

# Playing with Power

Residual Media and the  
Ambivalence of Eco-Modding

**Alex Custodio**

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PRESS  
START

# Afterlives

Informal technologies, practices, and discourses

- Fan archives
- Homebrew game development
- Hardware modification, maintenance, and repair



# Afterlives

## Informal technologies, practices, and discourses

- Fan archives
- Homebrew game development
- **Hardware modification, maintenance, and repair**

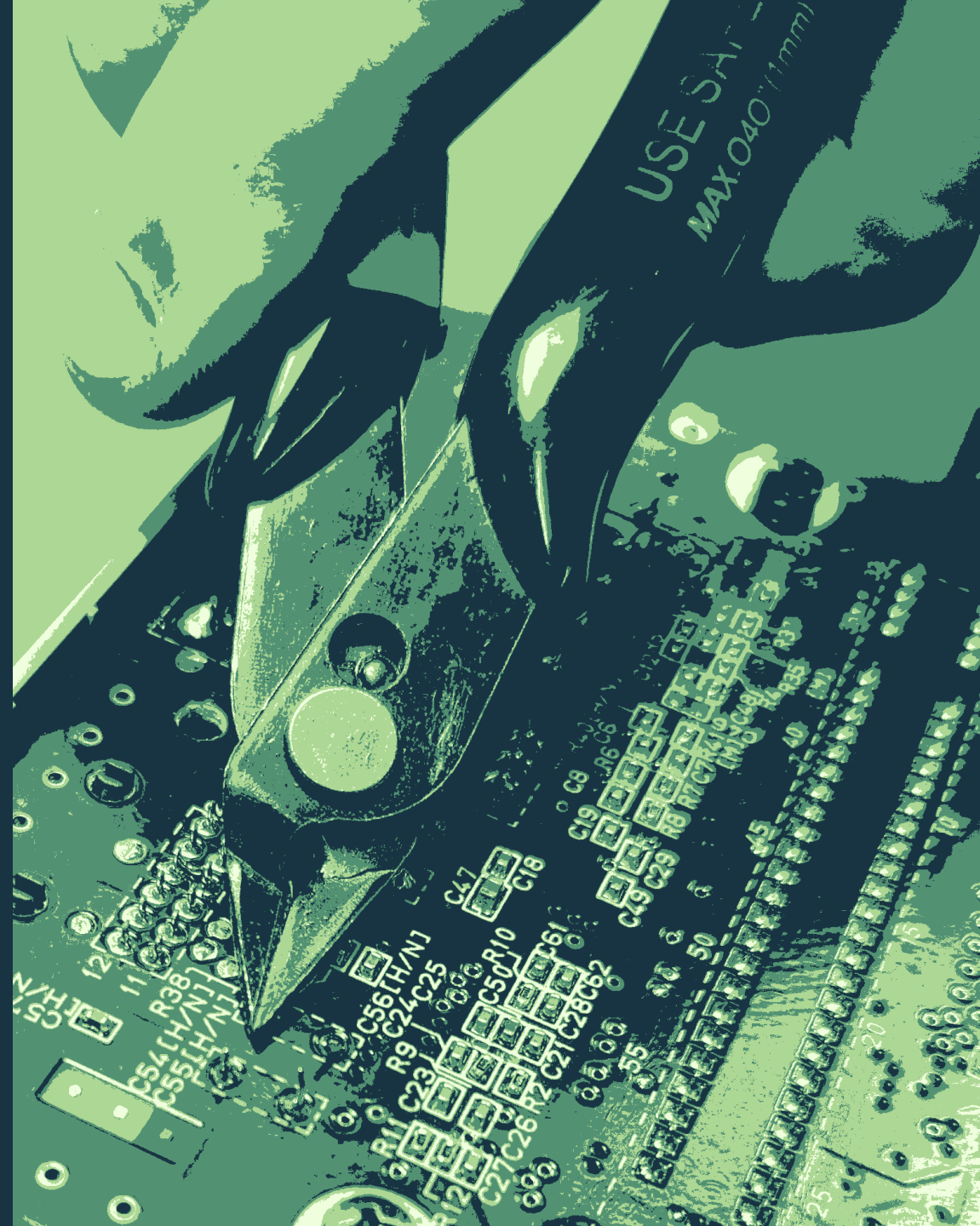


# Modding & Repair

Exist outside dominant modes of engagement with technology

Often imagine themselves as a **corrective** to the problem of waste, planned obsolescence, and overproduction.

- DIY modding culture
- Right to repair
- Critical making



# Research Questions

- What does hardware modding and preservation *actually* contribute to the pressing issue of waste and sustainability?
- Where can we meaningfully intervene as researchers, engineers, artists, hobbyists, and developers?



# Residual Media Depot

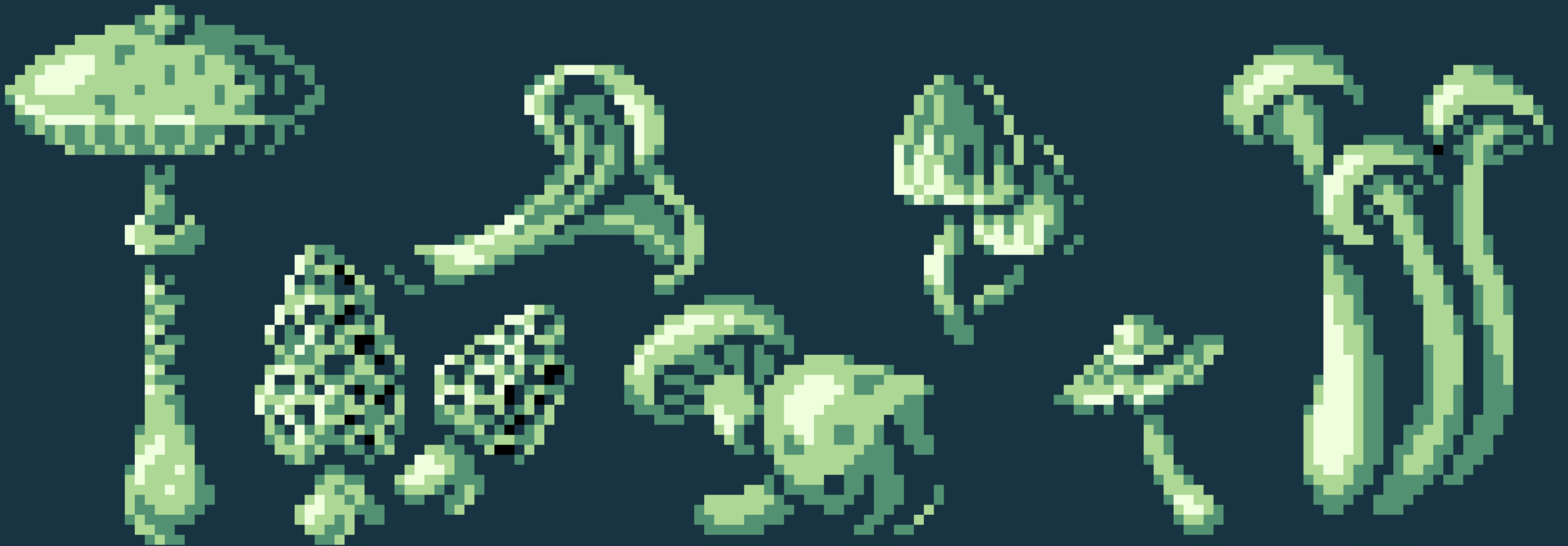
A historical collection of  
videogame hardware,  
original packaging and  
ephemera

Most of our systems date  
from between 1972-2006.



## Currently Reading:

Anna Tsing's *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*



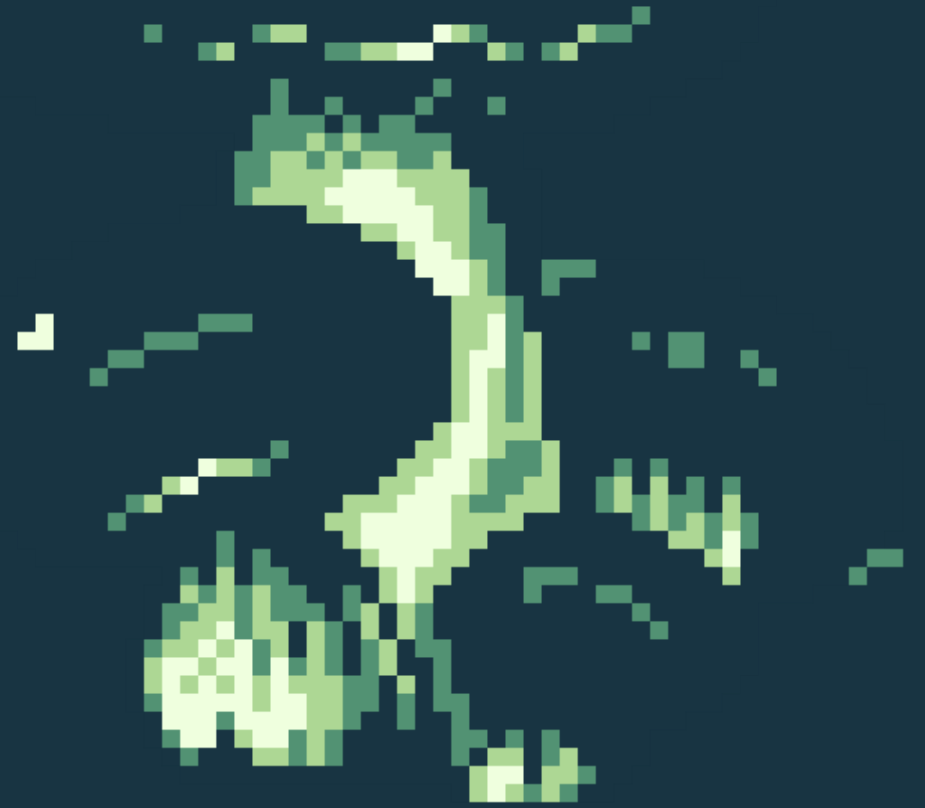
# Technology = Mushrooms? (maybe)





“Like the flushes of mushrooms  
that come up after a rain: an  
over- the- top bounty; a  
temptation to explore; an  
always too many.”

