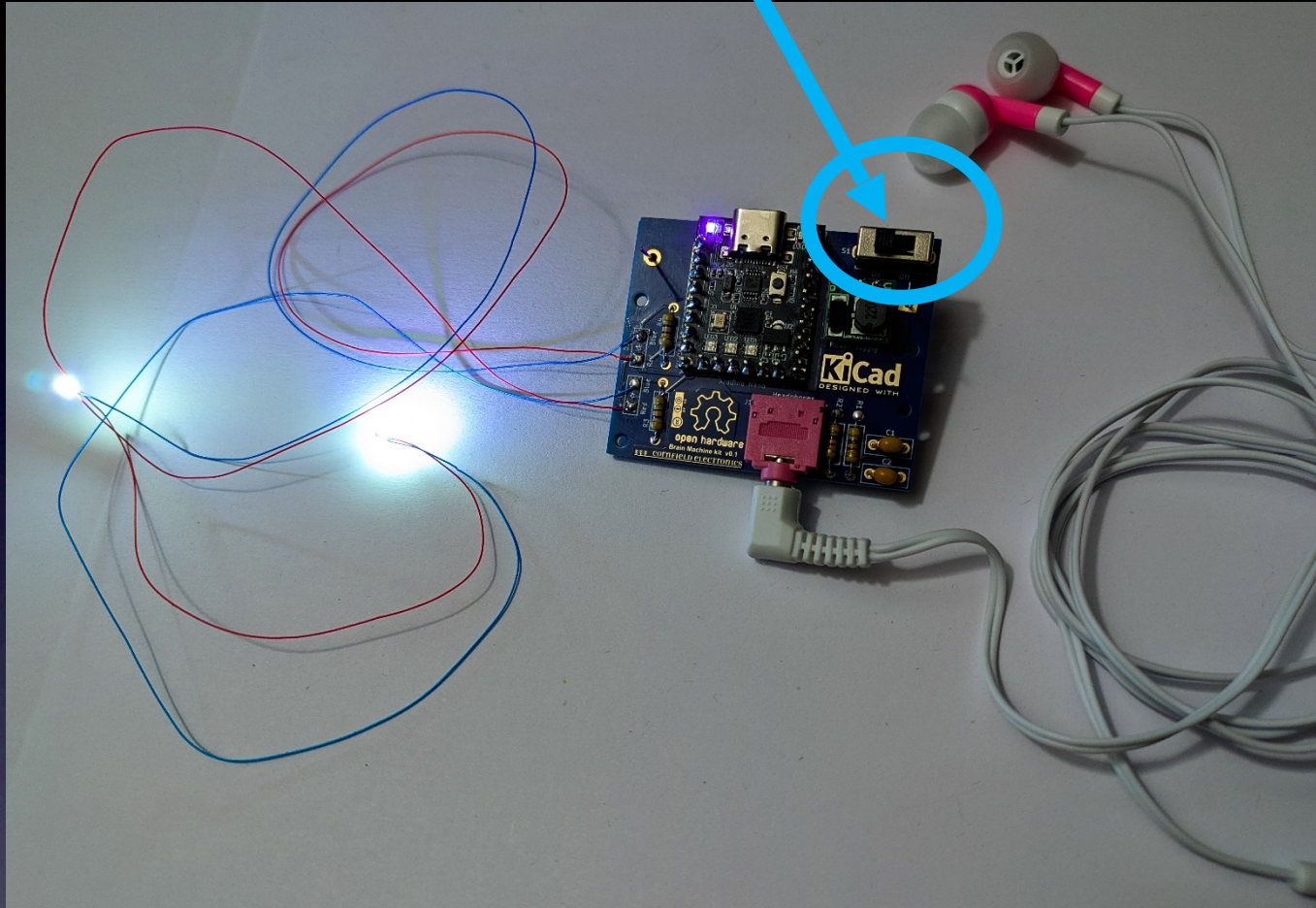
→ Do Not solder, yet ←

Let's Test !



Insert Earbuds

Let's Test !

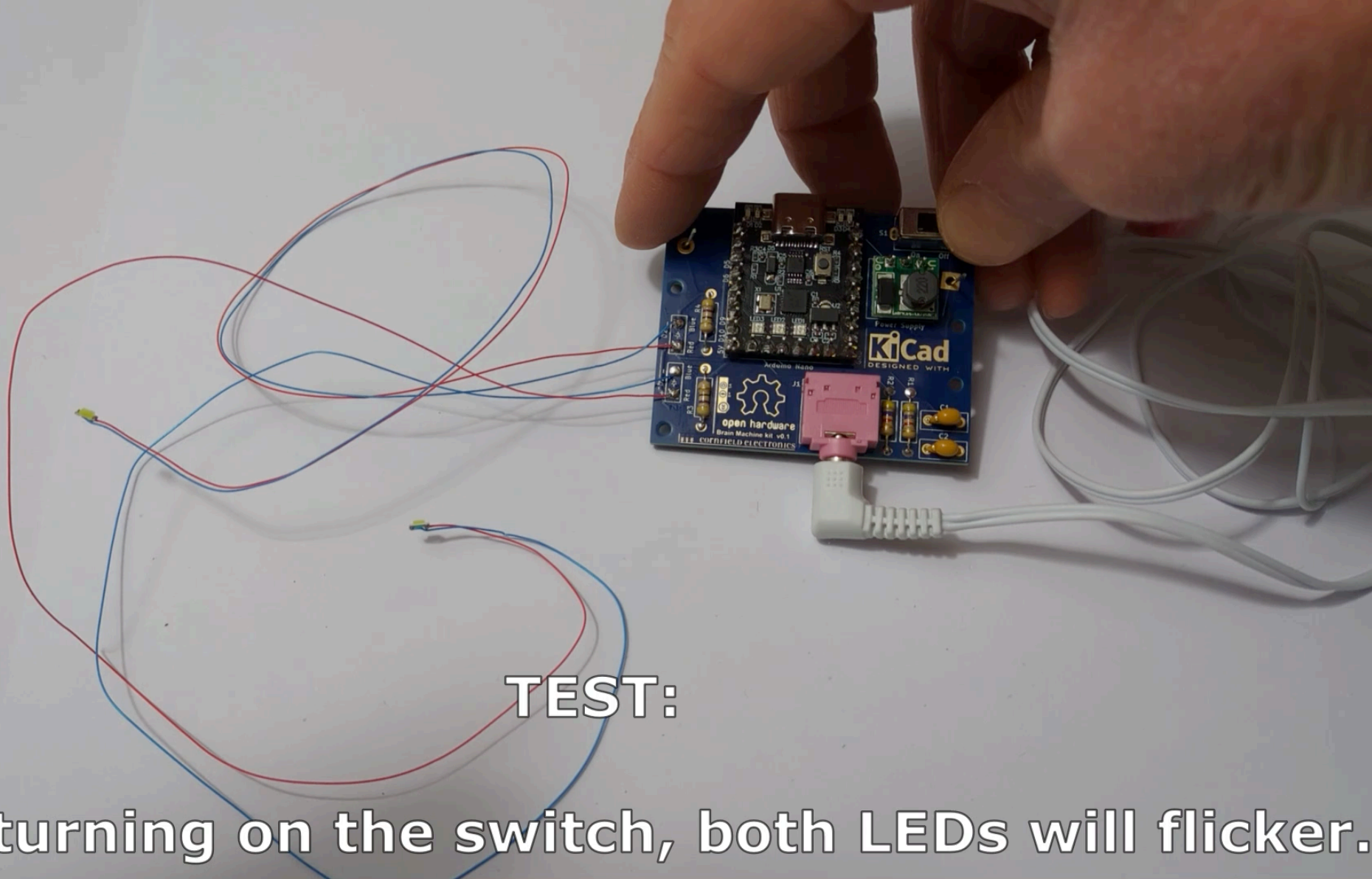


Turn ON

* LEDs flicker

* Each ear has a different pitch

Let's Test !



TEST:

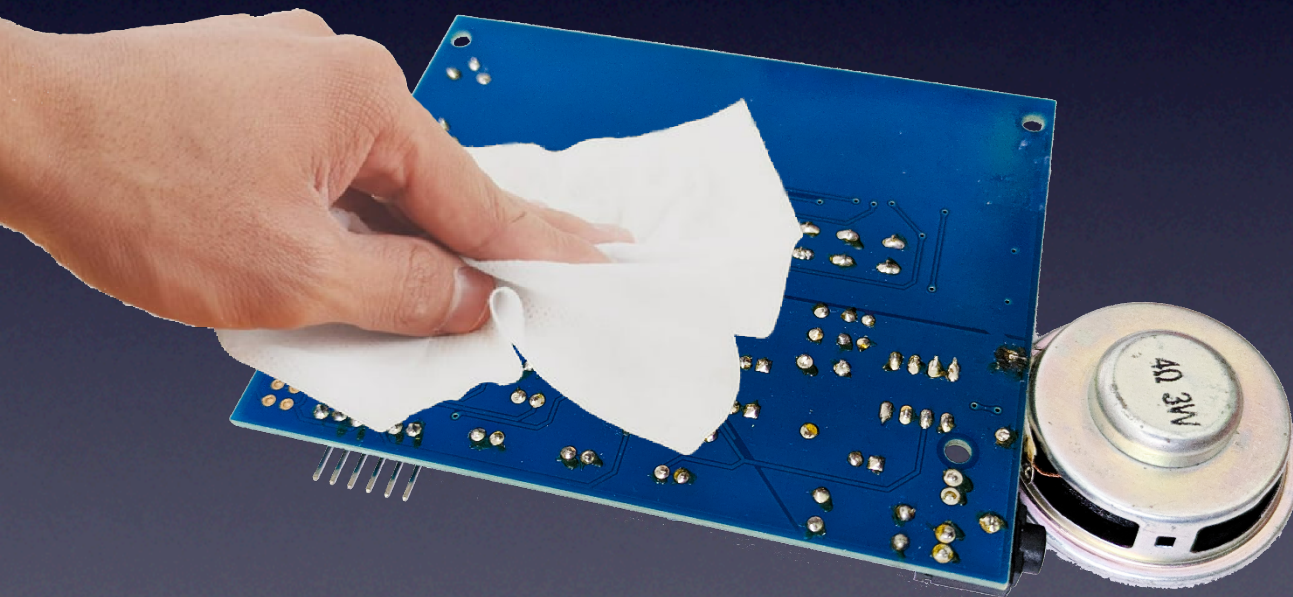
After turning on the switch, both LEDs will flicker.

Video

If you used any *flux paste* for re-working problems



The bottom of the PCB will be sticky from the flux



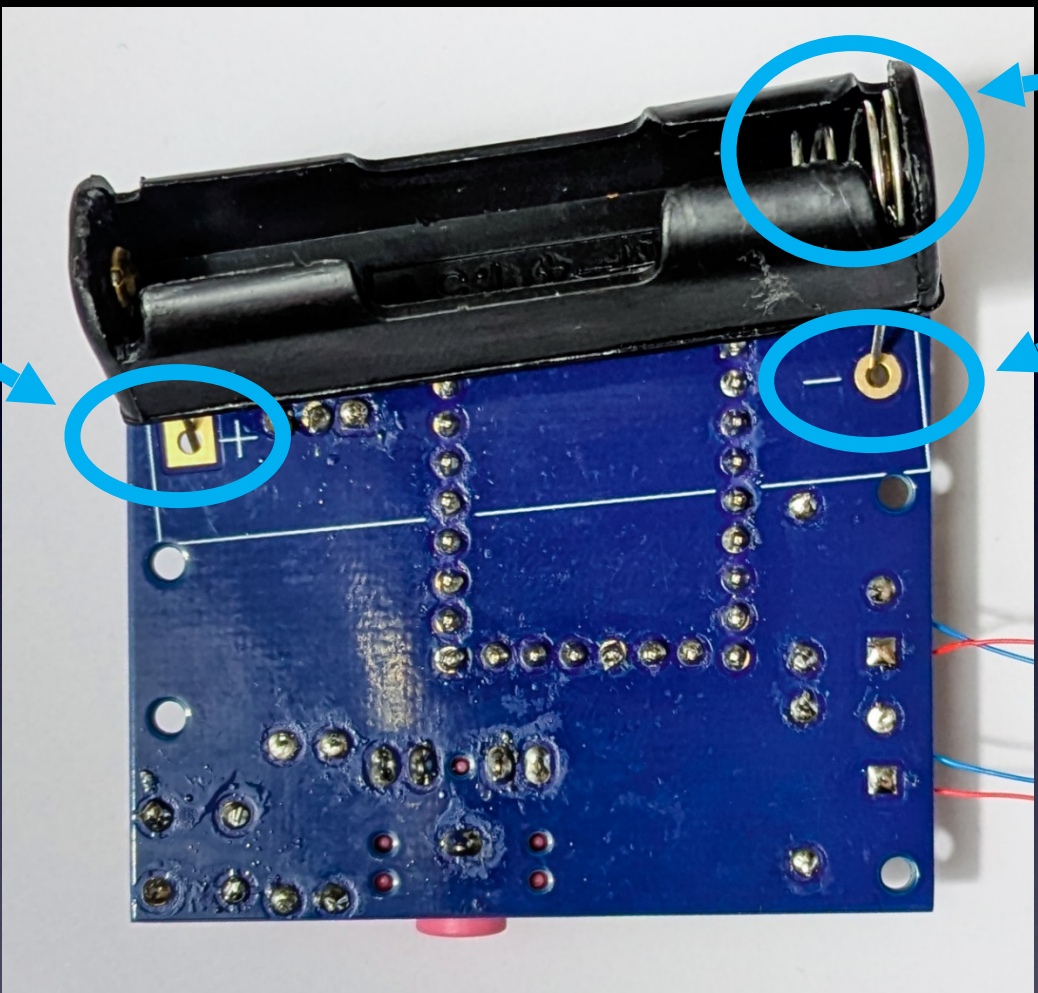
You can clean it with a cloth wet with *Isopropyl Alcohol*

