

# NINTENDO<sup>®</sup>64

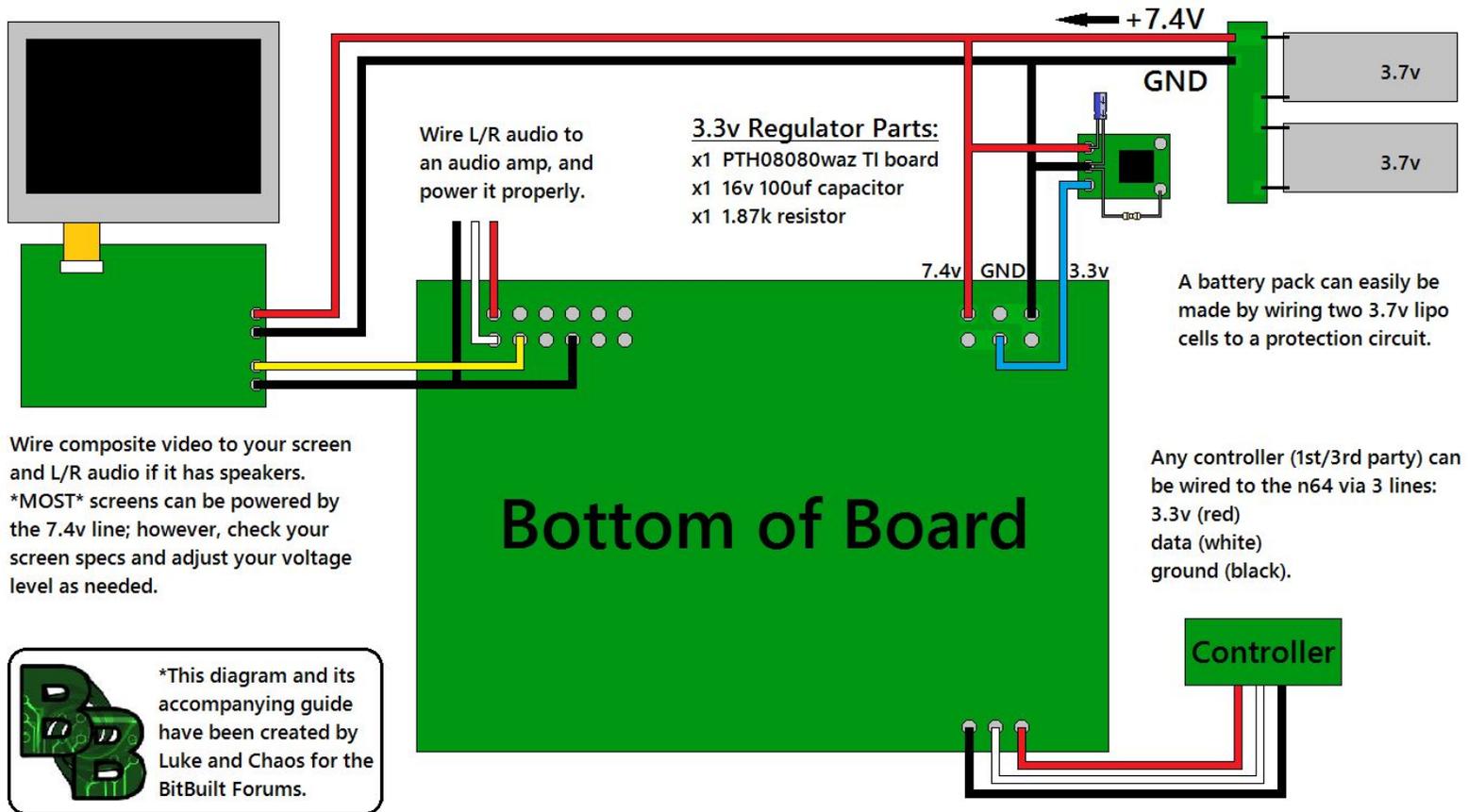


## Overview

Here's the general concept of what we want to accomplish:

1. Remove the N64 motherboard from its shell.
2. Trim down the motherboard by removing some of its components.
3. Show you how to wire power to the board.
4. Show you how to wire audio/video from the board.

# N64 Portable Quick-Reference Guide



\*\*\* The above diagram is meant as a quick-reference guide, but PLEASE do not just wire the whole thing up, and power it on and hope for the best. Follow the instructions listed below, and only use this as reference. The key is to do one thing at a time and test that you still have a working project in between each step. If you do everything all at once and try to power it on and it doesn't work, then you will have no idea what is causing the problem.

## What This Guide Is and What This Guide Is Not:

This guide is to help you with **the specifics of wiring an n64 portable**. This guide is **not** here to help with case fabrication, controller trimming/wiring, or other case-by-case specifics. There are other guides on BitBuilt for that purpose. There will be a reference section for all of those things. We will also not be showing you any general modding skills such as how to solder or use a multimeter. We assume that you have some knowledge in these areas; if not, we suggest you go to YouTube and watch some guides.

## Required Hardware:

1. Soldering Iron
2. Solder
3. Wire Cutters
4. Multimeter - A must have for troubleshooting and checking for correct voltages.



So you've recently stumbled onto the Portablizing scene, and want to try your hand at the n64. Excellent! You've come to the right place. Let us begin.