- Tsing, *The Mushroom at the  
End of the World*

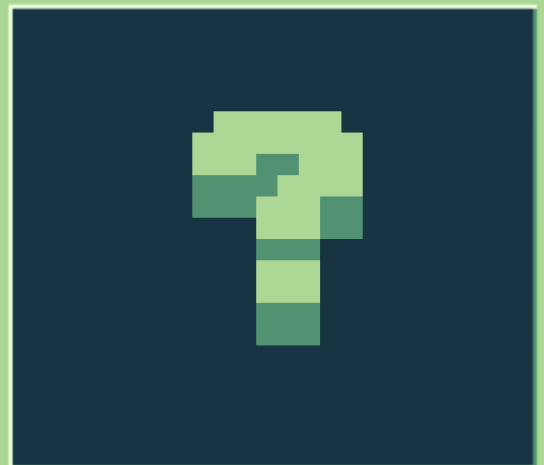




LEVEL 1



LEVEL 2



LEVEL 3



LEVEL 4



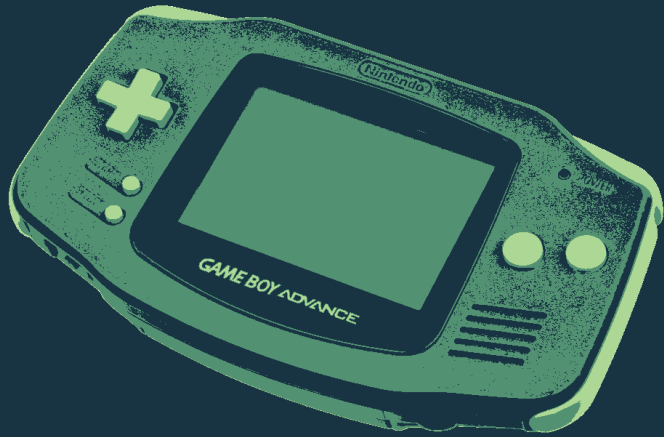
LEVEL 5



LEVEL 6

# Assemblage

A network of human and nonhuman agents that depend on one another



# Assemblage

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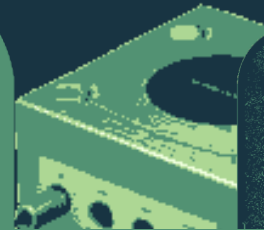
A network of human and nonhuman agents that depend on one another



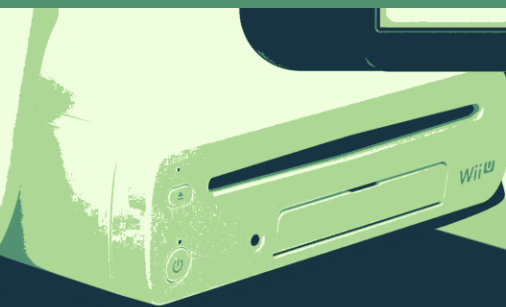
# Assemblage

A network of human and nonhuman agents that depend on one another





# AHHHHH!!!!

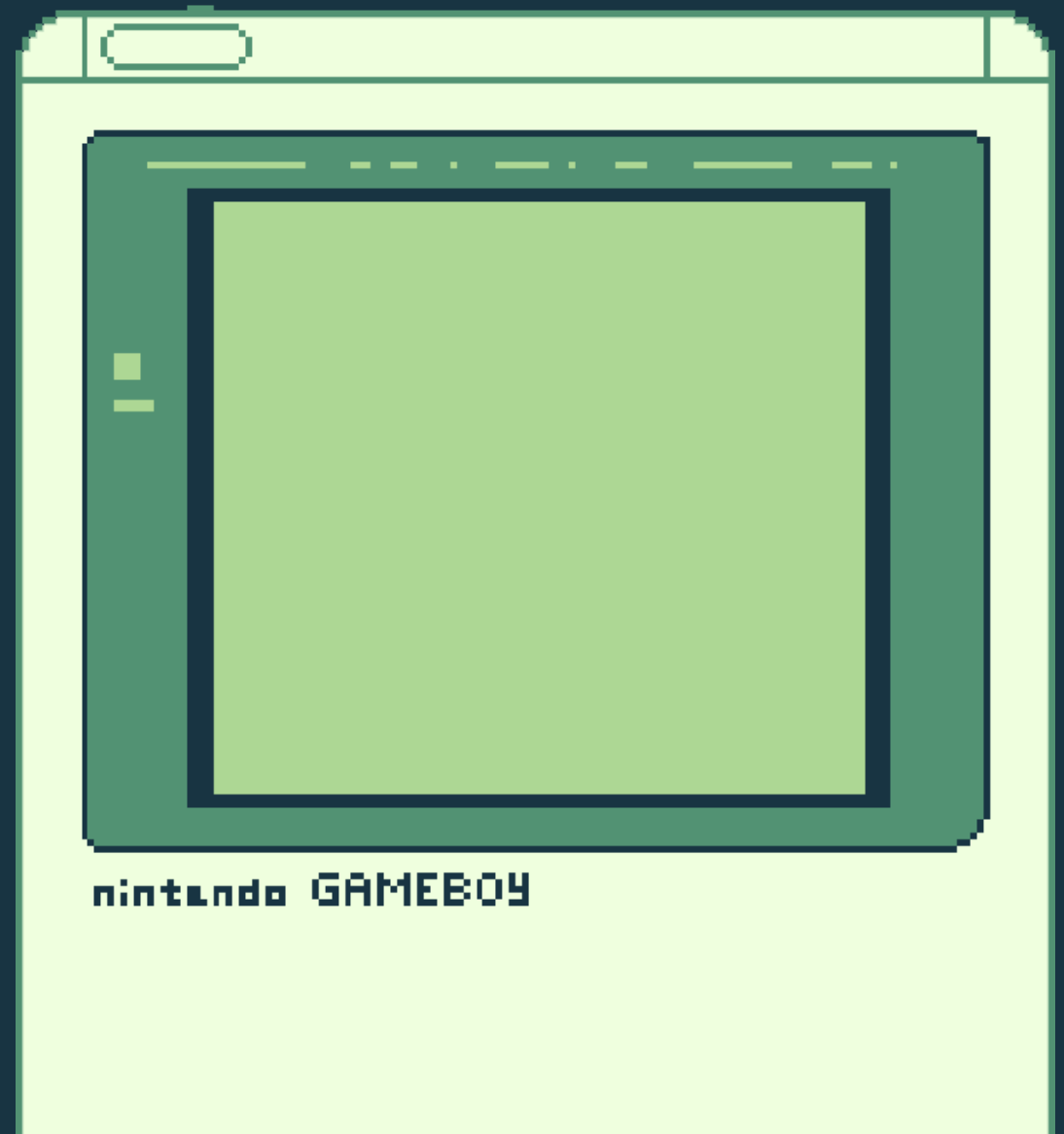




# Assemblage

The obviousness of external differences distracts us from **informal** avenues of access and **internal** dissimilarities within individual models.