Insert Battery Holder

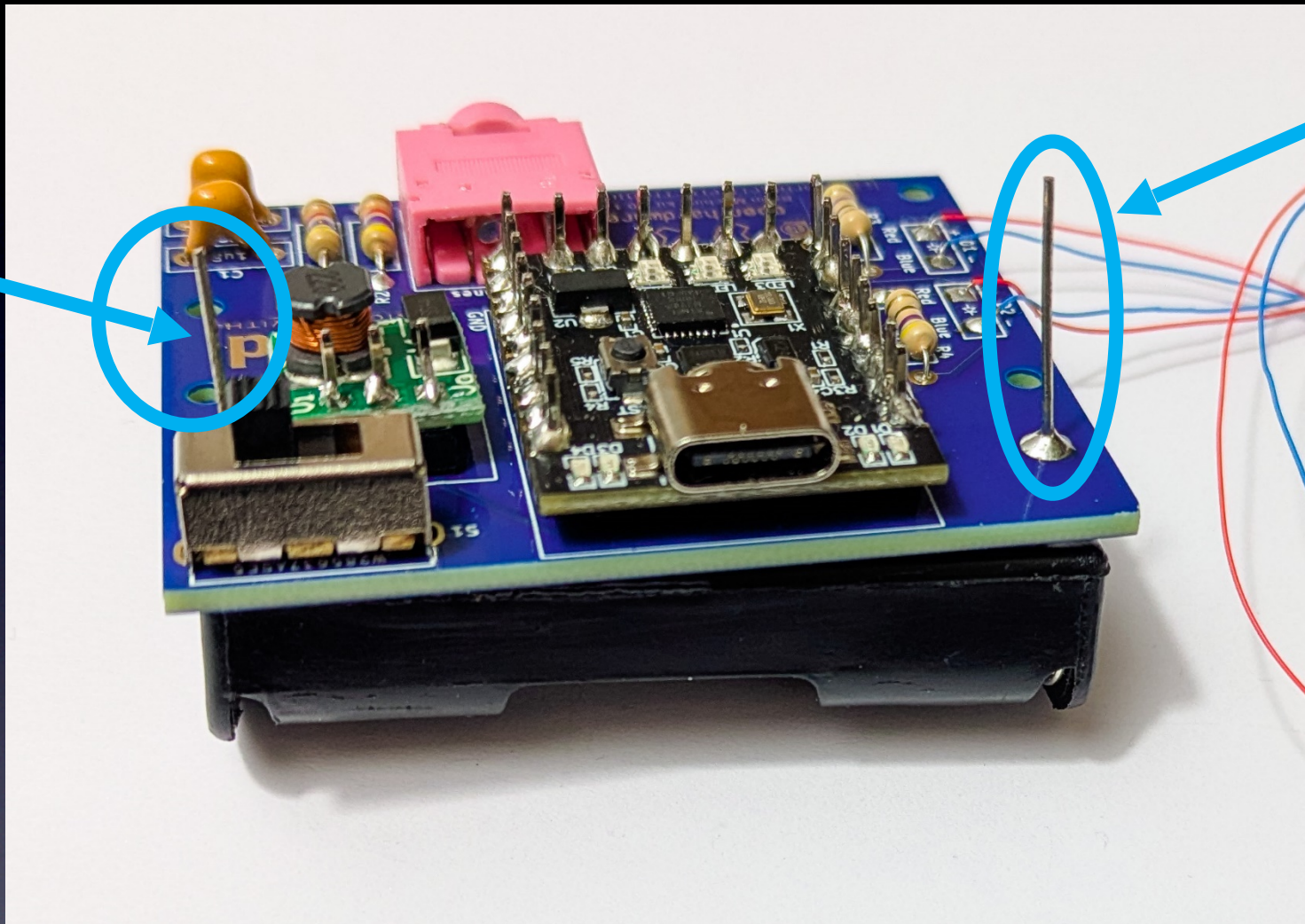
“+”

spring

“-”



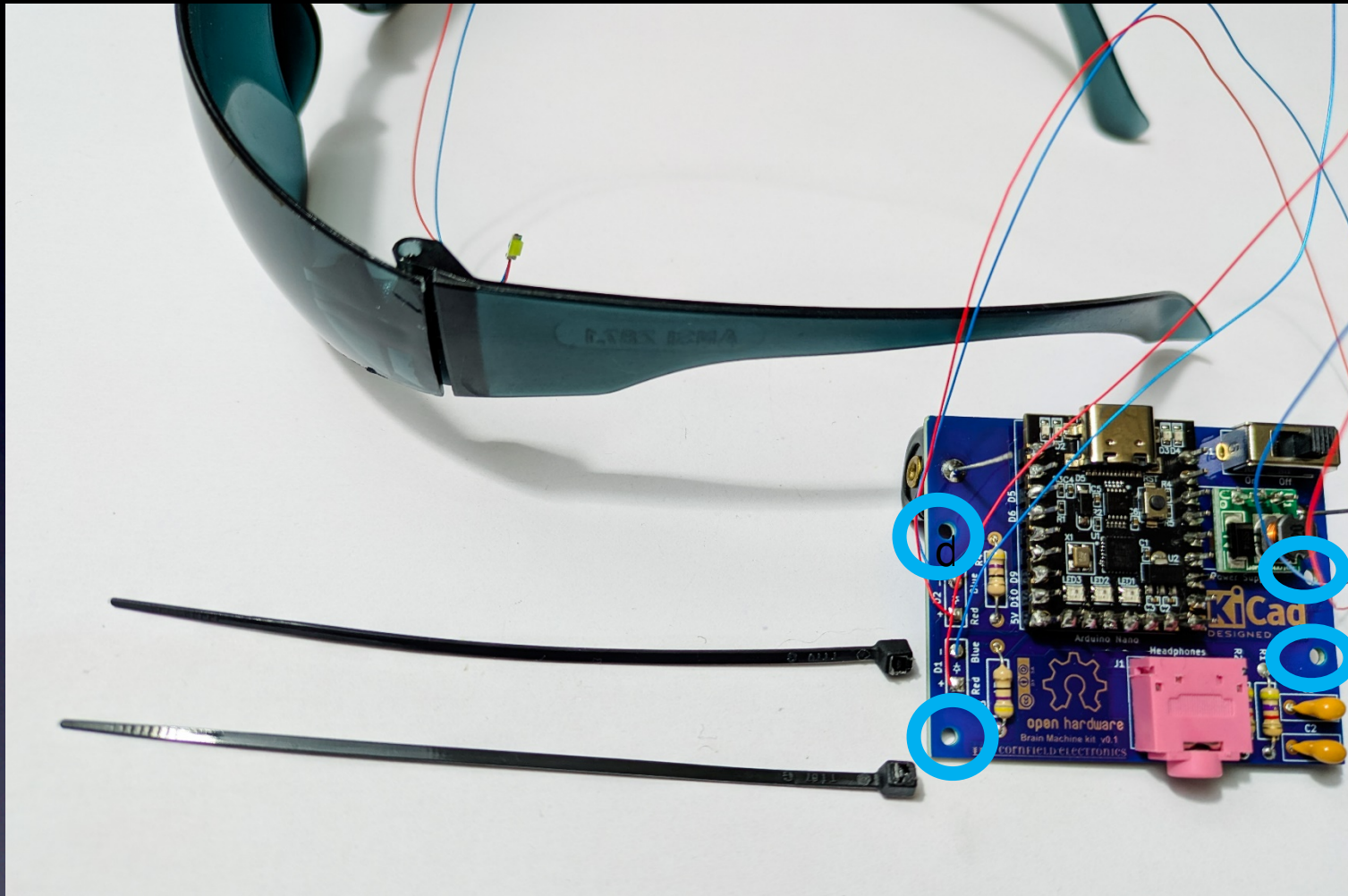
Battery Holder Soldered



→ **DO NOT cut battery holder leads !** ←

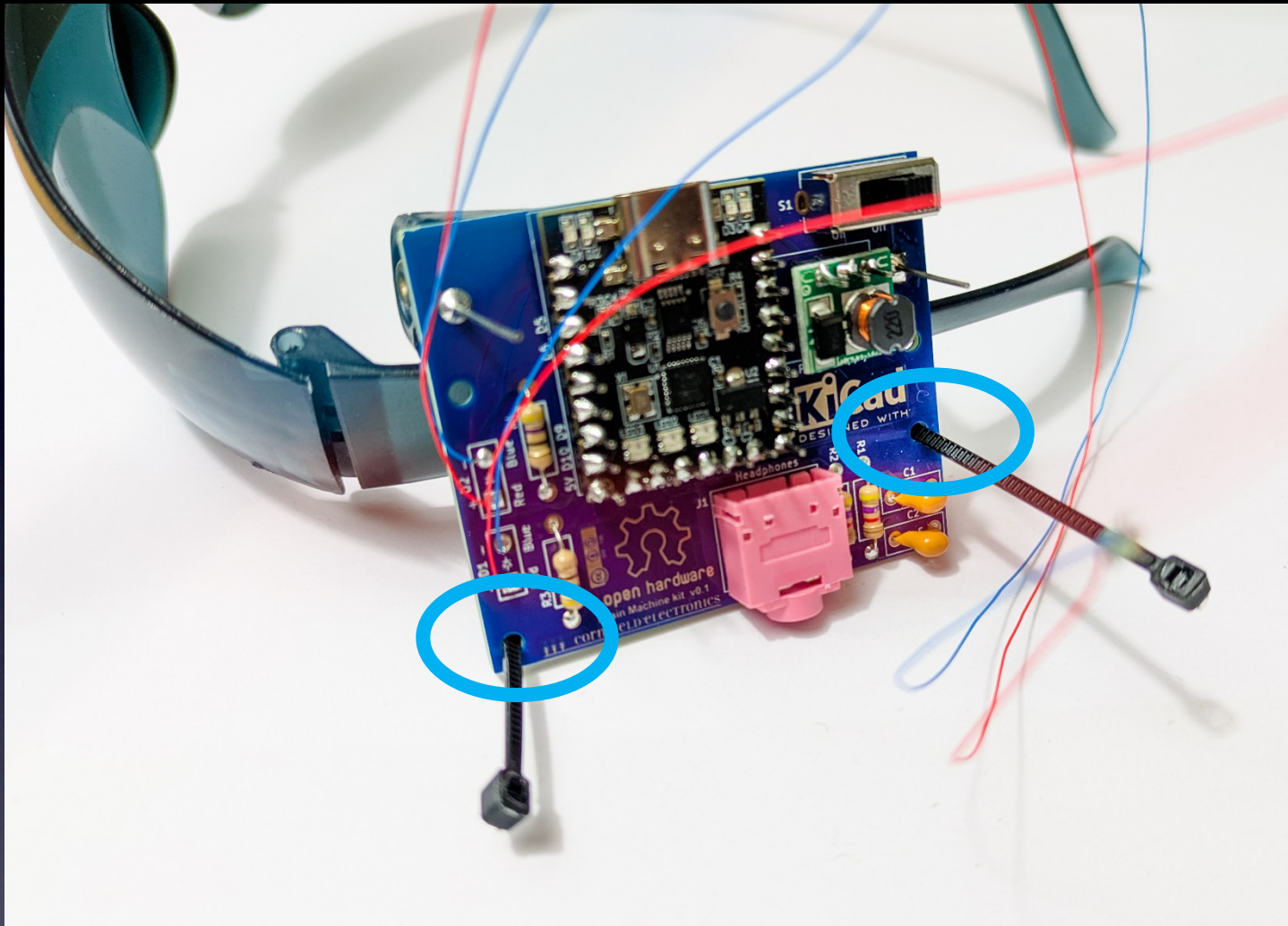
(That will destroy the wire cutters)

Attach Board to Glasses



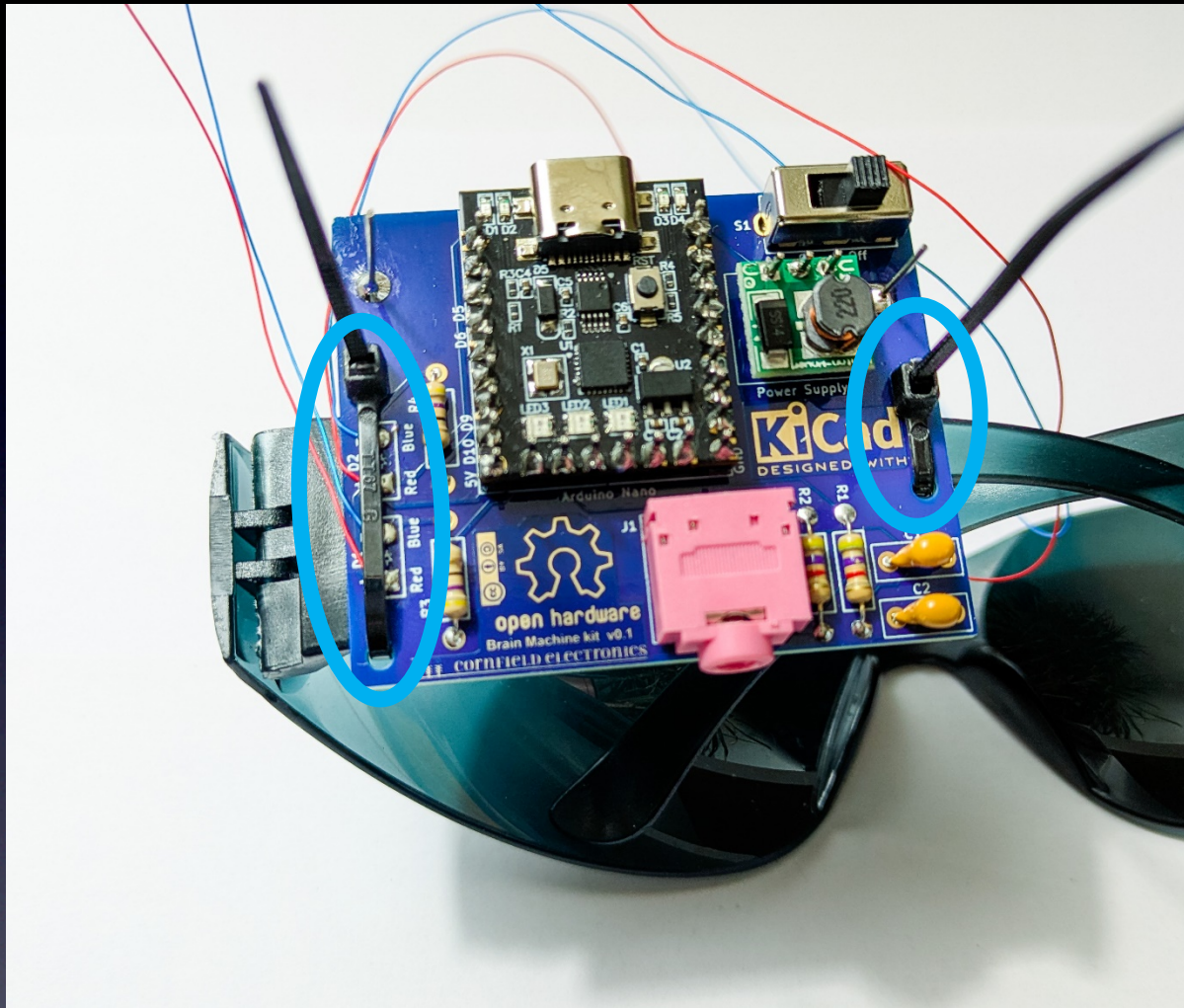
→ Use left side of glasses ←

Attach Board to Glasses



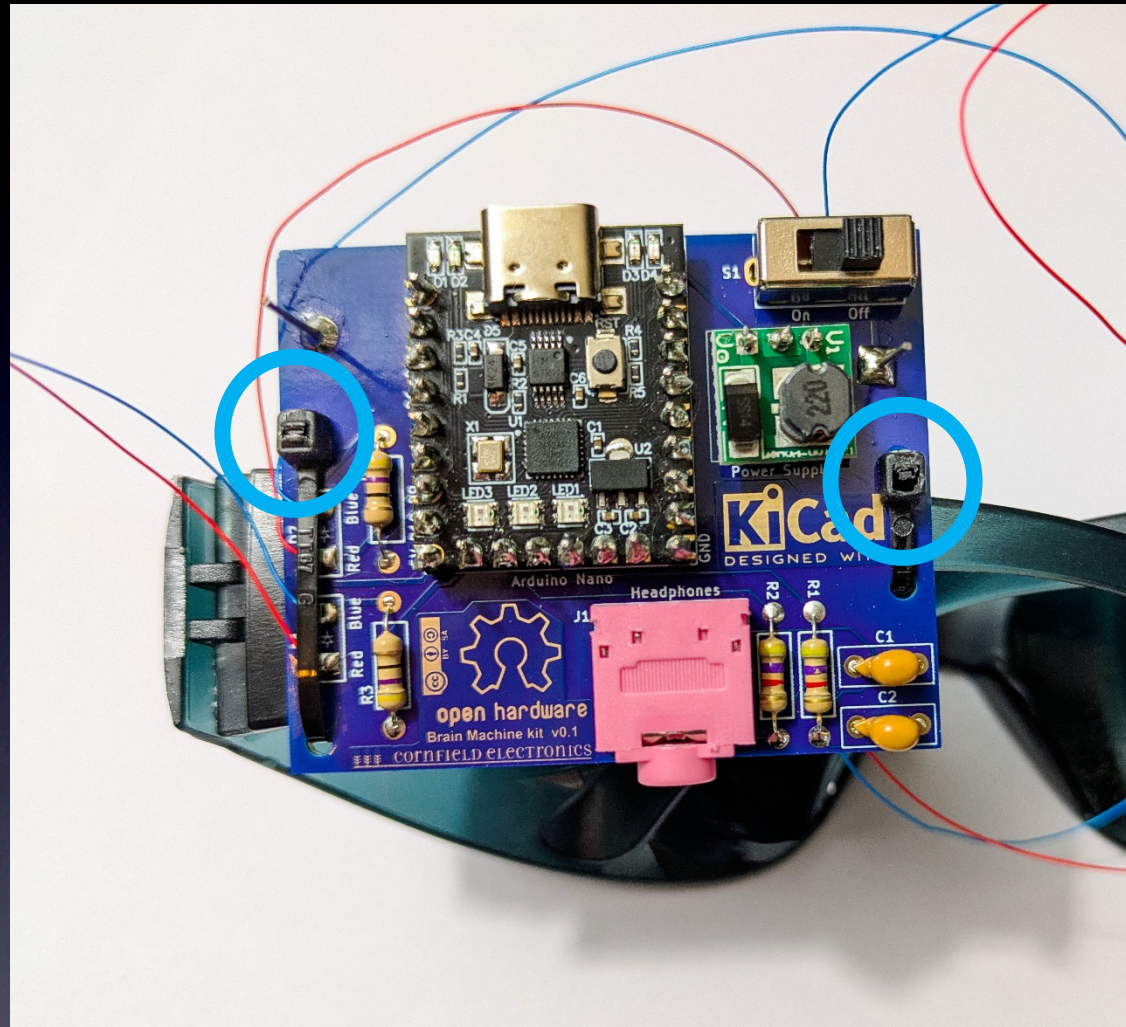
Insert zip-ties into lower mounting holes

Attach Board to Glasses



Wrap zip-ties around, and secure

Attach Board to Glasses



Cut zip-ties short

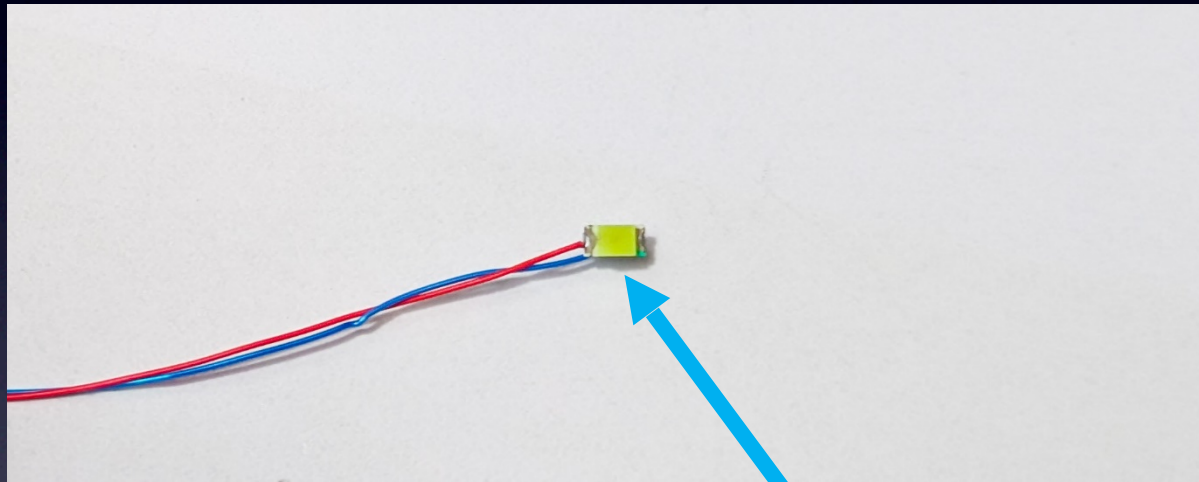
Mark where LEDs will go



For each eye:

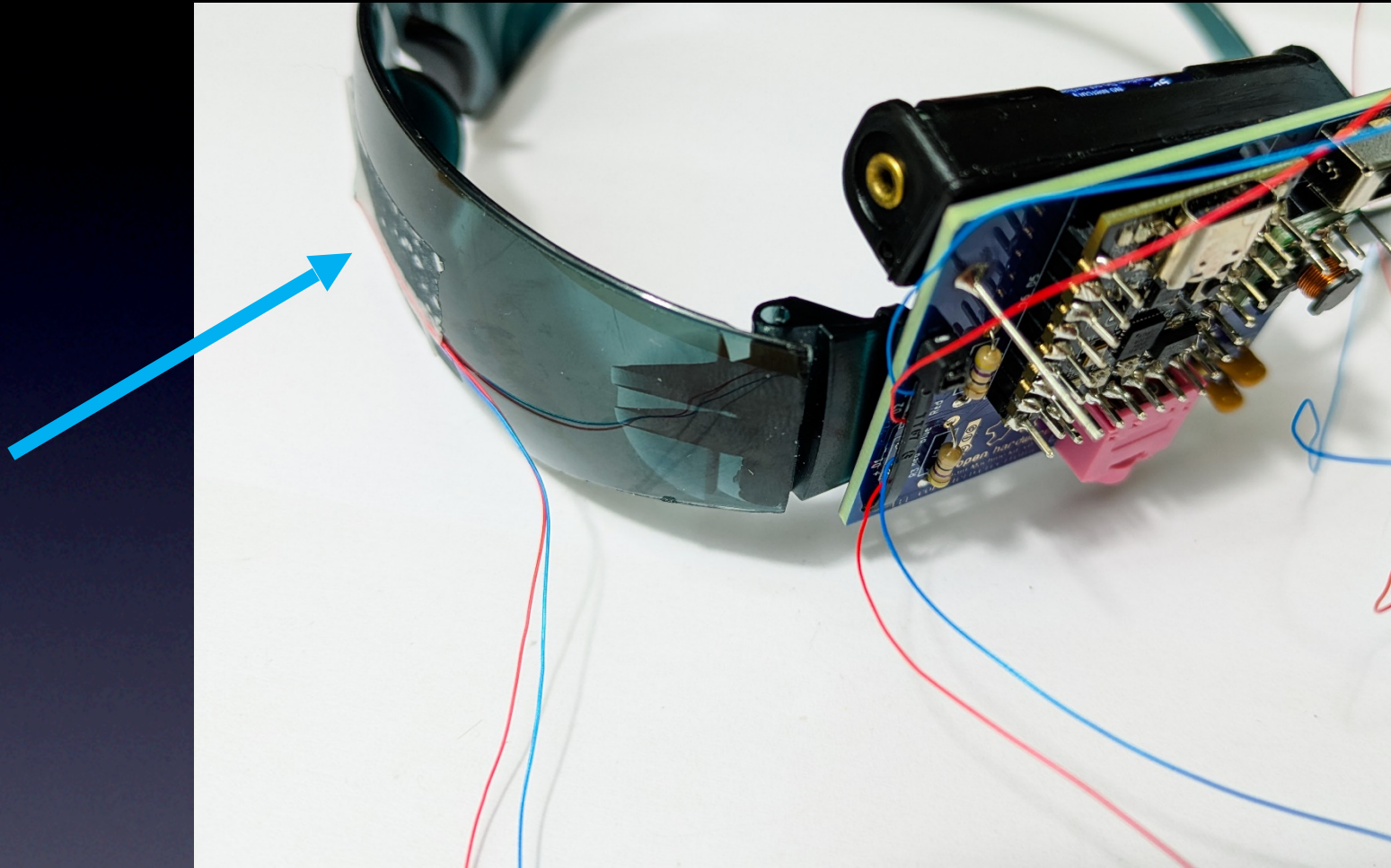
Slowly move the marker toward your eye to make a mark directly in front of your eye.

LEDs light up on one side



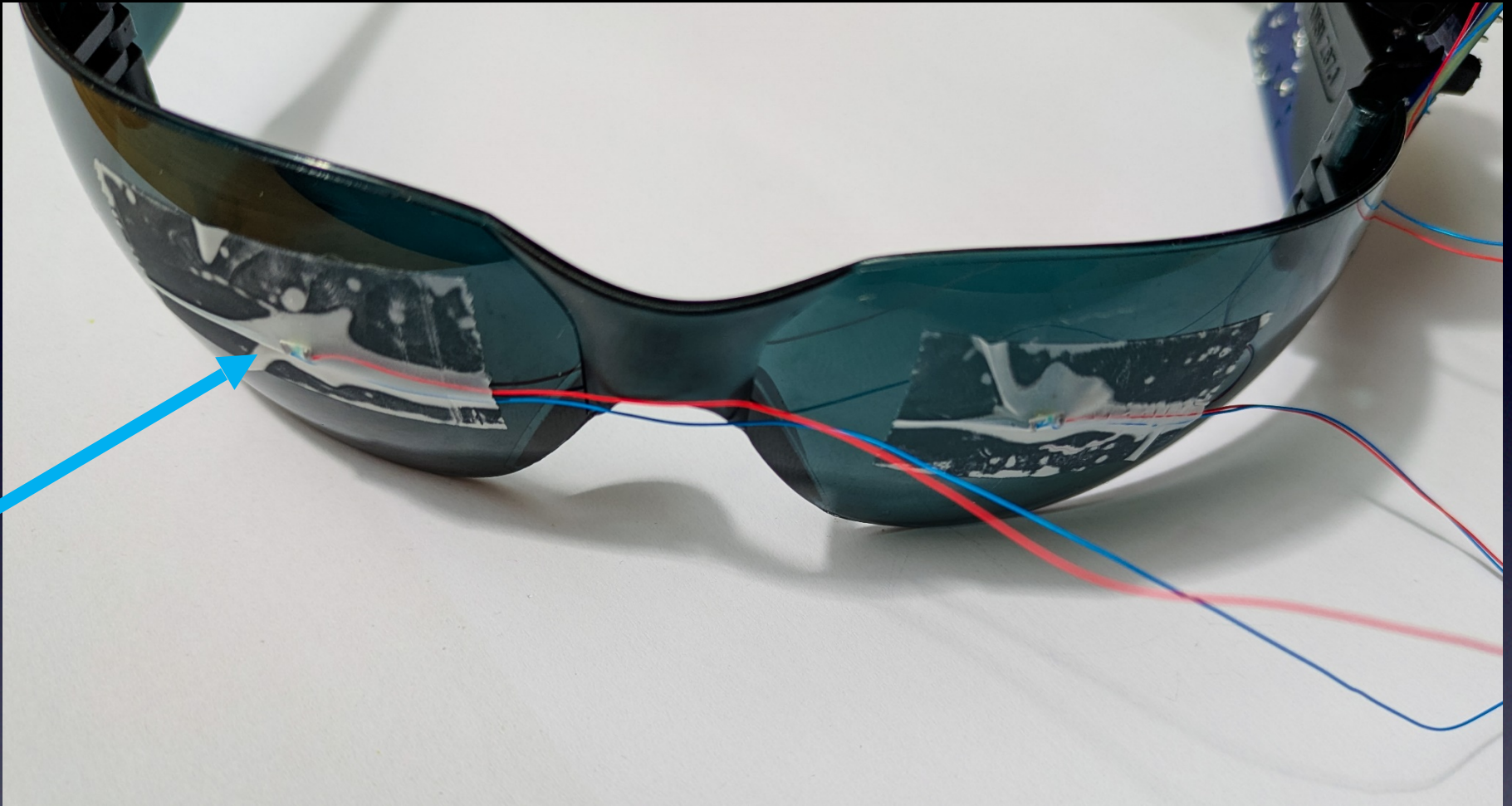
The LEDs light up on the flat white side

Tape Left LED to Glasses



**Tape the flat white side of D1 over the left
(so the light will shine on your eye)**

Tape Right LED to Glasses



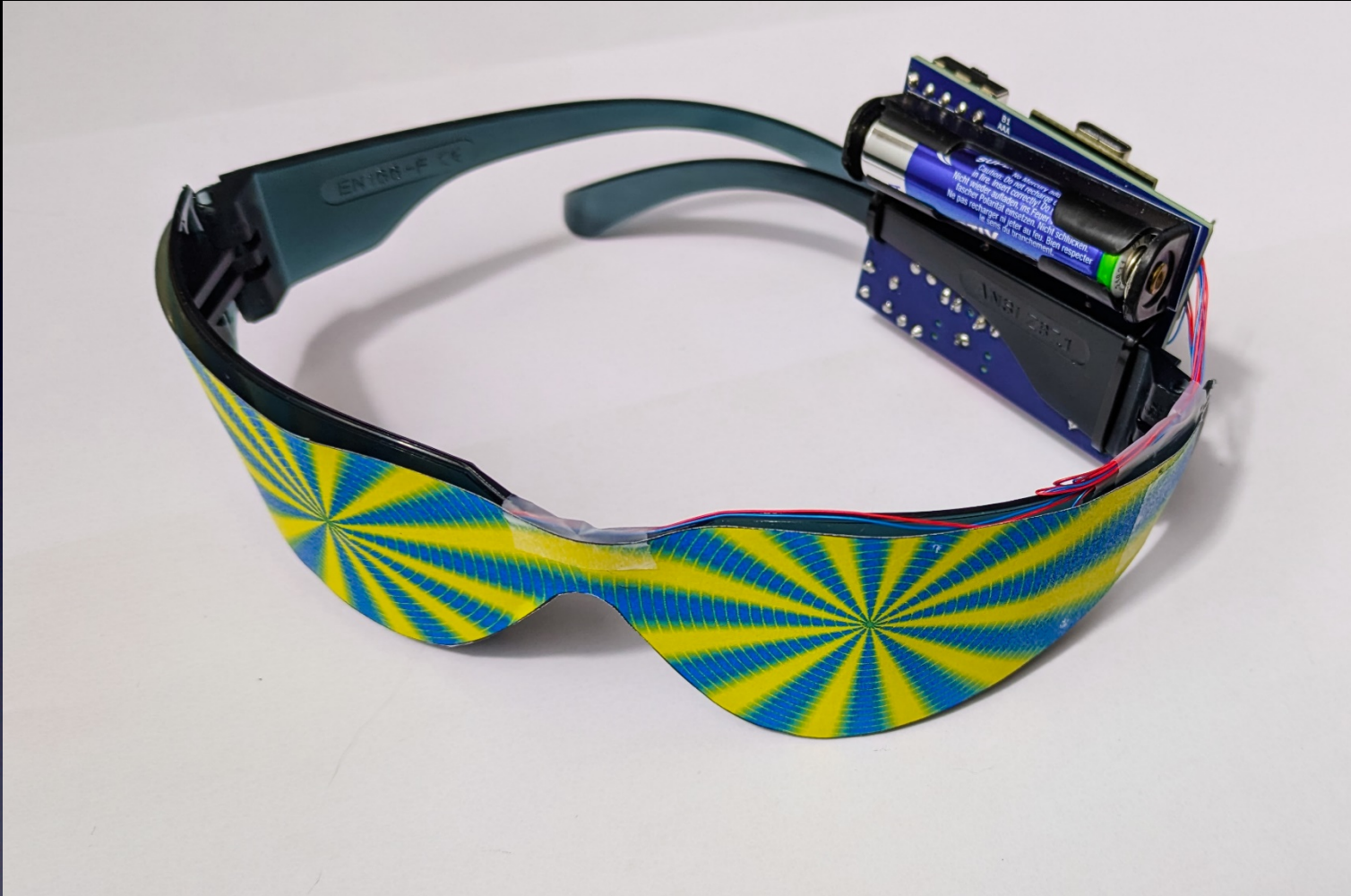
Tape the flat white side of D2 over the right mark
(so the light will shine on your eye)

Secure LED wires on Glasses



Use tape to clean up and secure the LED wires

Add Trippy Graphics !