**Game Boy:** 1989 to 2003

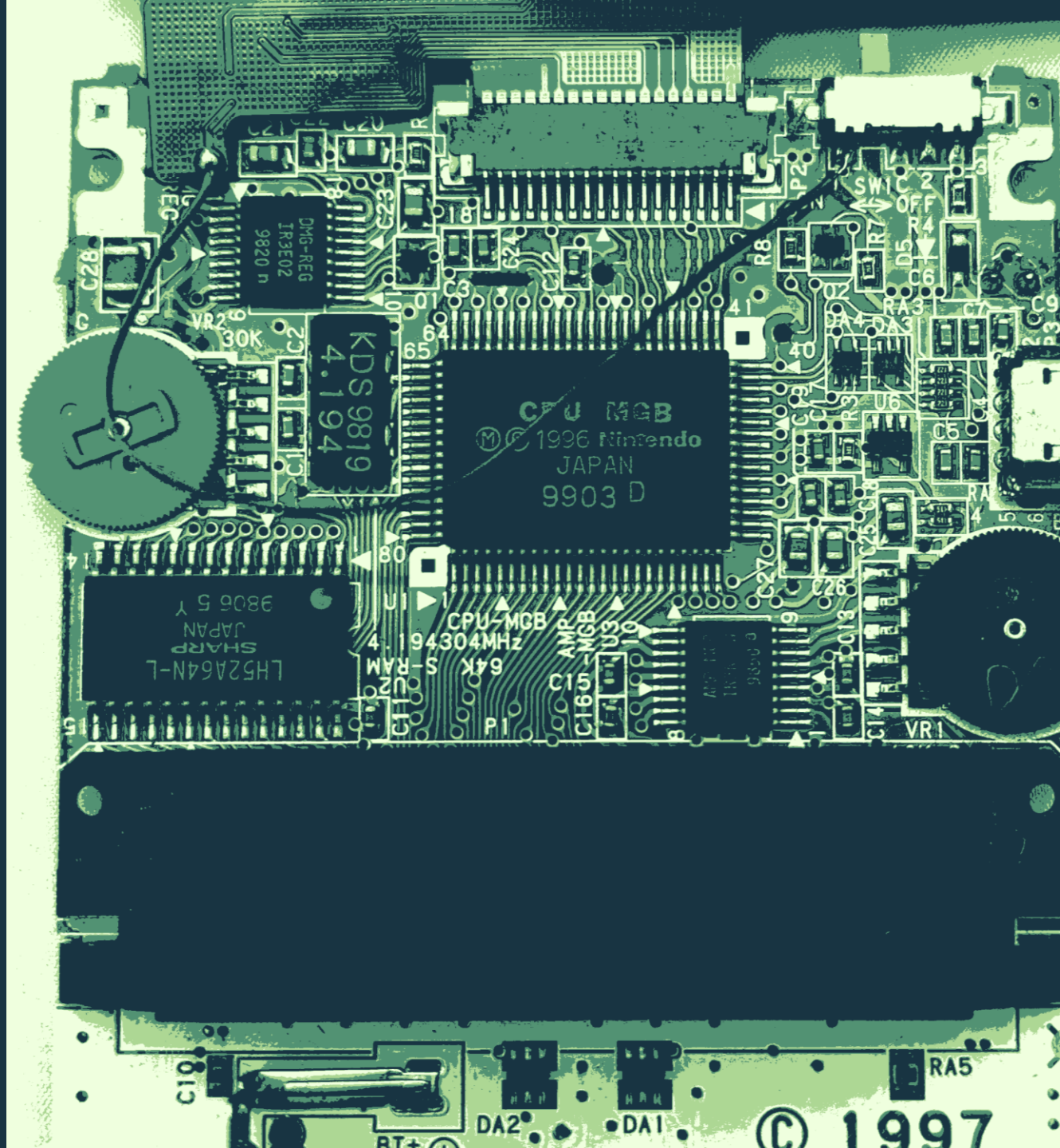


# Assemblage

**DMG** (Dot-Matrix Game)

Internal architecture subject to numerous revisions

- **Mainboard:** DMG-CPU-01 through DMG-CPU-08
- **CPU:** DMG-CPU and DMG-CPU-A through E
- **+ LCD, power, headphone jack boards**



# So then... what is a videogame platform?

My proposition is to treat it as an assemblage of formal and informal technologies, practices, discourses, and imaginaries—the ideas and beliefs that have come to define the platform over time.

These are the Game Boy's afterlives.





LEVEL 1



LEVEL 2



LEVEL 3



LEVEL 4



LEVEL 5



LEVEL 6

■

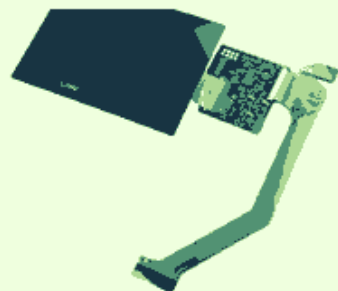
LEVEL I

**Restoration**



## Modern Displays

Show your Game Boy what the Future is all about! >

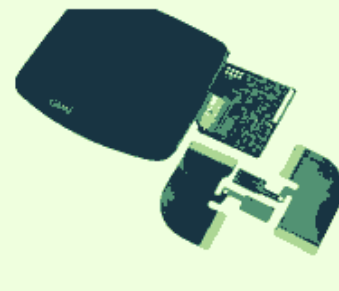


\$62.99 USD

FunnyPlaying 3.0 Inch IPS  
LCD GBA SP Backlight Kit M2  
Funny Playing

5+ in stock

★★★★★ 1 Review

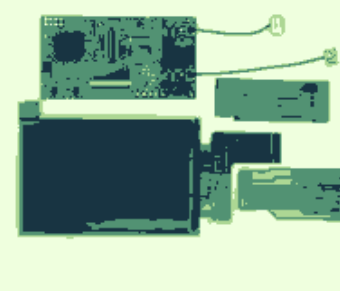


\$62.99 USD

FunnyPlaying 3.0 Inch IPS  
LCD GBA Backlight Kit M2  
Funny Playing

5+ in stock

★★★★★ 1 Review



\$58.99 USD

Game Boy Advance 3.0 inch  
Drop-in LCD Kit  
Hispeedido

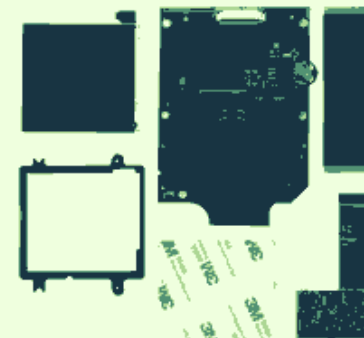
5+ in stock

★★★★★ 1 Review



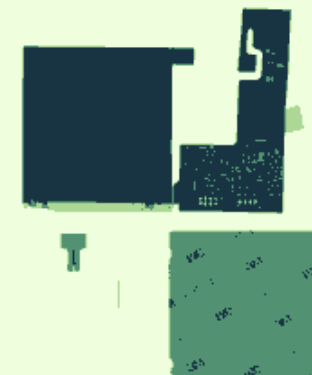
\$69.99 USD

Retro Pixel IPS LCD 2.5D  
Laminated for Game Boy Color



\$65.99 USD

DMG RetroPixel Q5 IPS LCD  
Kit for Game Boy

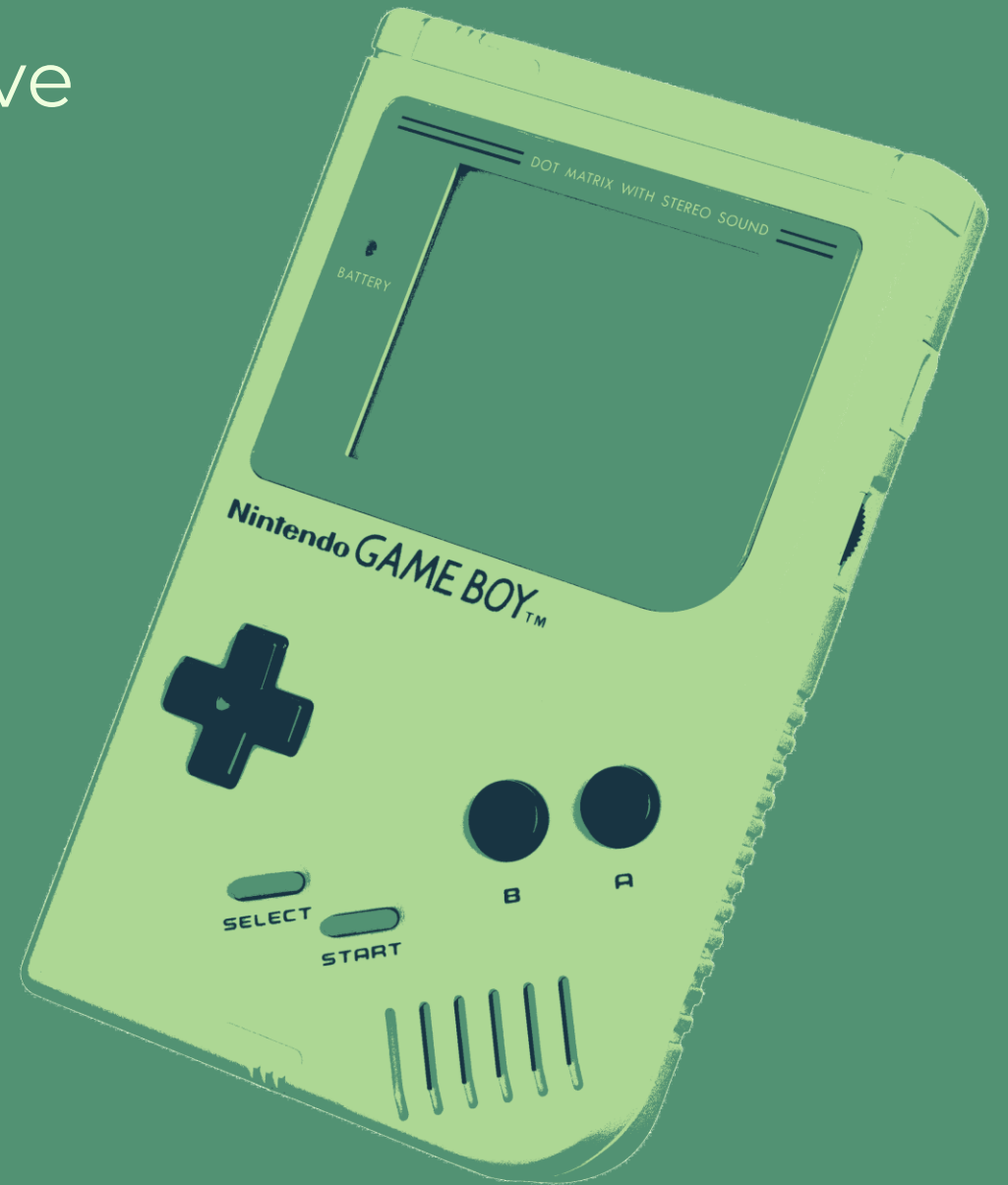


\$59.99 USD

Retro Pixel IPS LCD for Game  
Boy Pocket

“Nintendo shouldn’t be restrictive about how that stuff is handled afterwards. We’re talking about millions of Game Boys, all that plastic and all those PCBs with strange chemicals.”