Cut out the Trippy Graphics
and tape them over the glasses

Done!



Enjoy (with your eyes closed)



Meditate, Hallucinate, Trip Out !

Please Remember:

to

Wash your hands

after soldering

Let's Meditate

Your Brain Machine comes pre-programmed with a really nice 14-minute Meditation.

And, along the way you will hallucinate beautiful colors and patterns from your imagination.



Re-Programming

Your Brain Machine comes pre-programmed with a really nice 14-minute Meditation.

If you are happy with this meditation sequence then no need to re-program your Brain Machine.

But if you want to program other brainwave sequences the next pages show you how...



Re-programming the Brain Machine

We have two other sequences ready for you to use.

- * 30-minute Sleep sequence
- * 1 hour of 40 Hz Gamma Waves

The following slides show you how to program this sequence into your Brain Machine...



Re-programming the Brain Machine

We have two other sequences ready for you to use.

To program in a new sequence into your Brain Machine, you will need:

- the Arduino software
<<http://arduino.cc>>
- a USB-C cable
- the “sketch” for the other brainwave sequence
<<http://cornfieldelectronics.com/cfe/projects.php#brainmachine>>

The following slides show you how to do the above, in detail.



Arduino

**Arduino is a very powerful tool!
But it is very easy to use.**

It was designed for total beginners to use successfully.

I won't give a complete tutorial here – just some basics.

For more info, there are many good Arduino tutorials online.

A good place to start is:

<<https://www.arduino.cc/en/Tutorial/HomePage>>



Arduino

First:

Download and install the Arduino software
< <http://arduino.cc> >

Any version is OK



Re-programming the Brain Machine

Second:

Download a Brain Machine brainwave sequence sketch
<<http://cornfieldelectronics.com/cfe/projects.php#brainmachine>>

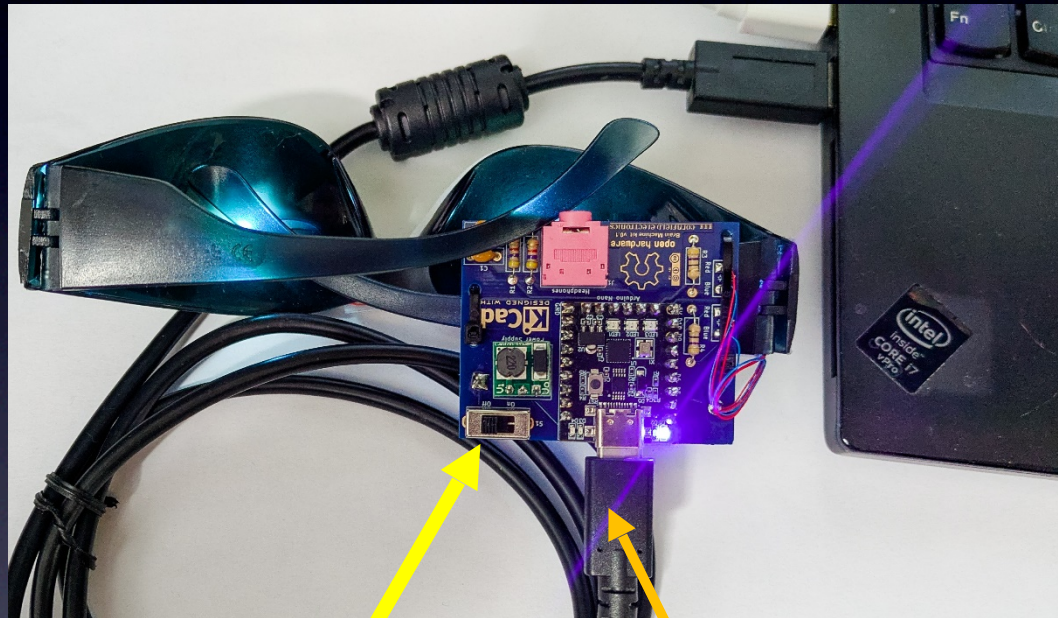
Store it on your computer anywhere you like.

(details on this soon)



Connecting your Brain Machine to your computer

USB-C cable

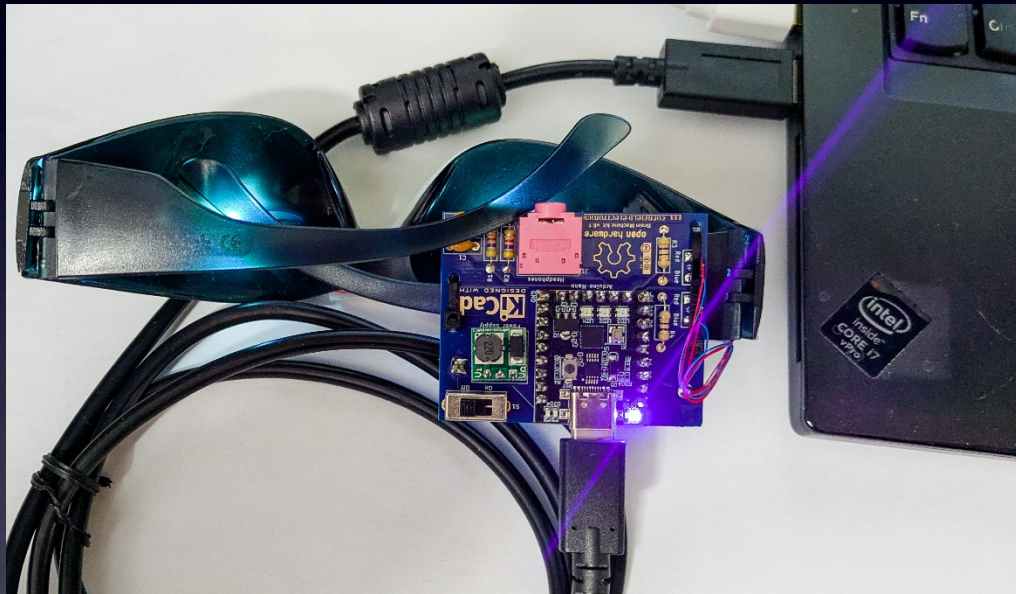


IMPORTANT:
Make sure the
Switch on your
Brain Machine
is *OFF*

to computer's USB

Connecting your Brain Machine to your computer

USB-C cable



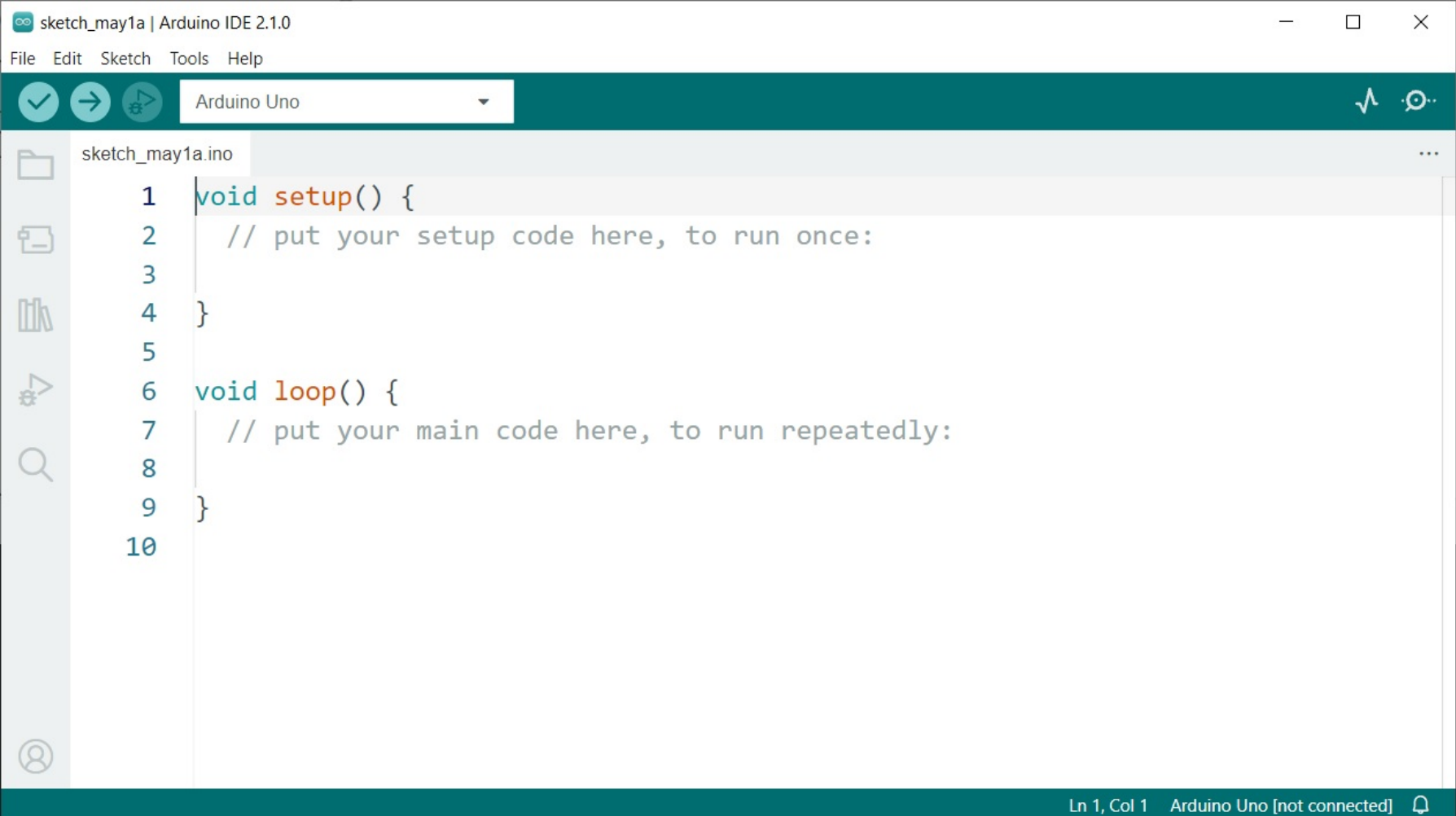
You may need to download and install a driver for your Operating System (Windows, MacOS, or Linux):

<<https://learn.sparkfun.com/tutorials/how-to-install-ch340-drivers/all>>

Or search for:
"CH340 driver"

Arduino

After you download and install the Arduino software start it, and you will see a screen that looks like this:

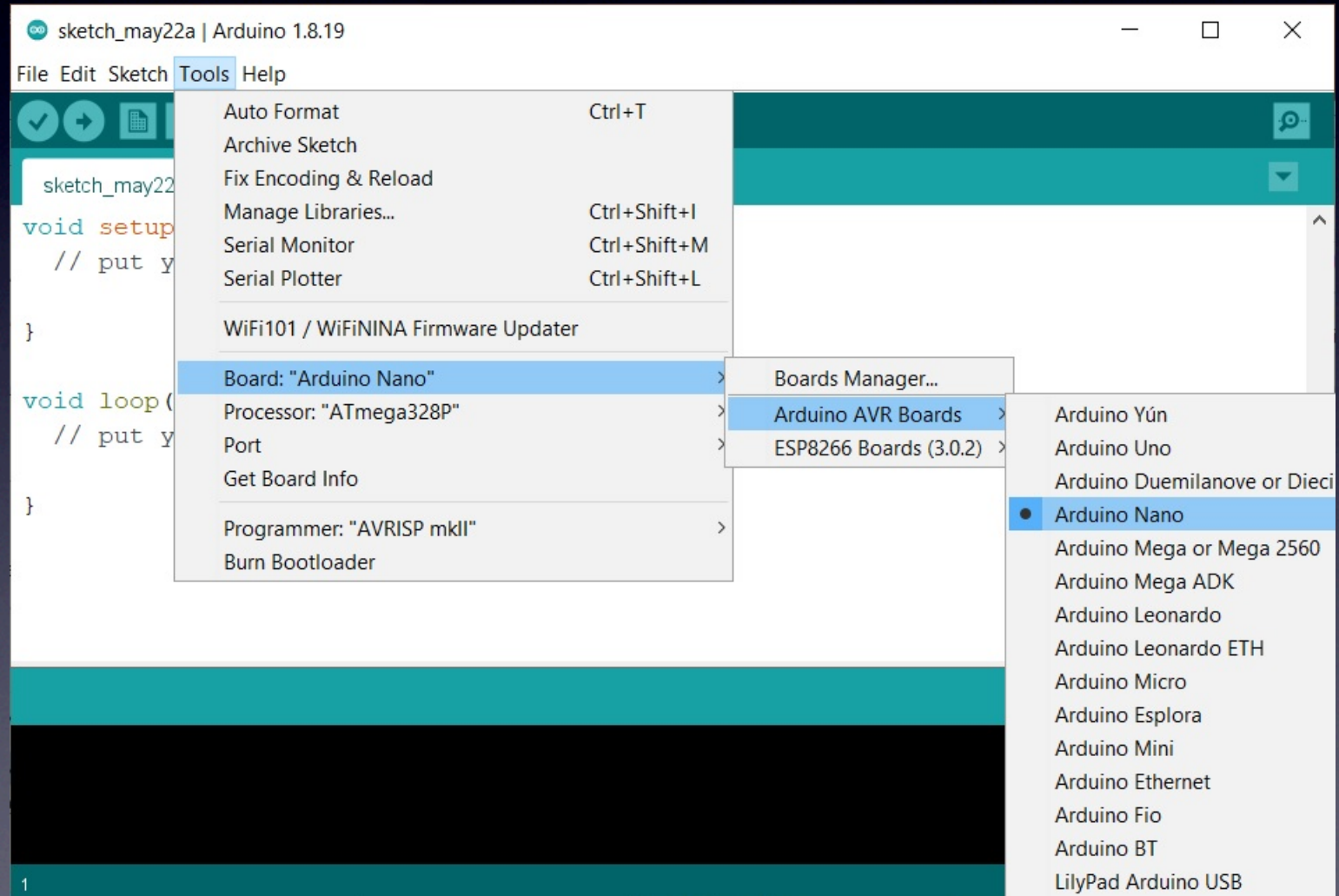


```
sketch_may1a | Arduino IDE 2.1.0
File Edit Sketch Tools Help
Arduino Uno
sketch_may1a.ino
1 void setup() {
2   // put your setup code here, to run once:
3
4 }
5
6 void loop() {
7   // put your main code here, to run repeatedly:
8
9 }
10
Ln 1, Col 1  Arduino Uno [not connected]
```

Arduino

The first time you start your Arduino software you need to set things up

(1)
Choose
"Arduino Nano"
as the Board



Arduino

The first time you start your Arduino software you need to set things up

(1)
Choose
“Arduino Nano”
as the Board



You now see “Arduino Nano”
here

Arduino

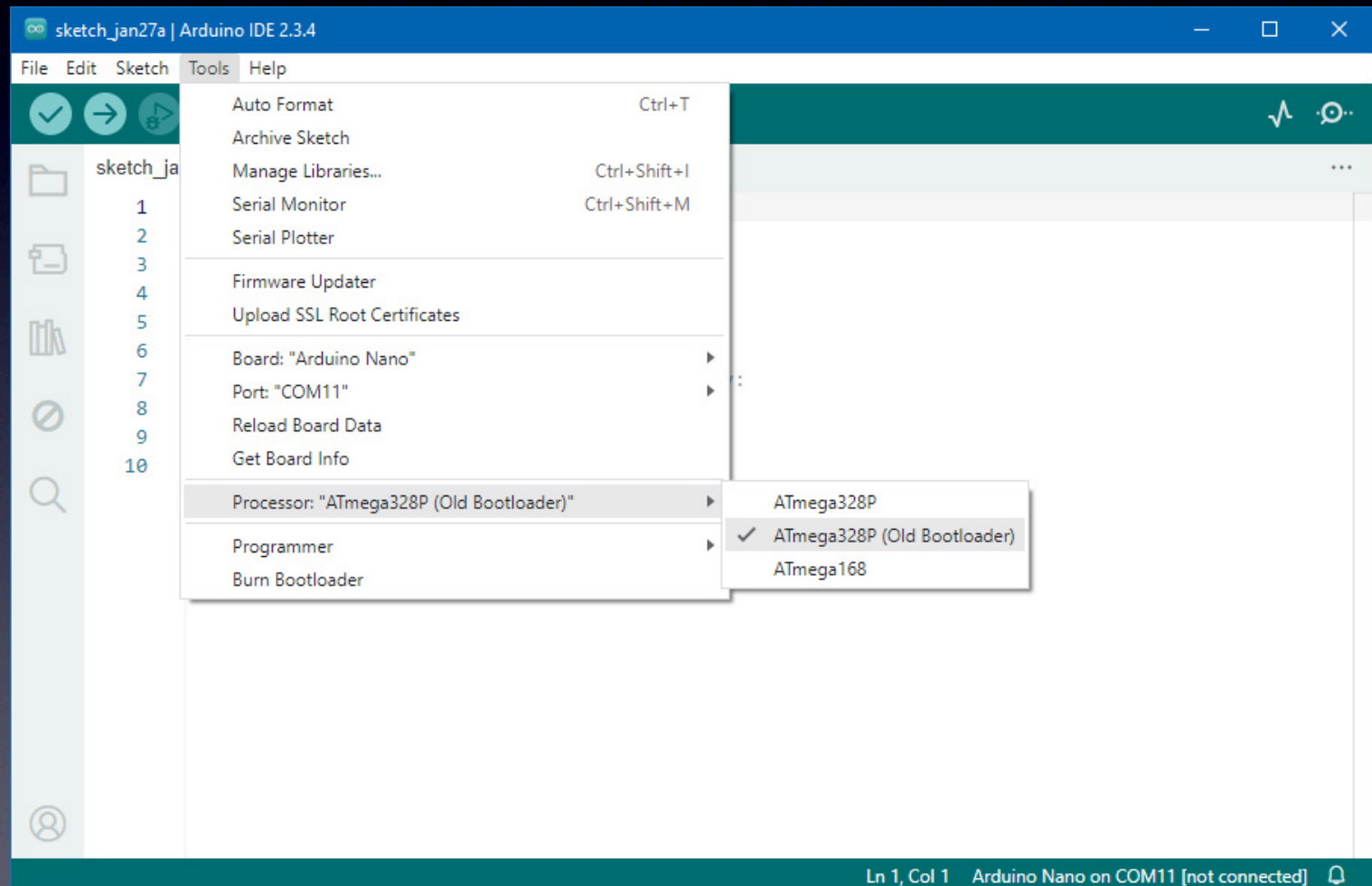
The first time you start your Arduino software you need to set things up

(2)
Choose
your Processor

“ATmega328P (Old Bootloader)”



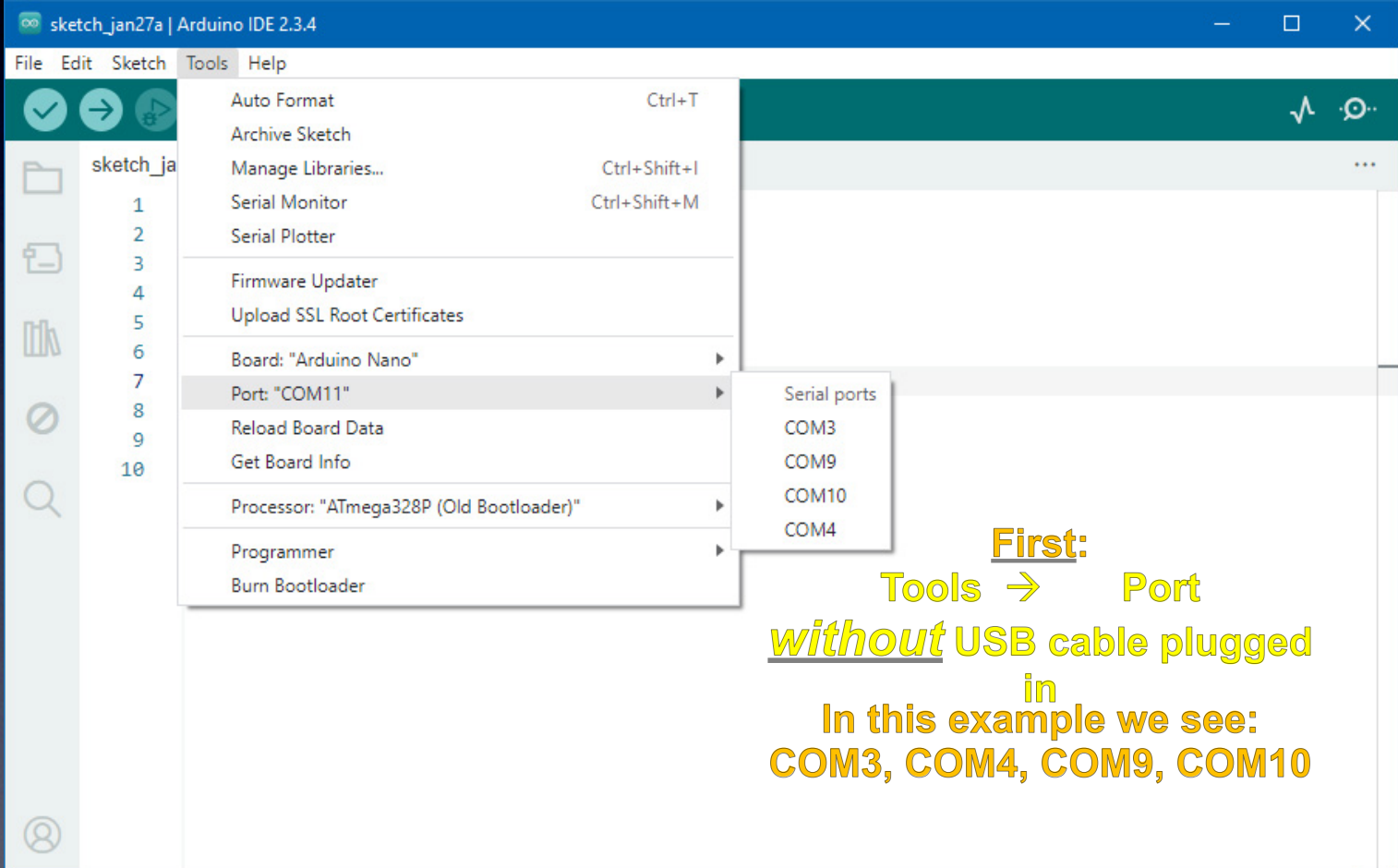
If this one doesn't work,
then
choose
“ATmega328P”



Arduino

The first time you start your Arduino software you need to set things up

(3)
Choose the Port
(this will be different depending on your Operating System)



The screenshot shows the Arduino IDE 2.3.4 interface. The 'Tools' menu is open, and the 'Port' option is selected, which has opened a sub-menu showing available serial ports: COM3, COM9, COM10, and COM4. The 'Board' is set to 'Arduino Nano' and the 'Processor' is 'ATmega328P (Old Bootloader)'. The status bar at the bottom indicates 'Ln 7, Col 49 Arduino Nano on COM11 [not connected]'.

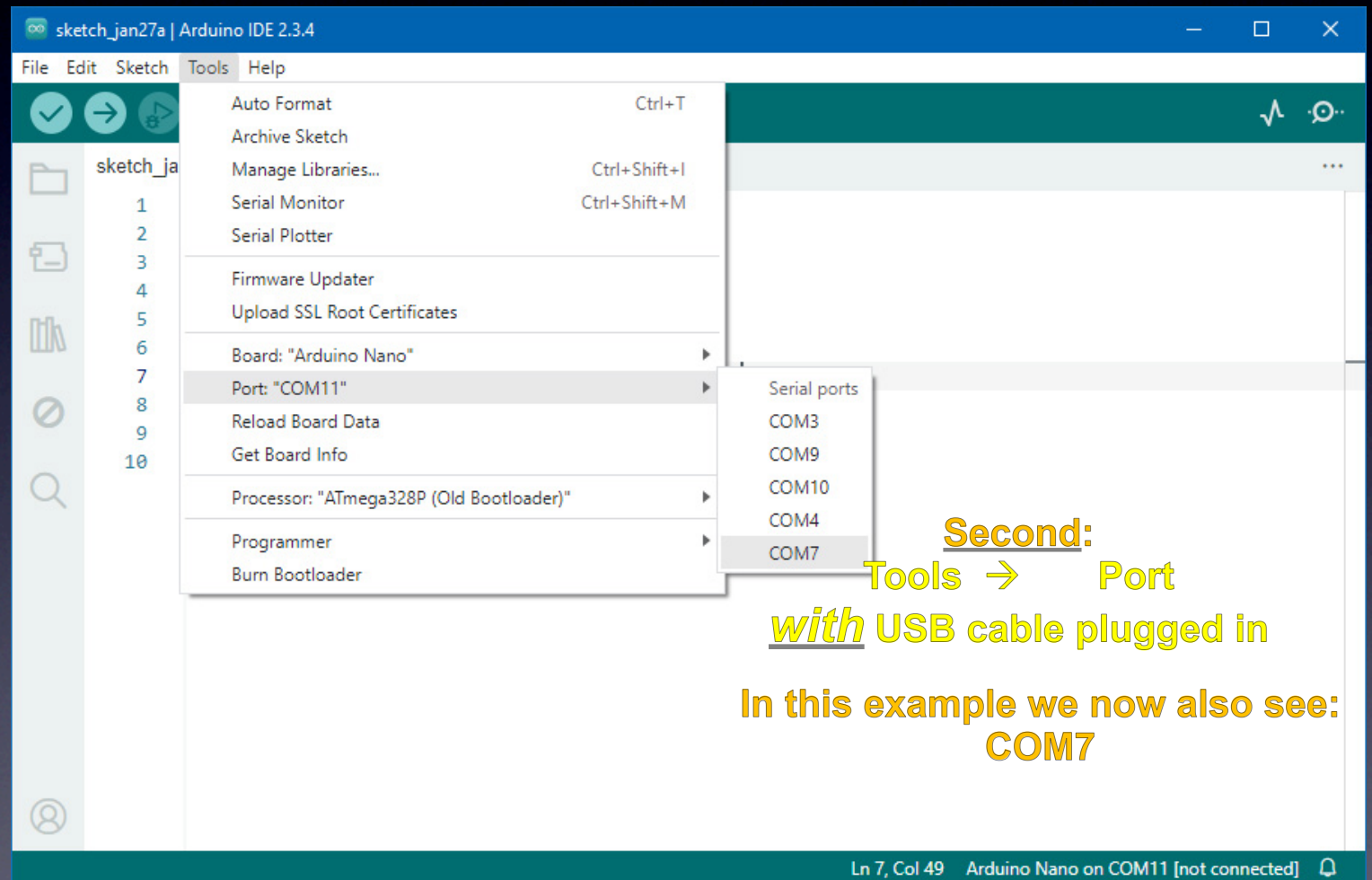
First:
Tools → Port
without USB cable plugged in
In this example we see:
COM3, COM4, COM9, COM10

Arduino

The first time you start your Arduino software you need to set things up

(3)
Choose the Port
(this will be different depending on your Operating System)

(After installing the driver for your Arduino (USB-Serial adapter), with your Arduino plugged in, your operating system will see a serial port and it appears here.)