- Founder of Retro Modding



# Global E-Waste Monitor 2024 Report:

- 62 million tonnes of E-waste in 2022
- Up 82% from 2010
- Enough to fill 1.5 million trucks & encircle the equator
- 1% or rare earth element demand is met by recycling
- Waste rising 5x faster than recycling





“Given the amount of money people spend on those consoles, you should be able to do whatever you want with it.”

There will always be consoles dying,” he said. “So you just need to catch them before they do.”

- Founder of Retro Modding





RESTORATION



LEVEL 2



LEVEL 3



LEVEL 4



LEVEL 5



LEVEL 6

■  
LEVEL 2

**Modification**

Zombie media: the “living dead of media history [and] waste [that signals] the real death of nature through [their] toxic chemicals and heavy metals.”

- Hertz and Parikka, “Zombie Media”



# Questions

- What might it look like to engage with our things in a way that exceeds their intended use as machines or as markers of social capital?
- What might an ethical relationship to hardware look like?
- How do we reconcile the labor involved in mining, extracting, and refining the materials in our electronics with the fact that they're meant to be replaced in 5 to 7 years?



# Mod Guides

What consoles to people modify and why?

What do modding practices say about a platform's affordances and constraints?

What emerges out of modding?



## Solar-Powered Game Boy Pocket

This modding project is an adaptation of the solar-powered Game Boy Pocket mod developed by the **Houston Museum of Natural Science**. We first completed it as part of a Solar Media Collective workshop in 2022 and later repeated it as a class activity for Mess & Methods—a course we co-instructed as part of Concordia University's summer institute.



## Game Boy Pocket FunnyPlaying IPS LCD

Our second Game Boy Pocket modding project uses the IPS LCD from FunnyPlaying. The results were beautiful and, with only two instances of soldering, this mod is extremely simple.



## New-Style SNES RGB Bypass Amplifier

This mod is one of many that enables and amplifies an RGB signal from within a SNES. It's remarkably cheap, streamlined, and easy-to-complete as far as mods go, but requires research on video signal types to fully understand and appreciate the output.



## Woozle's Game Boy Advance Consolizer

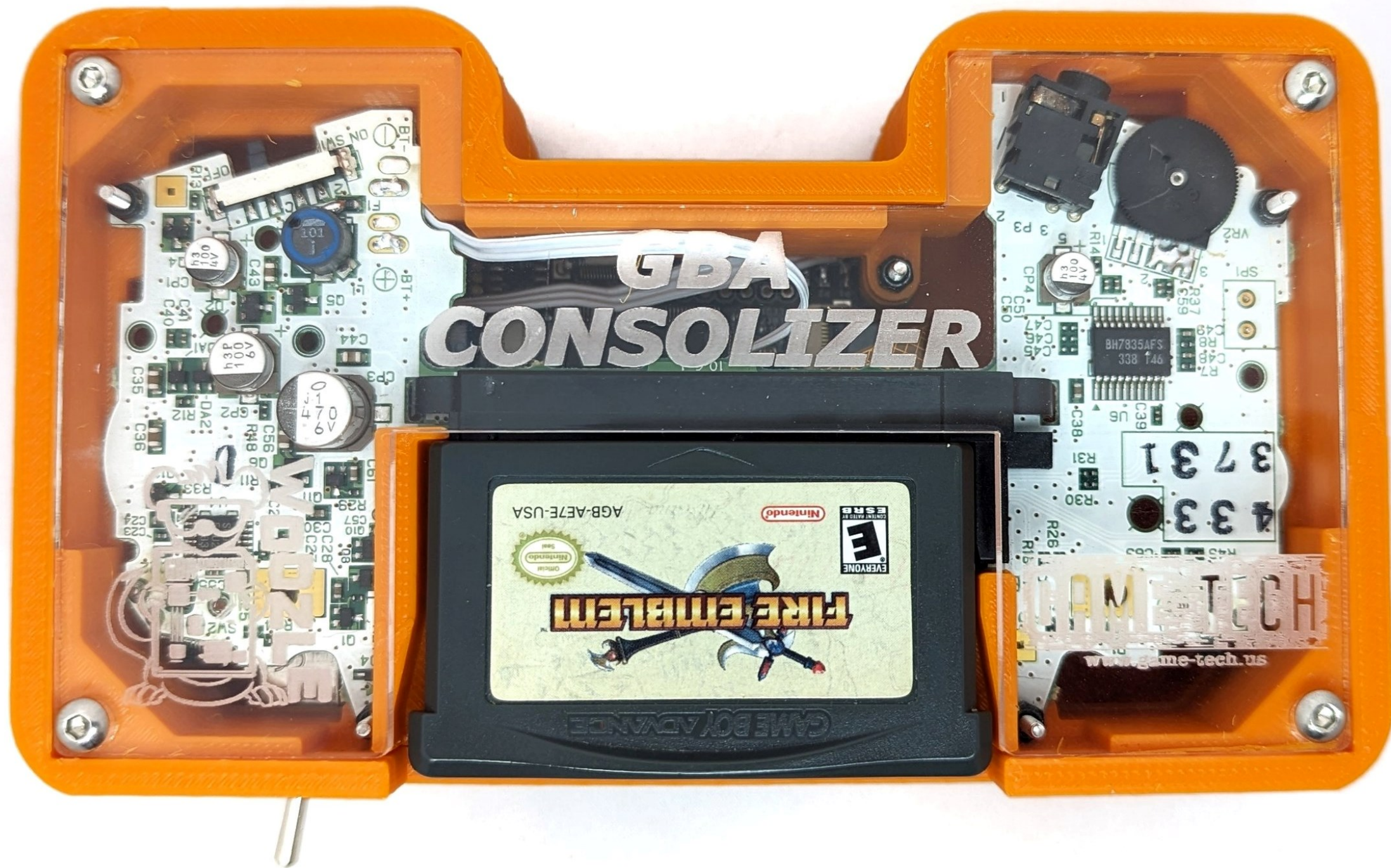
The GBAConsolizer allows the GBA to connect to a television via HDMI and accept input from a SNES controller. This is the most challenging mod we completed and, while we're not sure the final product is the best way to play GBA games on a screen, it was an excellent learning experience.



## Game Boy Pocket Backlit LCD

This modding project involves adding MGB TFT Backlit Kit to a Game Boy Pocket. With only a single instance of soldering, it's very beginner friendly.