(Driver: search for: "CH340 Driver")

Arduino

The first time you start your Arduino software you need to set things up

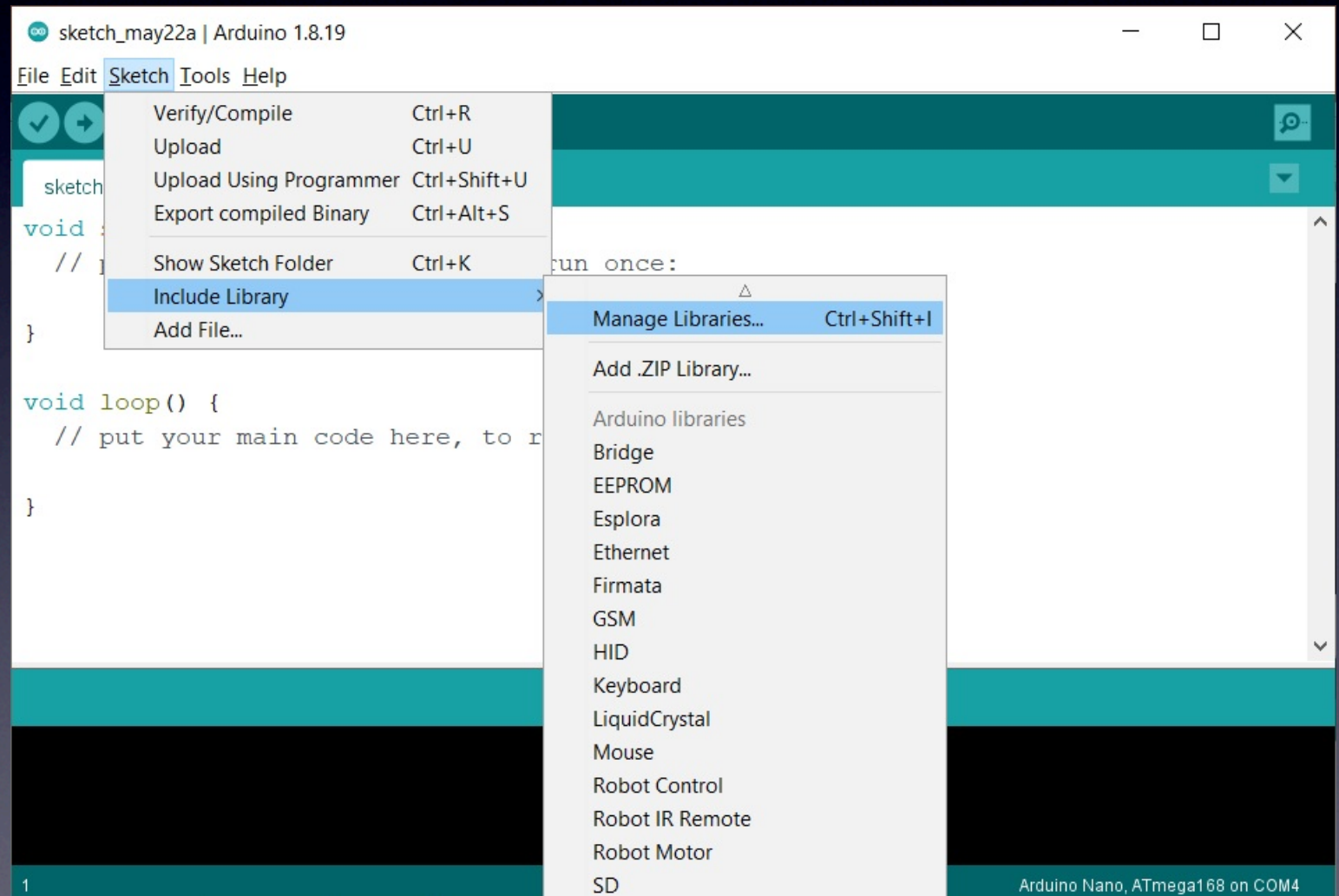
(3)
Choose the Port
(this will be different depending on your Operating System)



Arduino

The first time you start your Arduino software you need to set things up

(4a)
Install
the
Tone
library

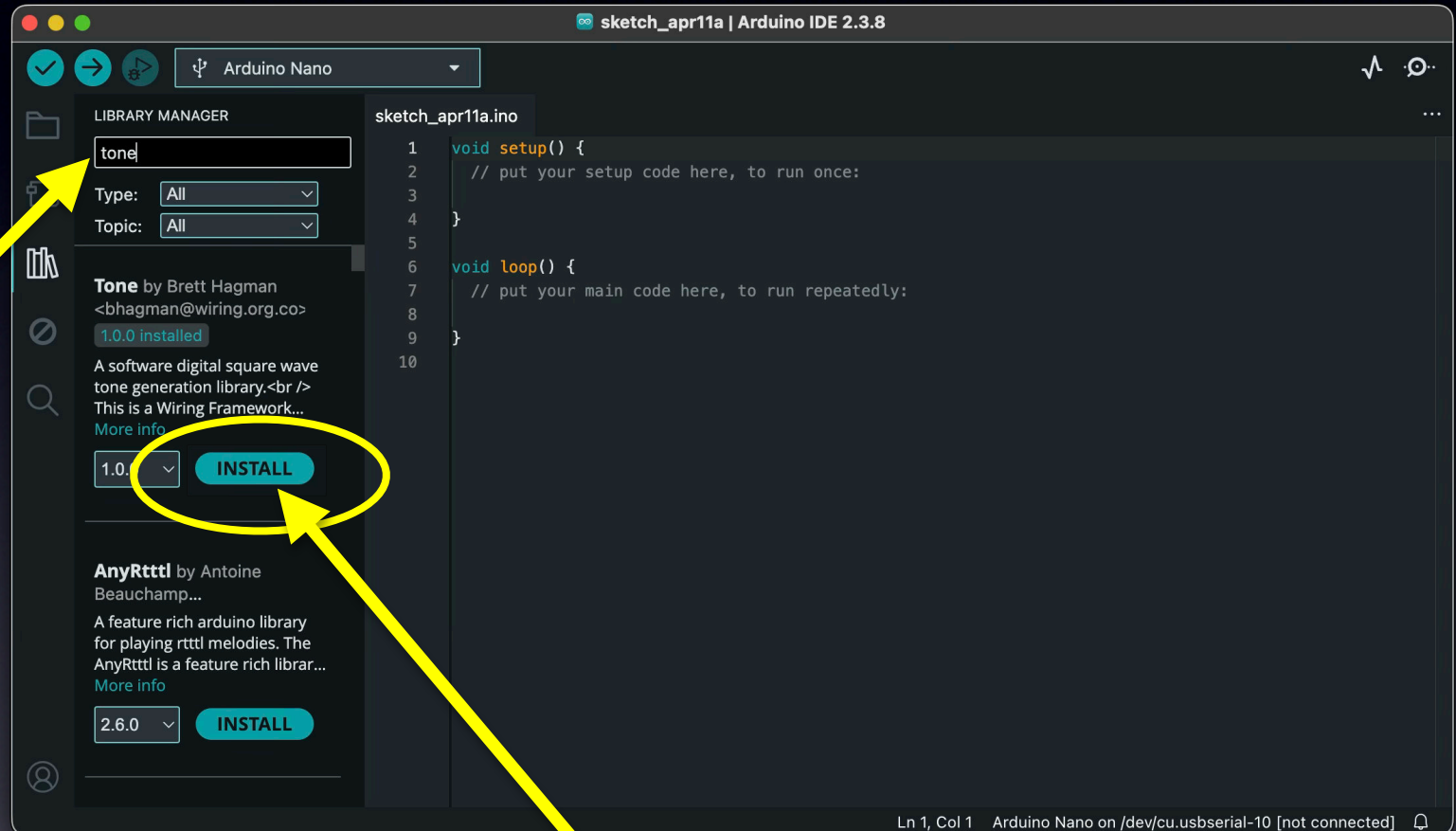


Arduino

The first time you start your Arduino software you need to set things up

(4b)
Install
the
Tone
library

type: "tone"
in the search bar

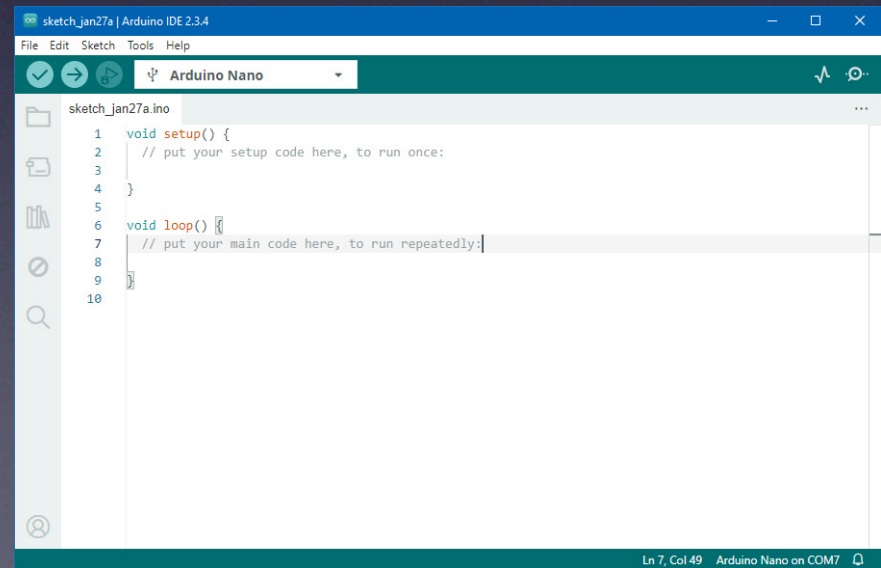


click the **INSTALL** button
for "Tone by Brett Hagman"

Arduino

Your Arduino software is now ready

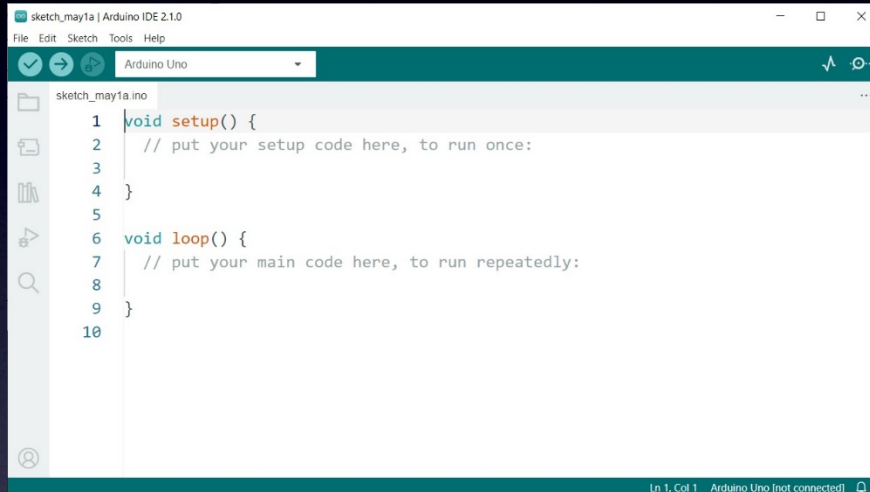
to program a new brainwave sequence sketch
into your Brain Machine !



```
sketch_jan27a.ino | Arduino IDE 2.3.4
File Edit Sketch Tools Help
Arduino Nano
sketch_jan27a.ino
1 void setup() {
2   // put your setup code here, to run once:
3
4 }
5
6 void loop() {
7   // put your main code here, to run repeatedly:
8
9 }
10
Ln 7, Col 49 Arduino Nano on COM7
```

Arduino

Designed for non-geeky artists



```
1 void setup() {  
2   // put your setup code here, to run once:  
3  
4 }  
5  
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8  
9 }  
10
```

Definition of

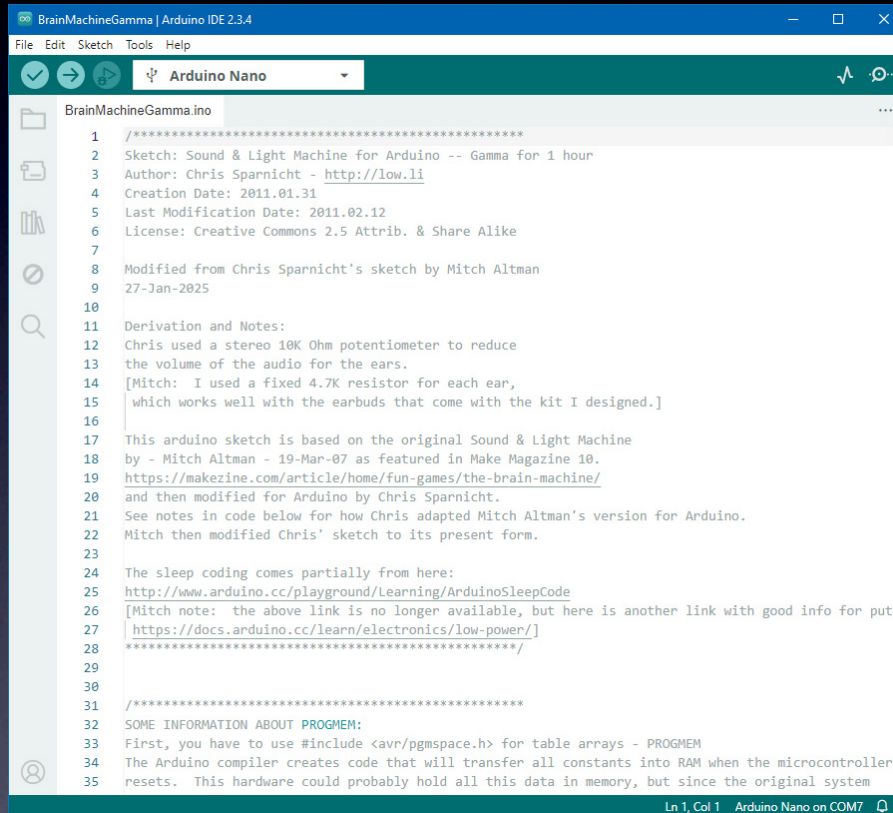
“Sketch” :

an Arduino program

Arduino

Designed for non-geeky artists

Download
the new
Gamma
“sketch”



```
BrainMachineGamma | Arduino IDE 2.3.4
File Edit Sketch Tools Help
Arduino Nano
BrainMachineGamma.ino
1  /*****
2  Sketch: Sound & Light Machine for Arduino -- Gamma for 1 hour
3  Author: Chris Sparnicht - http://low.li
4  Creation Date: 2011.01.31
5  Last Modification Date: 2011.02.12
6  License: Creative Commons 2.5 Attrib. & Share Alike
7
8  Modified from Chris Sparnicht's sketch by Mitch Altman
9  27-Jan-2025
10
11 Derivation and Notes:
12 Chris used a stereo 10K Ohm potentiometer to reduce
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14 [Mitch: I used a fixed 4.7K resistor for each ear,
15  which works well with the earbuds that come with the kit I designed.]
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26 [Mitch note: the above link is no longer available, but here is another link with good info for putting
27  https://docs.arduino.cc/learn/electronics/low-power/]
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34 The Arduino compiler creates code that will transfer all constants into RAM when the microcontroller
35 resets. This hardware could probably hold all this data in memory, but since the original system
```

“Sketch” :
an Arduino program

The following slides show where to find this sketch...

Arduino

Download a new brainwave sequence “sketch”

File Edit View History Bookmarks Tools Help
Cornfield Electronics :: Home
https://cornfieldelectronics.com/cfe/cfe.main.php 150% ☆

cornFIELD ELECTRONICS useful electronics for a better world

home **buy** about us press distributors projects show cart

TAKE CONTROL

At Cornfield Electronics we create devices that give people opportunities for effective choices in their lives. Each of us can decide whether to watch TV monitors, and when to watch. Each of us can decide when to get the rest we want, and how we dream. Everyone can learn to make cool things with our kits. Please explore our [products](#), make your own choices, and see how *your* life can be enhanced.

[Join our mailing list](#)

Love it or hate it, TV screens are all around us. [TV-B-Gone®](#) universal remote control is the first fruit of our technical savvy, embodying our belief in empowerment, and sense of humor. This universal remote control fits in your pocket and allows you to discreetly turn TVs off wherever you go. TV-B-Gone fans around the world are using it for a variety of practical, philosophical, and humorous purposes. Imagine the possibilities...

Years in the making [NeuroDreamer](#) sleep mask is another of our personal empowerment inventions. We all need rest, but we don't always get it in our busy lives. NeuroDreamer sleep mask lets you use your own brainwaves to

bring you the rest you need. And with the **lucid dreaming model**, you can take control of your dreams.

Want to learn electronics? We make way cool, fun, intriguing, educational [kits](#) that **anyone can make!** Our most **POPULAR** kits are: [AduTouch music synthesizer kit](#) and [TV-B-Gone kit!](#)

We make truly useful technological solutions that put you in charge.

Welcome to our better world!

NOTE: As of 14-Feb-2023 Cornfield Electronics is a sole proprietorship of Mitch Altman.