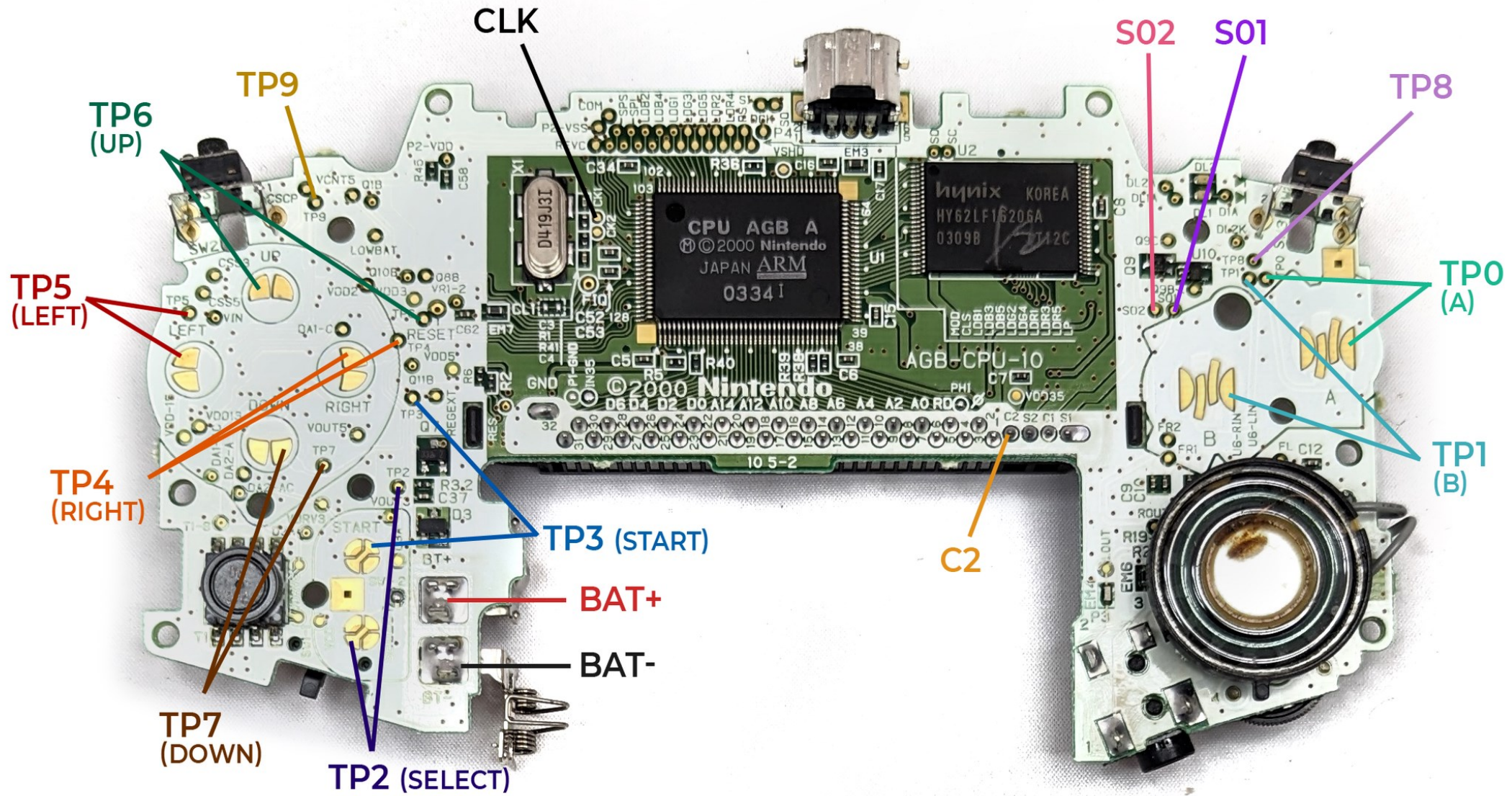


GBA  
CONSOLIZER

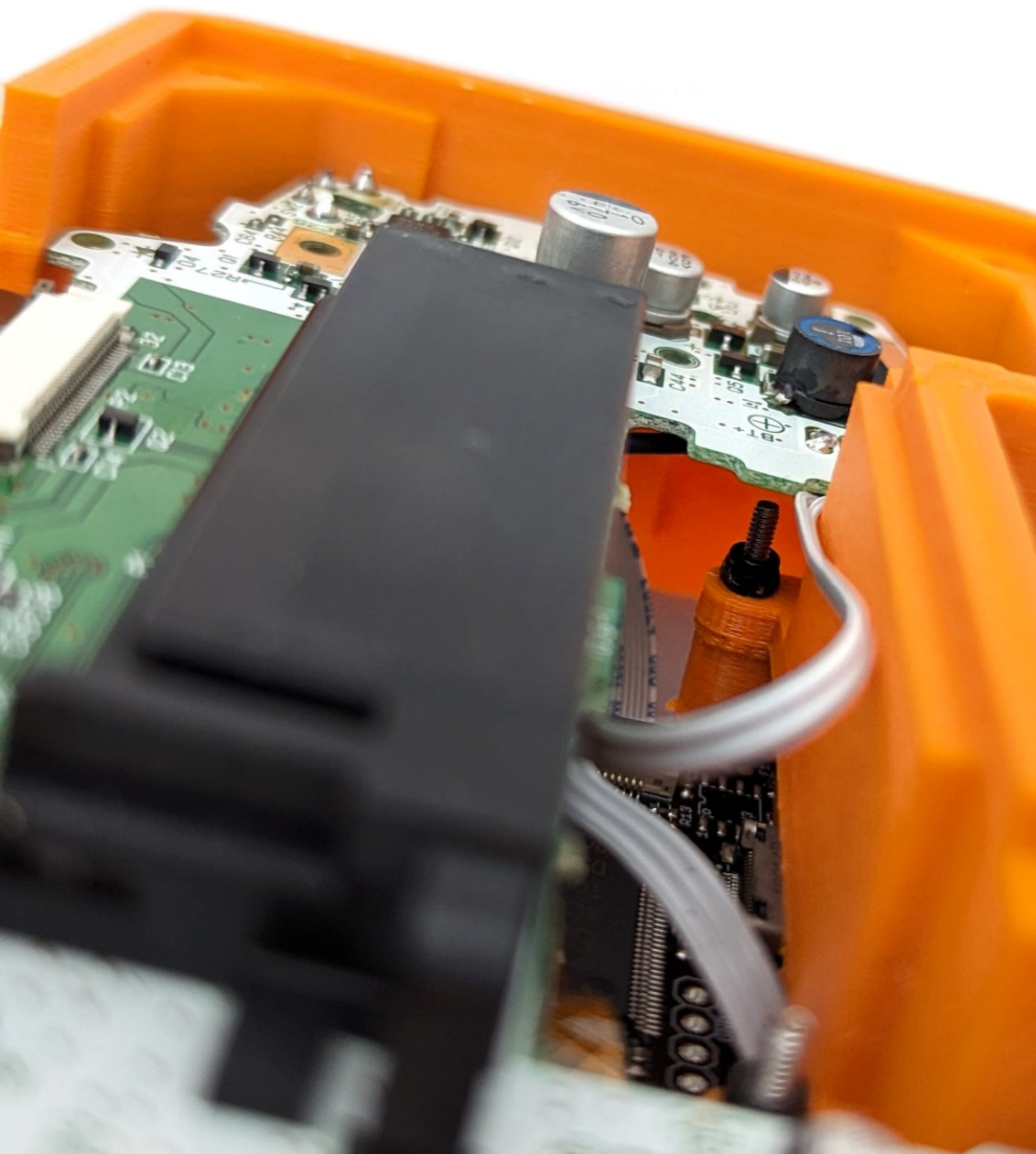


GAME-TECH  
www.game-tech.us









No emulation. All original hardware.  
All original feels.

GBHD Advance offers users a completely custom and unique way to experience their favorite classic games. The Gameboy [sic] Advance signals from original hardware are fed into our custom engineered PCB and processed for digital HDMI out with SNES controller input.



RESTORATION



MODIFICATION



LEVEL 3



LEVEL 4



LEVEL 5



LEVEL 6

LEVEL 3

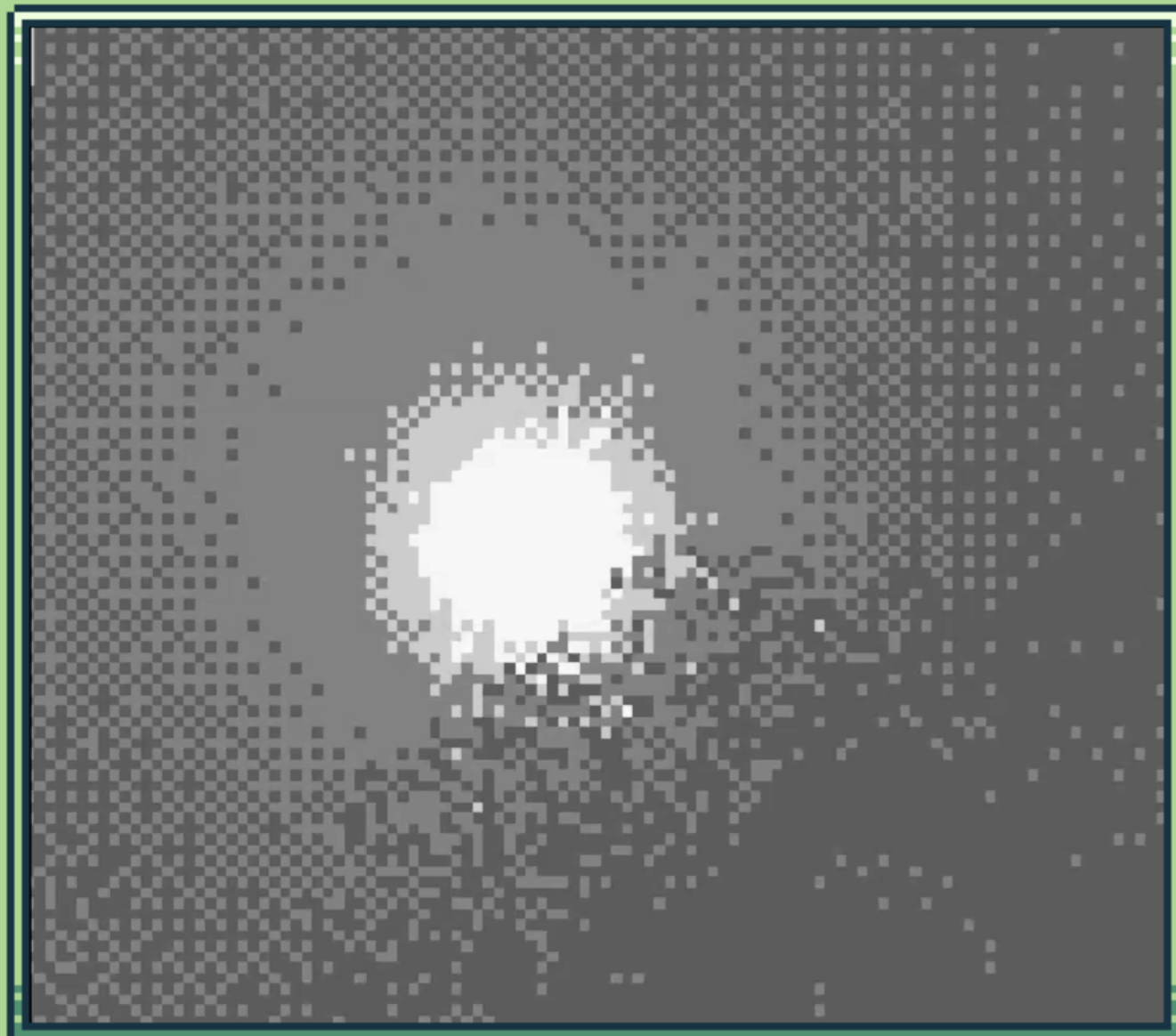
**Reimagination**

# SOLAR GAMEBOY CAM

The Solar Media Collective is watching a Total Solar Eclipse in Montreal. Learn more at:

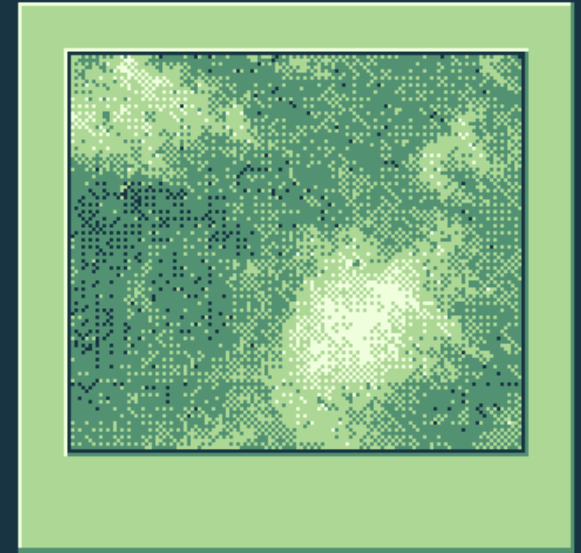
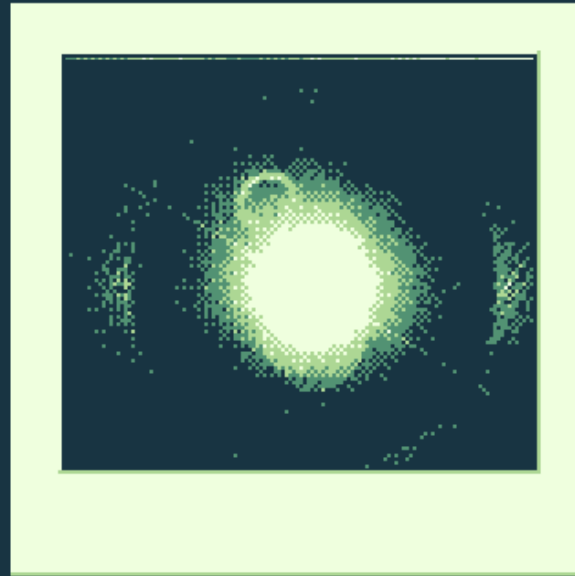
**SOLAR-MEDIA.NET**

**POWERED BY:**

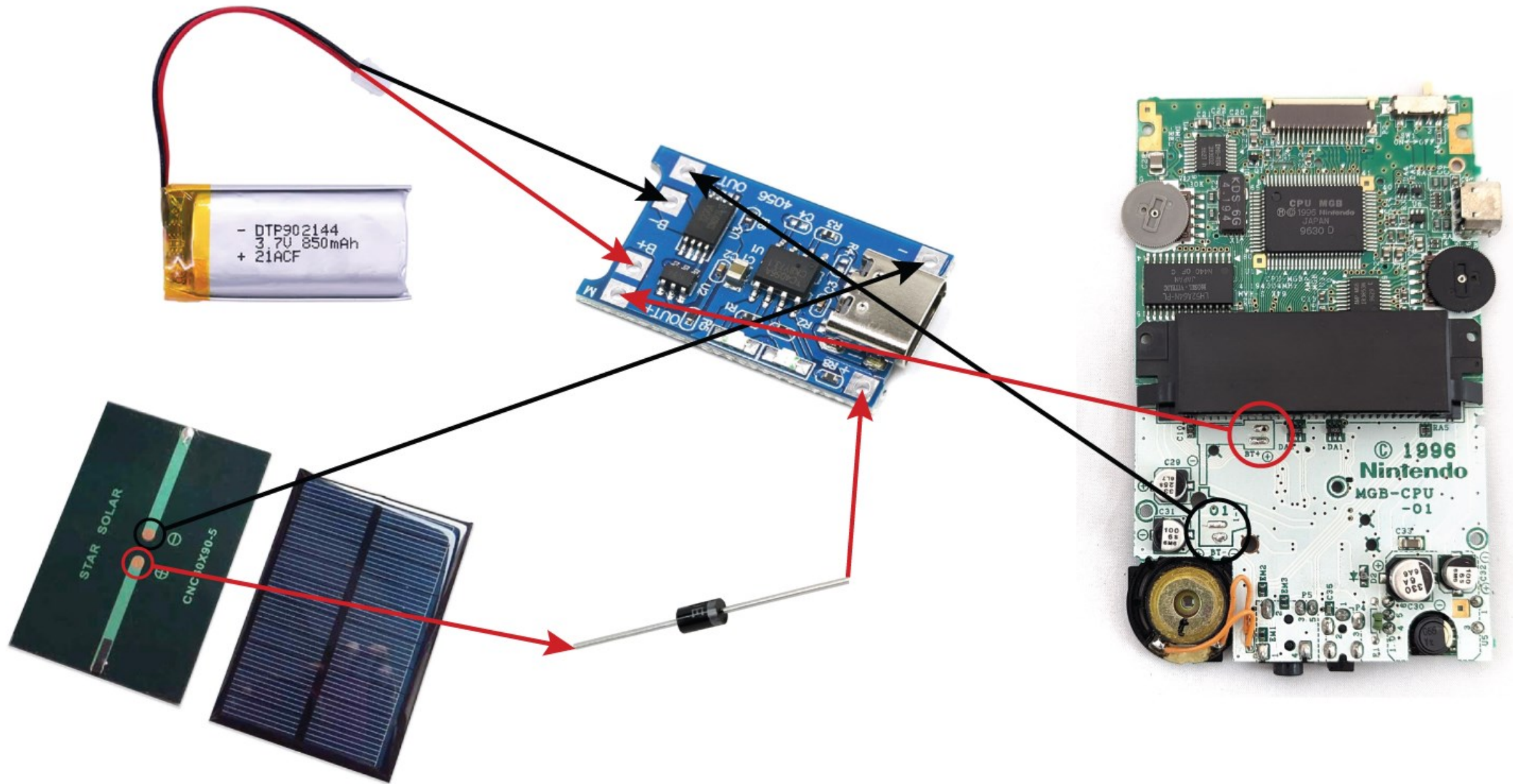


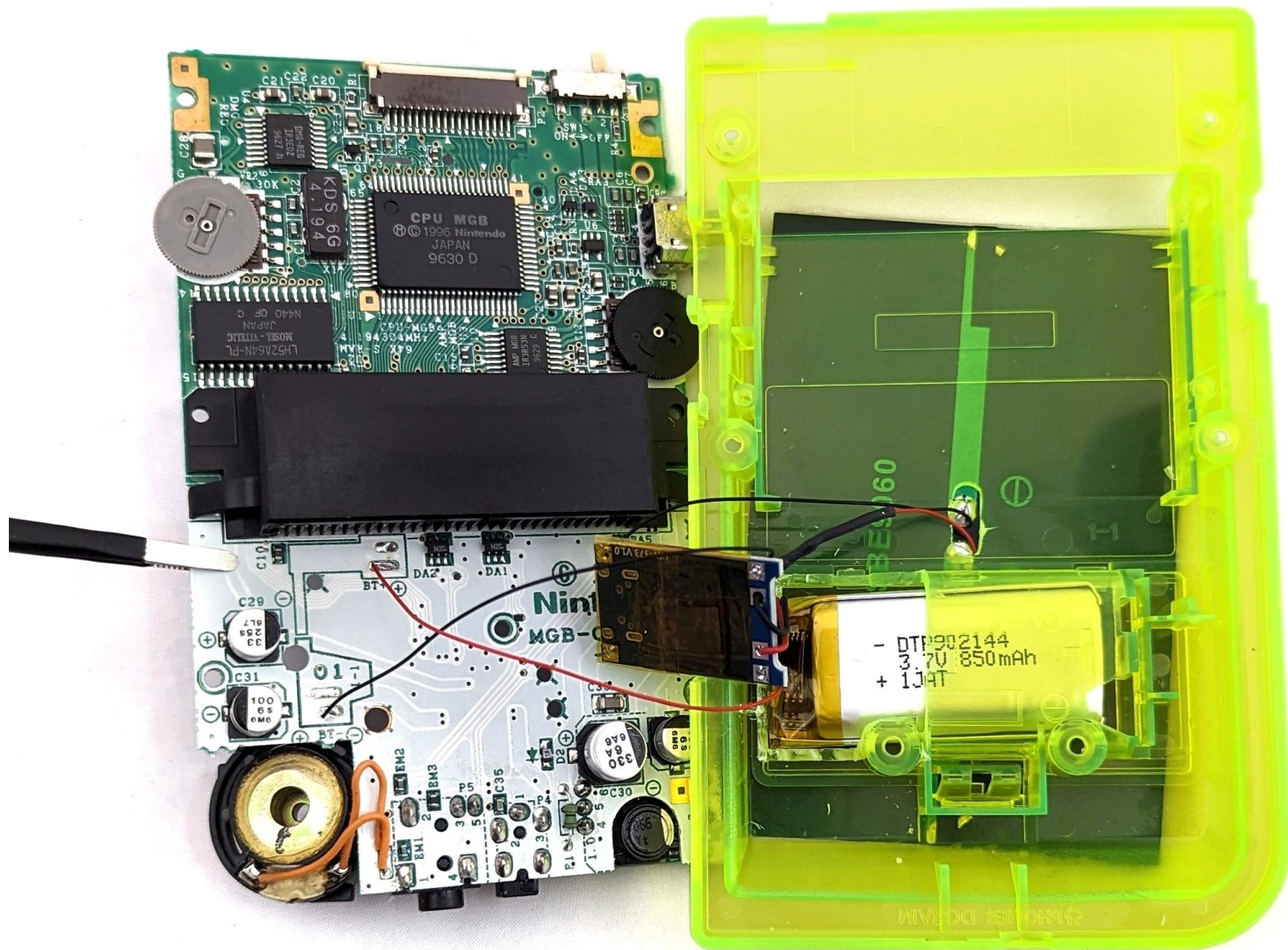
# Solar Eclipse

Fidelity wasn't our goal.  
We wanted to reimagine  
our relationship to our  
hardware.











# Why?

- Foster expertise (especially among beginners and non-modders)
- Reminds us of the cost of resources
- Connects the ability to play with energy access.



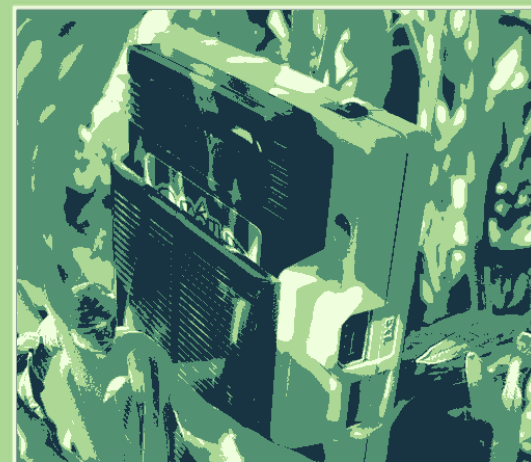




RESTORATION



MODIFICATION



REIMAGINATION



LEVEL 4



LEVEL 5



LEVEL 6

■  
LEVEL 4

**Defamiliarization**



## Ideal Conditions:

Sunny, lots of button clicks  
= less than 1 second down/10s

## Less than ideal Conditions:

Cloudy, text heavy  
= *lots* of downtime

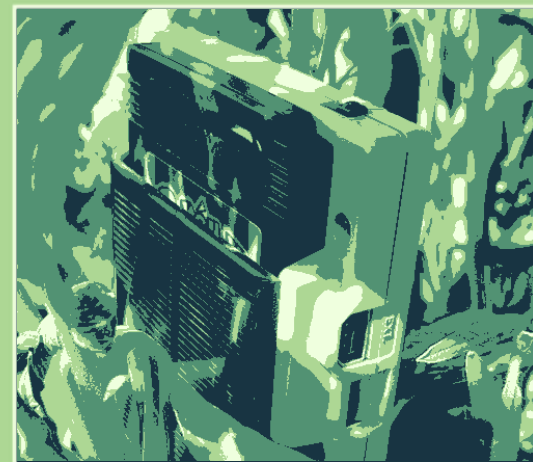




RESTORATION



MODIFICATION



REIMAGINATION



DEFAMILIARIZATION



LEVEL 5



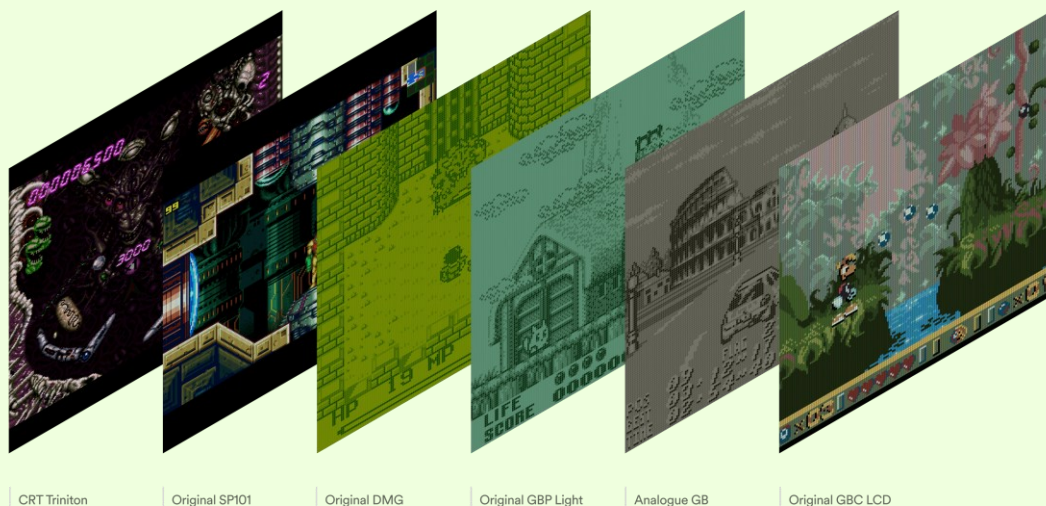
LEVEL 6

■  
LEVEL 5

**Preservation**

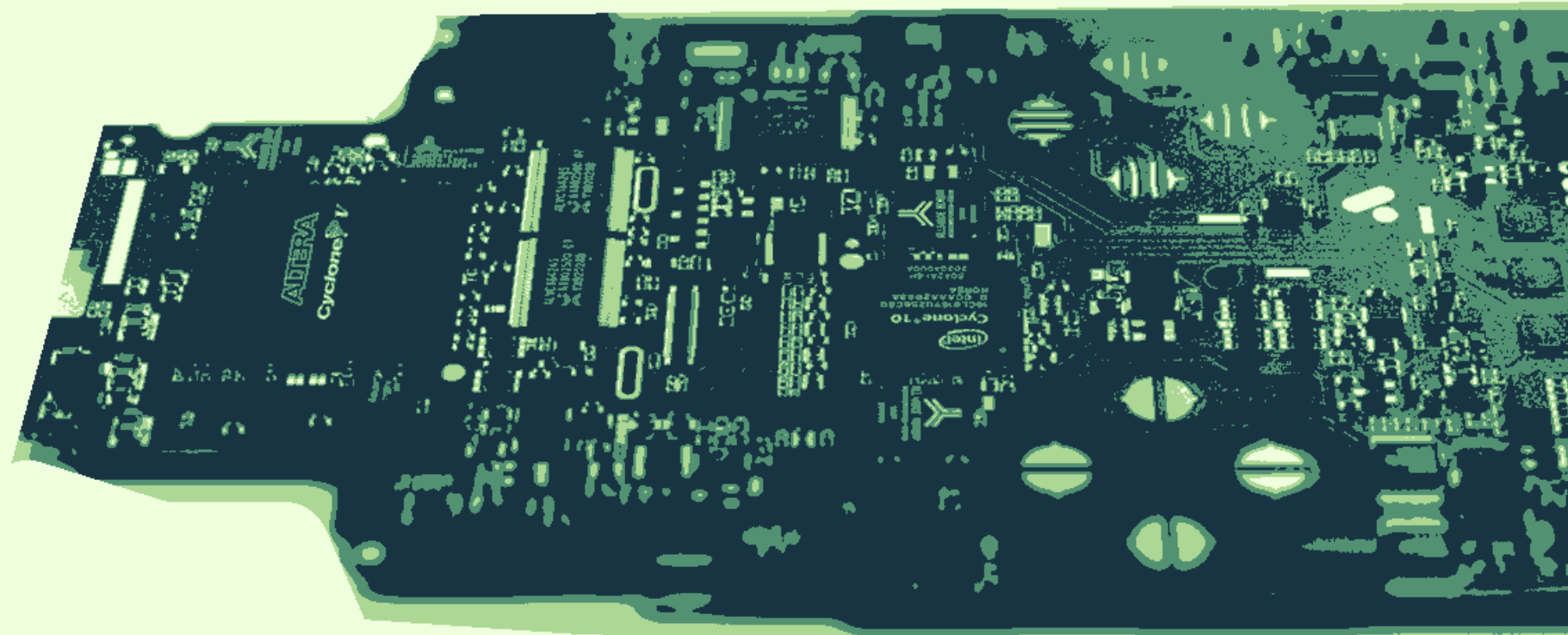
# An astonishingly accurate re-creation of original hardware.

## Completely engineered in two FPGAs. No emulation.



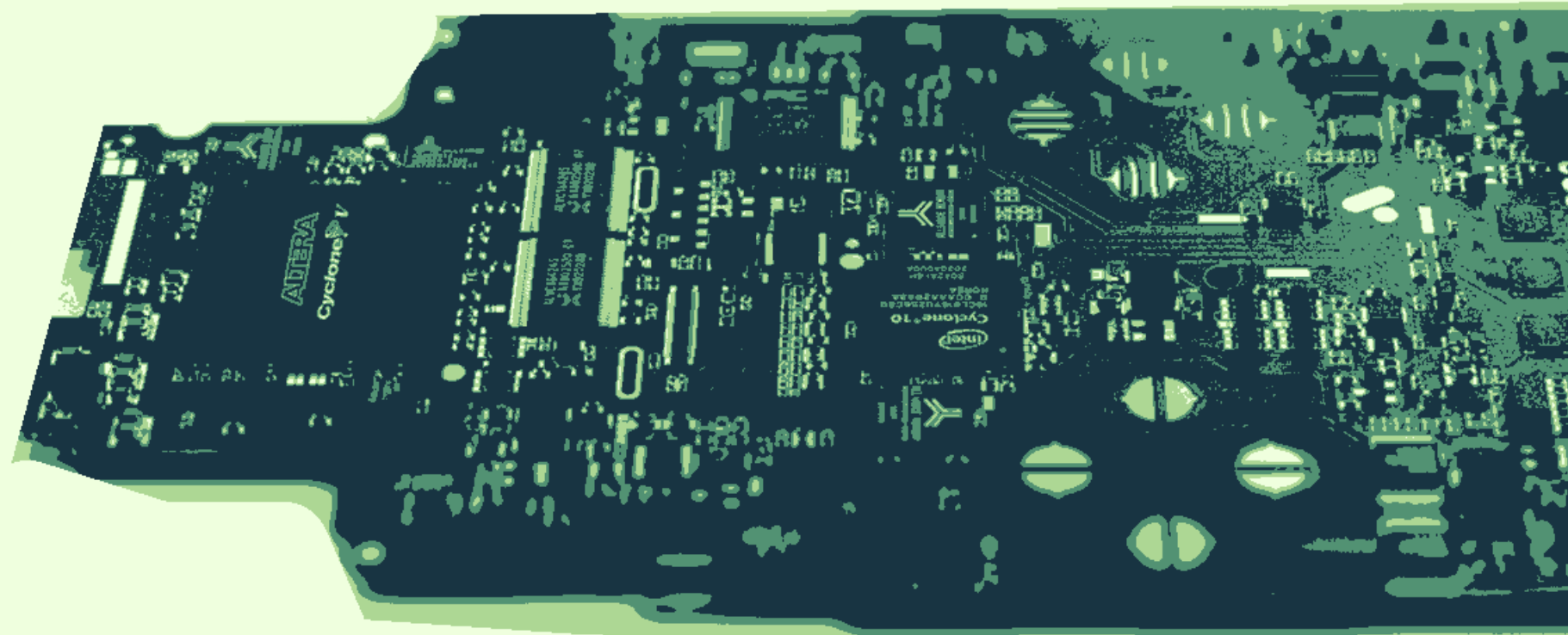


The FPGA mimics the Game Boy's architecture at the transistor level, allowing the Pocket to sidestep the quagmire of software emulation....