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<https://CornfieldElectronics.com>

Arduino

Download a new brainwave sequence “sketch”



The screenshot shows the Cornfield Electronics website. The navigation bar includes 'home', 'buy', 'about us', 'press', 'distributors', 'projects', and 'show cart'. The 'projects' tab is highlighted with a green arrow. The main content area features a large heading 'TAKE CONTROL' and a subheading 'At Cornfield Electronics we create devices that give people opportunities for effective choices in their lives.' Below this, there are three images: a blue Arduino board, a purple 'NeuroDreamer' sleep mask, and a black 'TV-B-Gone' universal remote control. The text describes these products and their uses. At the bottom, there is a footer with 'legal notices & privacy policy', a Creative Commons BY-SA license, and the year '2023 cornfield electronics'.

cornFIELD electronics
useful electronics for a better world

home buy about us press distributors projects show cart

TAKE CONTROL

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“Projects” tab

Arduino

Download a new brainwave sequence “sketch”



The screenshot shows a web browser window displaying the 'Cornfield Electronics' website. The page is titled 'DO-IT-YOURSELF PROJECTS' and is authored by Mitch Altman. It features a navigation menu with 'buy' highlighted. The main content area includes a list of tools needed for projects, a small image of these tools, and a link to a soldering tutorial. The footer contains contact information for the website.

File Edit View History Bookmarks Tools Help

Cornfield Electronics :: Projects

https://cornfieldelectronics.com/cfe/projects.php?PHPSESSID=d5d4714nuevraq25drkkoirr1m3

150%

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home buy about us press distributors projects show cart

DO-IT-YOURSELF PROJECTS
by **Mitch Altman**, and friends.
Last modified: 5-Oct-2022

You Can Make Cool Things With Electronics!
The projects on this page were all created for total beginners, with no experience, so everyone can complete them successfully at my workshops, or at home, or anywhere!

All you need is:
a desire, a handful of parts, a soldering iron (with stand and sponge), a wire-cutter, a wire-stripper, solder, and an afternoon.



Here is a really nice tutorial on how to solder -- for total beginners!
[Soldering Tutorial for total beginners](#)

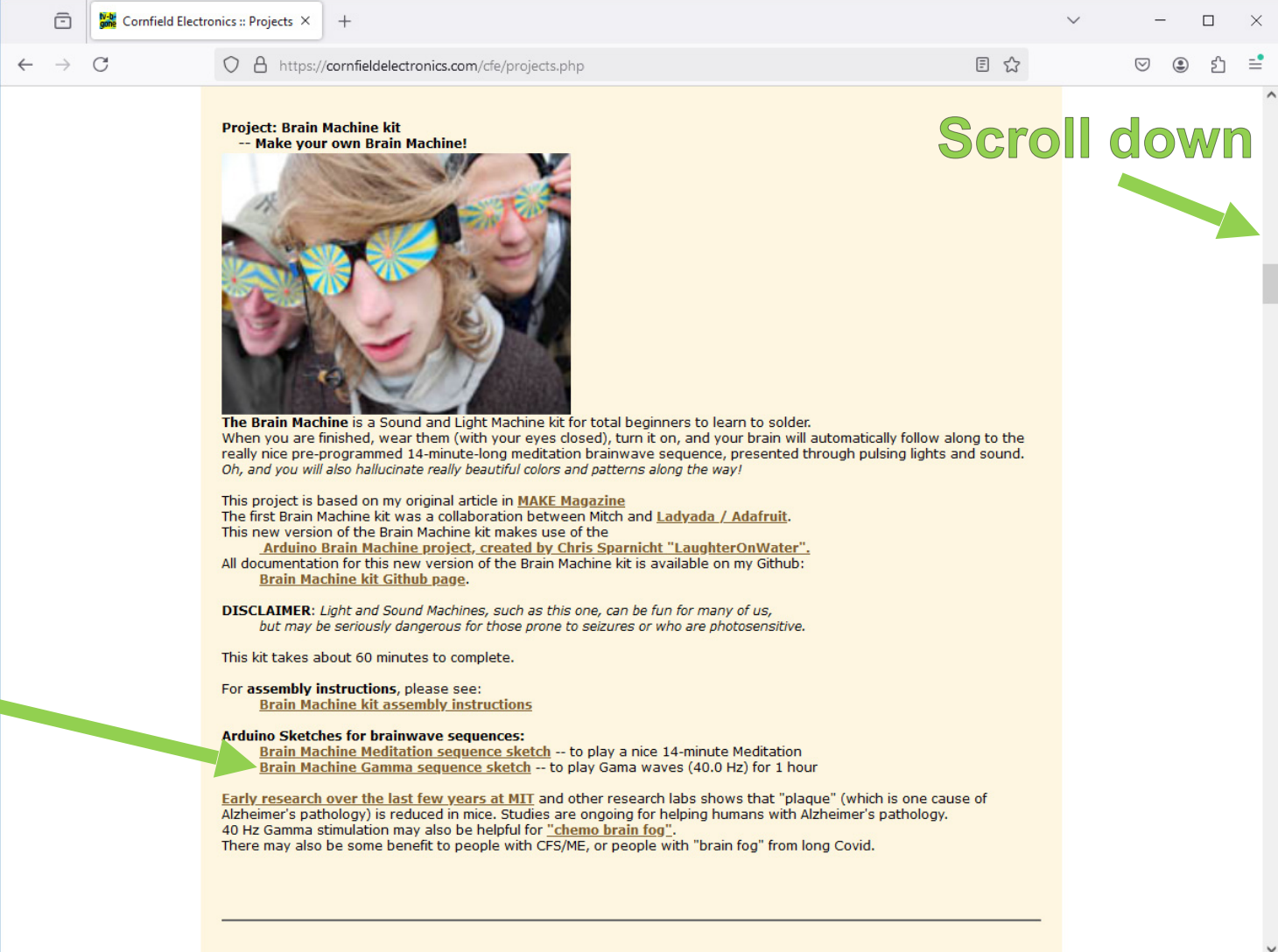
Open Hardware!
Everything on this page (and everything I do) is free and open source!
(That's *free* as in *freedom*.)
(But everything here is free to download -- and that is *free* as in *beer*.)
If you have any questions on anything, please feel free to email me:

Transferring data from cornfieldelectronics.com... ch AT CornfieldElectronics DOT com


“Projects” tab

Arduino

Download a new brainwave sequence “sketch”



Project: Brain Machine kit
-- Make your own Brain Machine!



The Brain Machine is a Sound and Light Machine kit for total beginners to learn to solder. When you are finished, wear them (with your eyes closed), turn it on, and your brain will automatically follow along to the really nice pre-programmed 14-minute-long meditation brainwave sequence, presented through pulsing lights and sound. Oh, and you will also hallucinate really beautiful colors and patterns along the way!

This project is based on my original article in [MAKE Magazine](#). The first Brain Machine kit was a collaboration between Mitch and [Ladyada / Adafruit](#). This new version of the Brain Machine kit makes use of the [Arduino Brain Machine project, created by Chris Sparnicht "LaughterOnWater"](#). All documentation for this new version of the Brain Machine kit is available on my Github: [Brain Machine kit Github page](#).

DISCLAIMER: *Light and Sound Machines, such as this one, can be fun for many of us, but may be seriously dangerous for those prone to seizures or who are photosensitive.*

This kit takes about 60 minutes to complete.

For **assembly instructions**, please see: [Brain Machine kit assembly instructions](#)

Arduino Sketches for brainwave sequences:
[Brain Machine Meditation sequence sketch](#) -- to play a nice 14-minute Meditation
[Brain Machine Gamma sequence sketch](#) -- to play Gama waves (40.0 Hz) for 1 hour

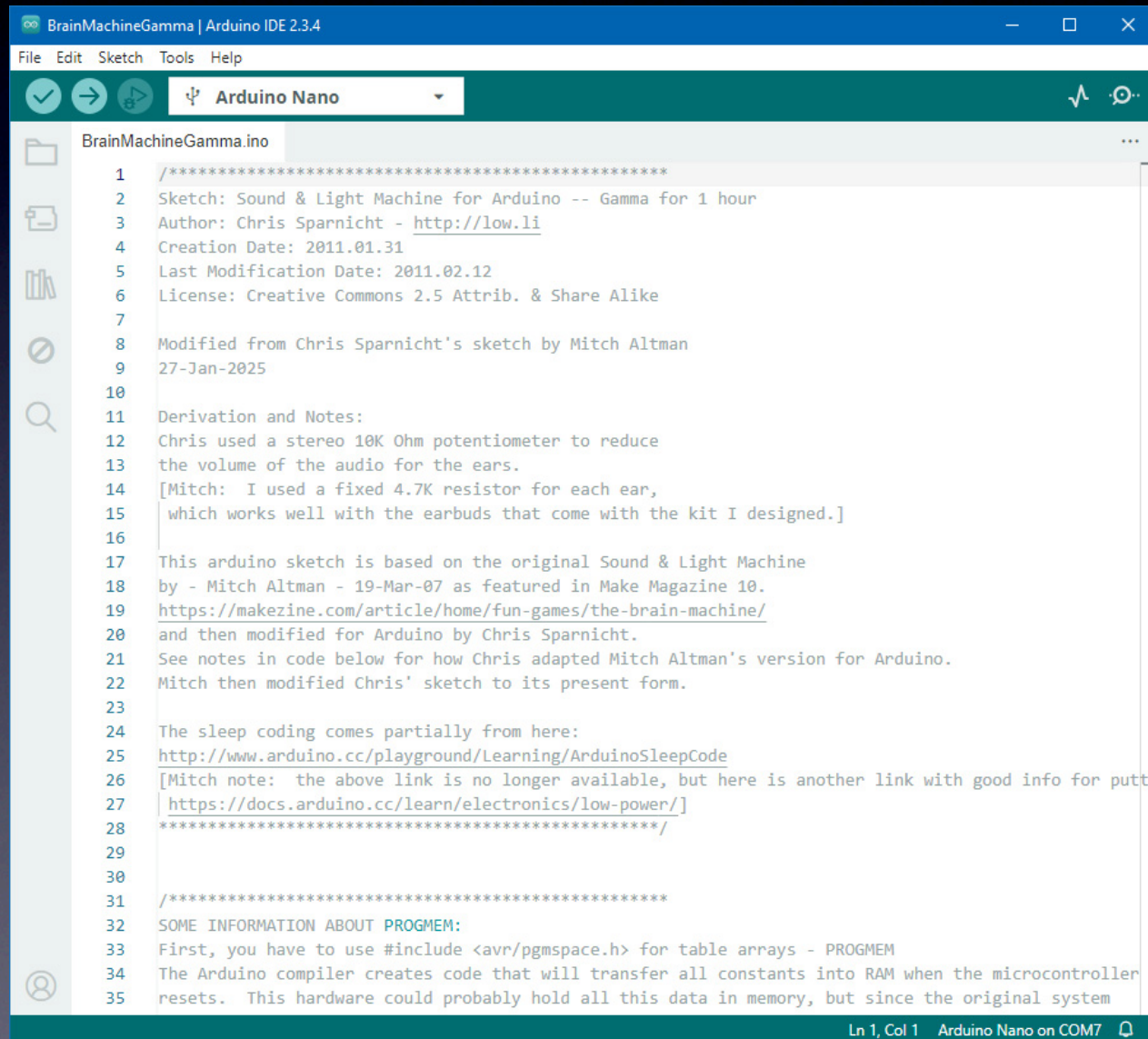
Early research over the last few years at MIT and other research labs shows that "plaque" (which is one cause of Alzheimer's pathology) is reduced in mice. Studies are ongoing for helping humans with Alzheimer's pathology. 40 Hz Gamma stimulation may also be helpful for "[chemo brain fog](#)". There may also be some benefit to people with CFS/ME, or people with "brain fog" from long Covid.

Scroll down

Click here to download the Gamma wave sequence sketch

Arduino

You can now open the brainwave sequence sketch:
File → Open...