The FPGA mimics the Game Boy's architecture at the transistor level, allowing the Pocket to sidestep the quagmire of software emulation....

... it's hardware emulation.



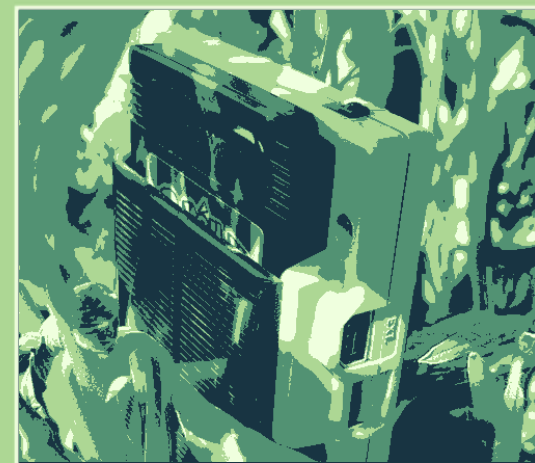




RESTORATION



MODIFICATION



REIMAGINATION



DEFAMILIARIZATION



PRESERVATION



LEVEL 6



■  
LEVEL 6

**Intervention**

# TPMs

Technical protection measures or digital locks include security screws, seals, passwords—things that prevent you from getting inside your electronics.

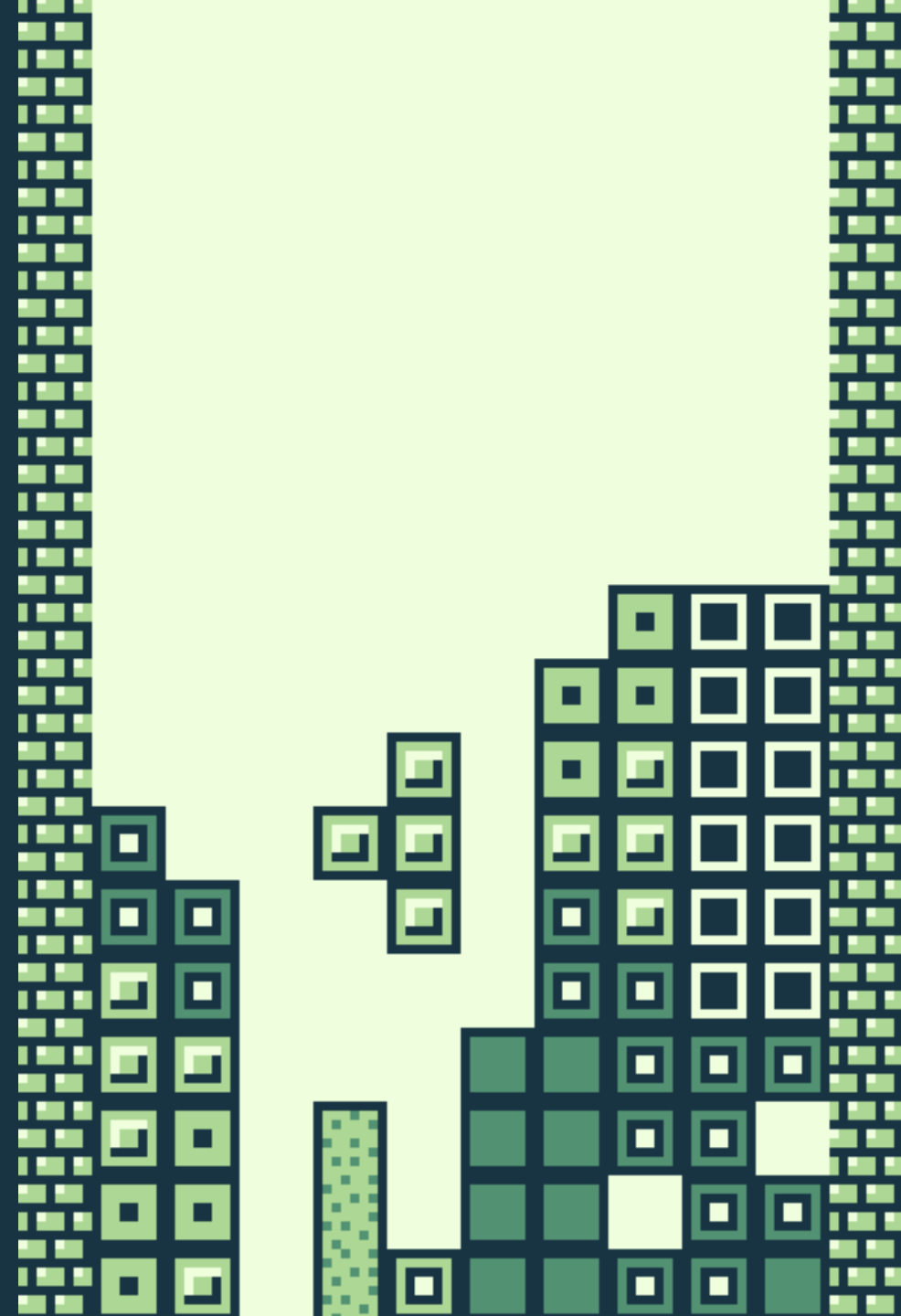
Researchers working with technology have been able to circumvent TPMs under fair dealing.



# Breaking Open the Black Box

A **black Box** is a system we can view and engage with in terms of inputs and outputs without understanding what's going on inside

Black boxes are **engineered** to ensure we use systems as intended and don't know how to repair them (i.e. buy a new one)







# 2024 Canadian Copyright Act

Bill **C-244** and **C-294** allow TPMs to be circumvented for the purposes of

“maintaining or repairing a product including any related diagnosing”

“to make the program or device in which it’s embedded interoperable with any other computer, device, or component.”

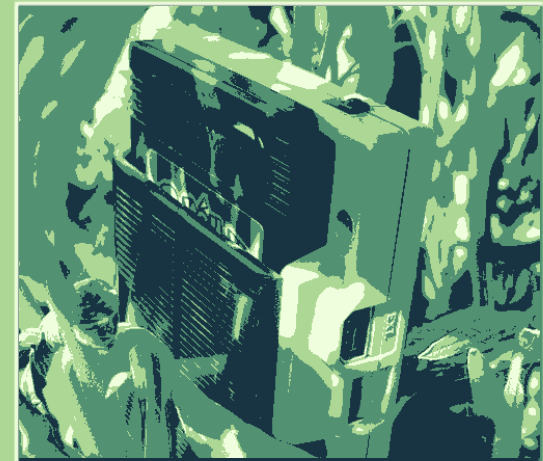
This is a tremendous win for the **right to repair** movement.



RESTORATION



MODIFICATION



REIMAGINATION



DEFAMILIARIZATION



PRESERVATION



INTERVENTION

LEVEL 7

**Waste**

# Changing Landscape of Modding

- Moving away from “original” hardware objects
- Skyrocketing prices of hardware because of inoperability and ease of modification (a paradox?!)

# Changing Landscape of Modding

- Moving away from “original” hardware objects
- Skyrocketing prices of hardware because of inoperability and ease of modification (a paradox?!)
- Accelerated by the COVID-19 crisis

“Nostalgia appears to be a longing for a place, but it is actually a yearning for a different time—the time of our childhood, the slower rhythms of our dreams.”

- Boym, *The Future of Nostalgia*

From old  
hardware to  
new software?



# How Is the Shell Made?

- Acrylonitrile butadiene styrene or ABS
- Injection molding to create high volumes of identical parts
- Color options!



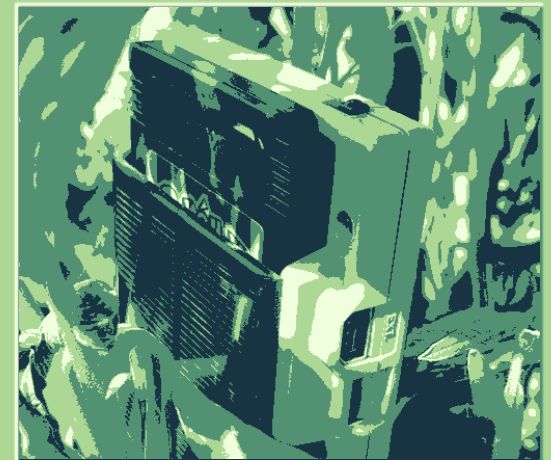




WASTE?



WASTE?



WASTE?



WASTE?



WASTE?



WASTE?

■

**Where do we go  
from here?**

The background is a dark blue night sky filled with pixel art stars of various sizes and colors (white, yellow, orange, red). A constellation of white stars is connected by thin white lines, forming a cross-like shape. In the upper left, a yellow star is circled by a yellow ring, with a yellow crosshair centered on it. Stylized, pixelated clouds in shades of blue and white are visible along the bottom edge.

# Thank you!

**Alex Custodio**

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