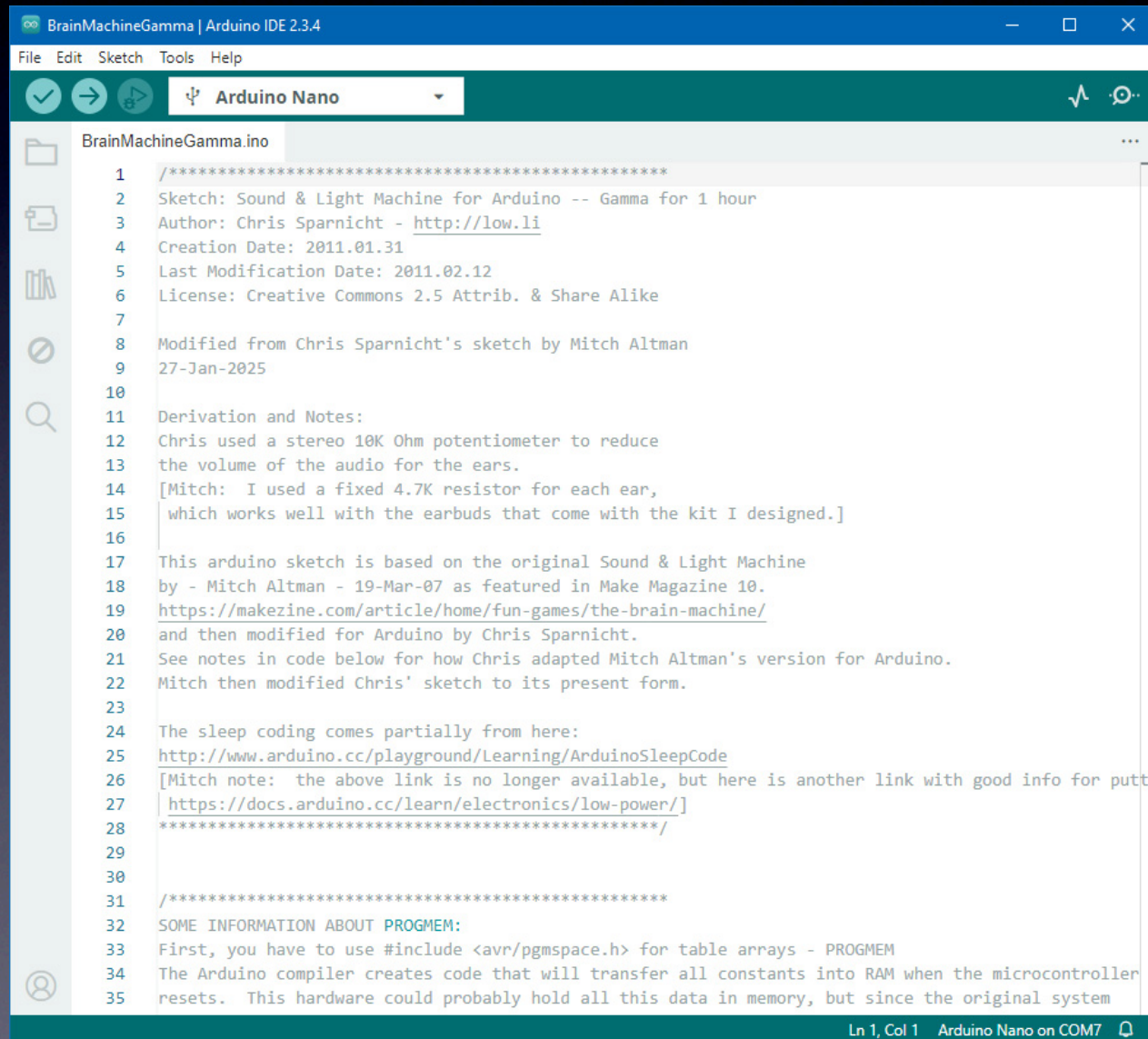


```
BrainMachineGamma.ino
1  /*****
2  Sketch: Sound & Light Machine for Arduino -- Gamma for 1 hour
3  Author: Chris Sparnicht - http://low.li
4  Creation Date: 2011.01.31
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25 http://www.arduino.cc/playground/Learning/ArduinoSleepCode
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29
30
31 /*****
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```

Ln 1, Col 1 Arduino Nano on COM7

Arduino

You can now program your Brain Machine with a new synth sketch !

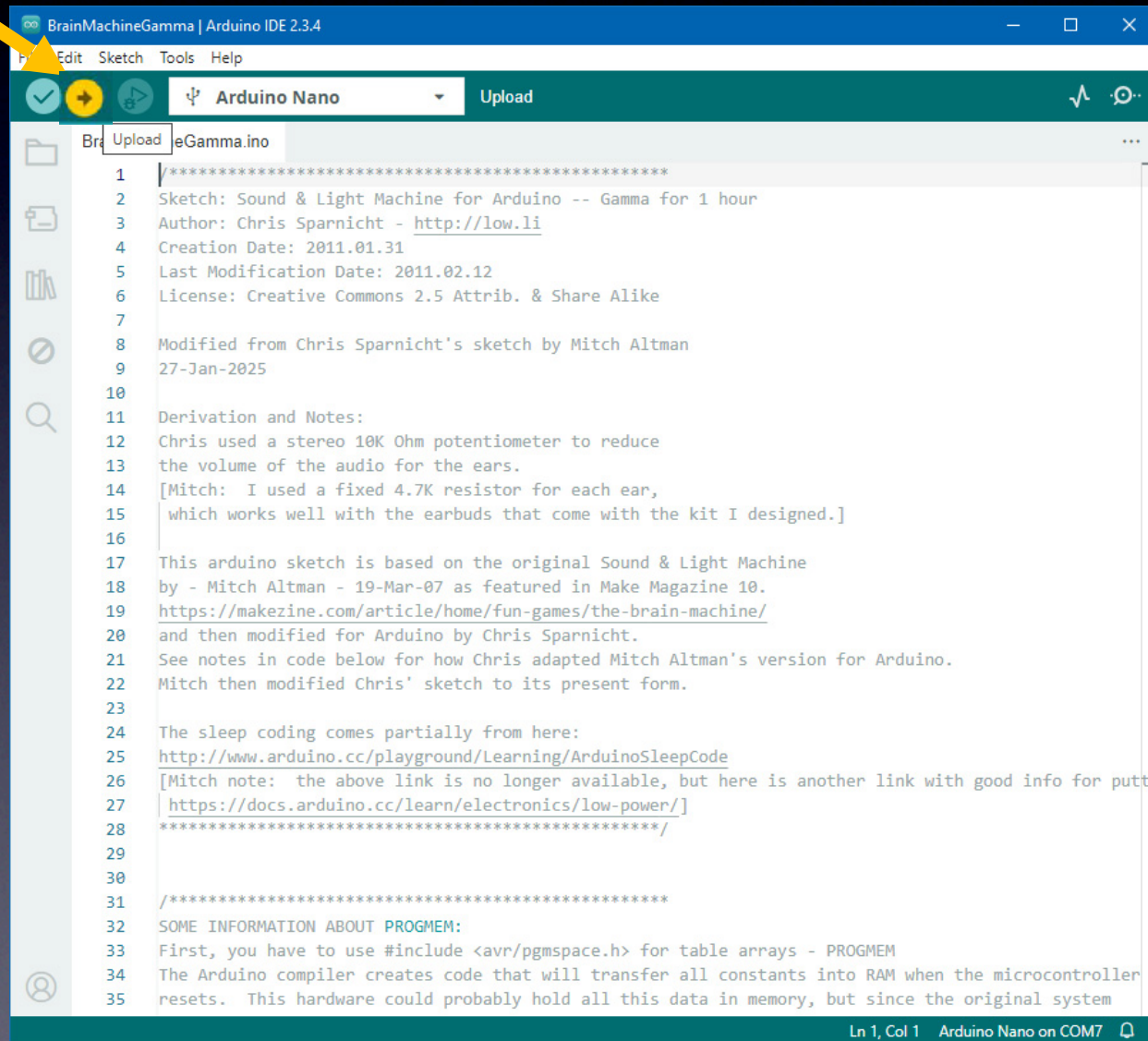


```
BrainMachineGamma | Arduino IDE 2.3.4
File Edit Sketch Tools Help
Arduino Nano
BrainMachineGamma.ino
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```

Ln 1, Col 1 Arduino Nano on COM7

Arduino

With the USB-C cable connected to your Brain Machine press the “Upload” button

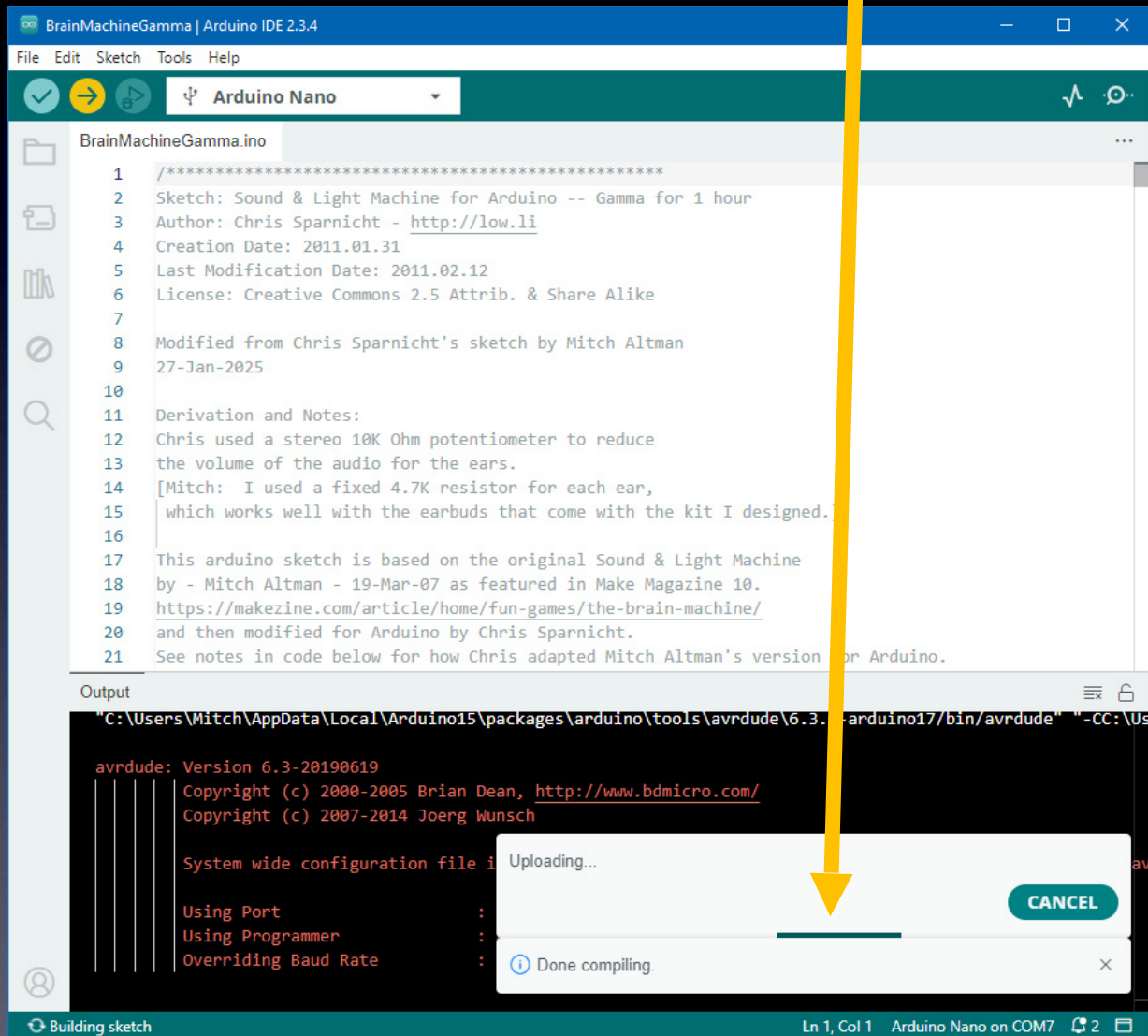


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2 Sketch: Sound & Light Machine for Arduino -- Gamma for 1 hour
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Ln 1, Col 1 Arduino Nano on COM7

Arduino

While uploading, you will see a progress bar...



...and when it's completed successfully, it says: "Upload done"

Arduino

If you get an error, please search for “tone” after clicking here:

The screenshot displays the Arduino IDE 2.3.4 interface. The main window shows the sketch file 'BrainMachineGamma.ino' with the following code:

```
1  /*****  
2  Sketch: Sound & Light Machine for Arduino -- Gamma for 1 hour  
3  Author: Chris Sparnicht - http://low.li  
4  Creation Date: 2011.01.31  
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21  See notes in code below for how Chris adapted Mitch Altman's version for Arduino.
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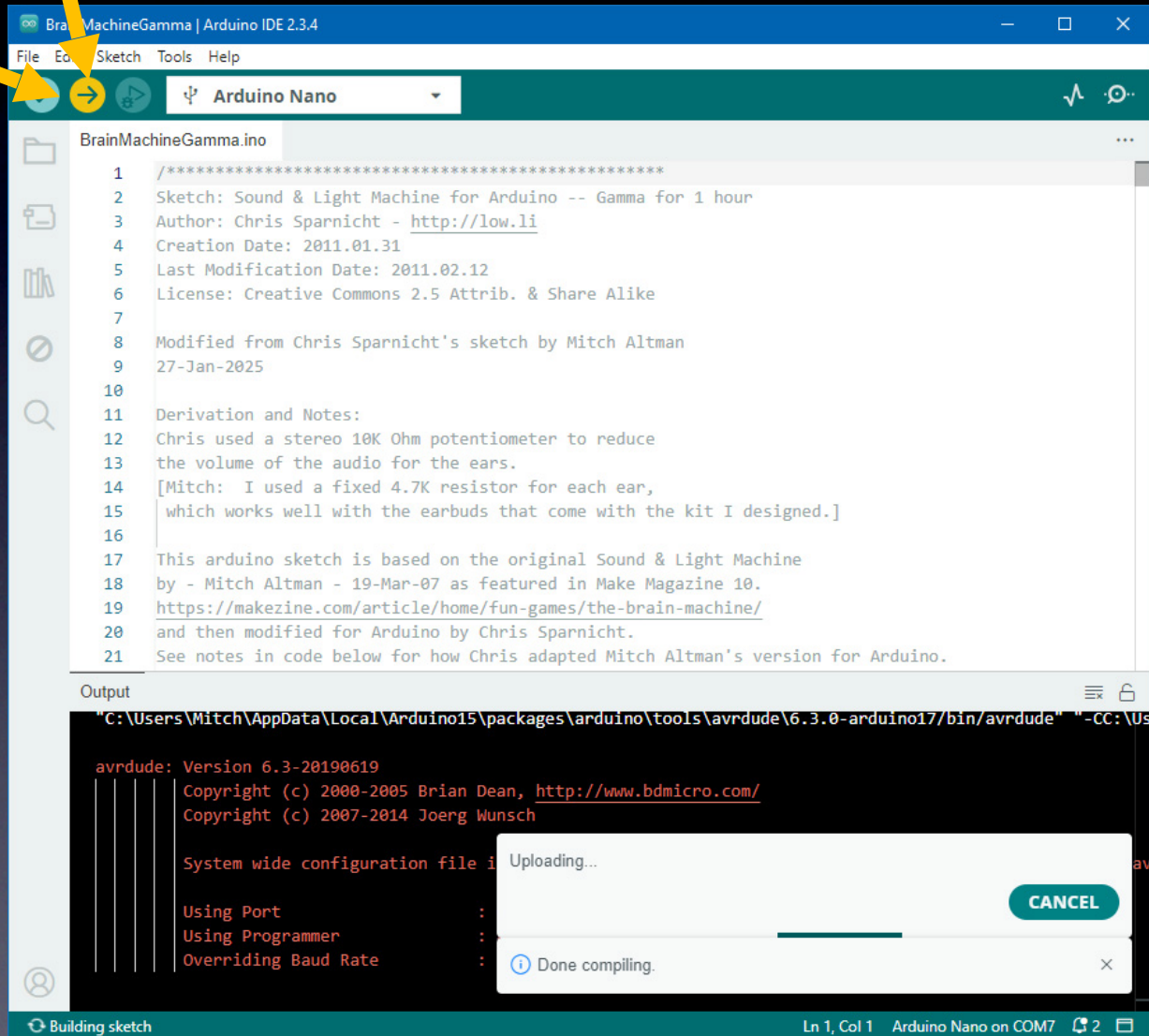
The output window shows the following text:

```
"C:\Users\Mitch\AppData\Local\Arduino15\packages\arduino\tools\avrduide\6.3.0-arduino17\bin\avrduide" "-CC:US  
avrduide: Version 6.3-20190619  
Copyright (c) 2000-2005 Brian Dean, http://www.bdmicro.com/  
Copyright (c) 2007-2014 Joerg Wunsch  
System wide configuration file i  
Using Port :  
Using Programmer :  
Overriding Baud Rate :  
Uploading...  
Done compiling.
```

The status bar at the bottom indicates 'Building sketch' and 'Ln 1, Col 1 Arduino Nano on COM7'.

Arduino

...then try again if you needed to download the “tone” library:



...and when it's completed successfully, it says: “Upload done”

Brain Machine

**Disconnect your Brain Machine board
from the USB-C cable,**

turn on your Brain Machine,

And...

Let's Trip Out in New Ways !



Please Remember:

to

Wash your hands

after soldering

Brain Machine kit

Hack Your Brain With Sound & Light



open source
hardware



CC BY-SA 4.0 © 2026 Mitch Altman



CORNFIELD ELECTRONICS

Brain Machine kit

Hack Your Brain With Sound & Light

Mitch Altman

Chief Scientist, **Cornfield Electronics**, San Francisco, CA

Inventor of **TV-B-Gone** universal remote controls

Co-founder of **3Ware** (successful Silicon Valley startup)

Pioneer of **VR** (in the mid-1980s)

Founding mentor at **HAX** (1st and biggest hardware accelerator)

Co-founder of **Noisebridge** (San Francisco hackerspace)

email: mitch@CornfieldElectronics.com

site: www.CornfieldElectronics.com

facebook: [maltman23](https://www.facebook.com/maltman23)

flickr: [maltman23](https://www.flickr.com/photos/maltman23/)

WeChat: [mitchaltman](https://www.wechat.com/qrcode?qr_code=mitchaltman)

Fediverse: [@maltman23@mastodon.social](https://maltman23@mastodon.social)

Patreon: [mitchaltman](https://www.patreon.com/mitchaltman)

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EASTERHEGG 2026 | EH23



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