## Step 1: Removing the Motherboard.

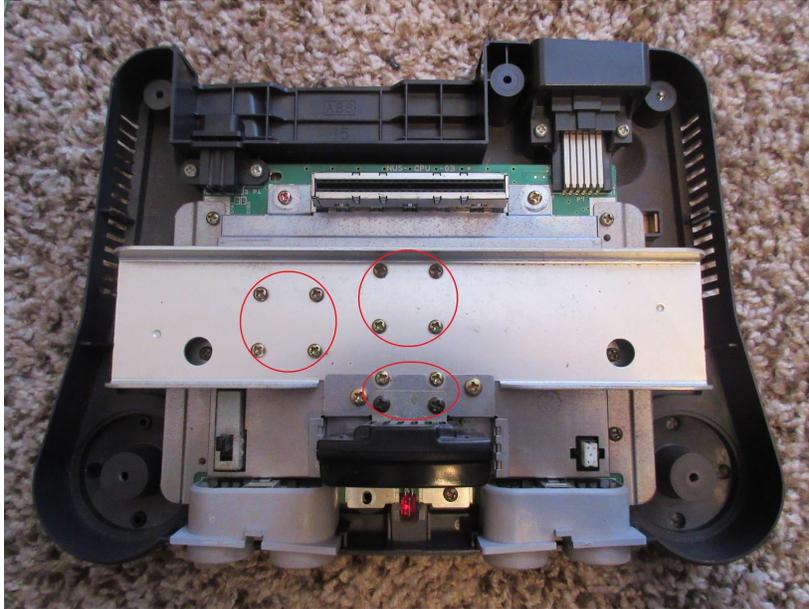


Opening up the N64 can be difficult without the right driver. Nintendo's screws are sort of hex-star shaped. It's as if they did not want you to crack it open and mod the insides. Strange.

### Techniques

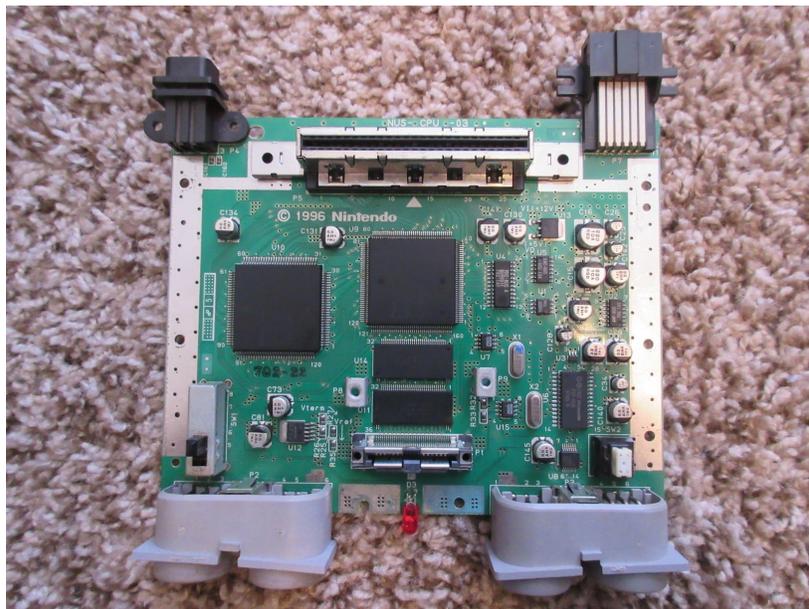
There are many techniques for getting into the N64, including:

1. Buying a Nintendo Gamebit screwdriver. It's cheap enough, and ask anyone, chances are this won't be the first n64 you open.
2. Needlenose pliers.
3. Melting a pen and shoving it onto the screw head so it molds to the shape of the screw.
4. Hacking the case open in any way you see fit.



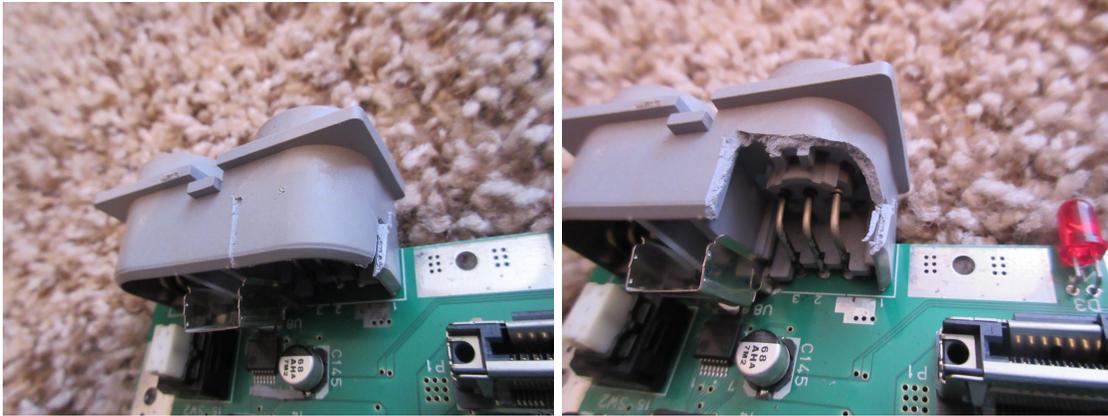
Once you're inside, you can start removing every screw you see. The ones circled in red are optional, as they are only keeping the heat dissipation blocks in place. Leaving them on will cause these blocks to pop off along with the rest of the metal. The metal you are removing is the heat sink. **YOU WILL** need to replace it with your own heat sink(s), placed over the 3 chips the original one was protecting.

**NOTE: From this point on, make sure you don't accidentally put in a game or the jumper/expansion pak backwards, doing so, will fry your n64.**



Step 1 is complete! This is what you should be seeing. As a sanity check, you can plug power, a/v, the jumper pak, and your favorite game in, and make sure it still works.

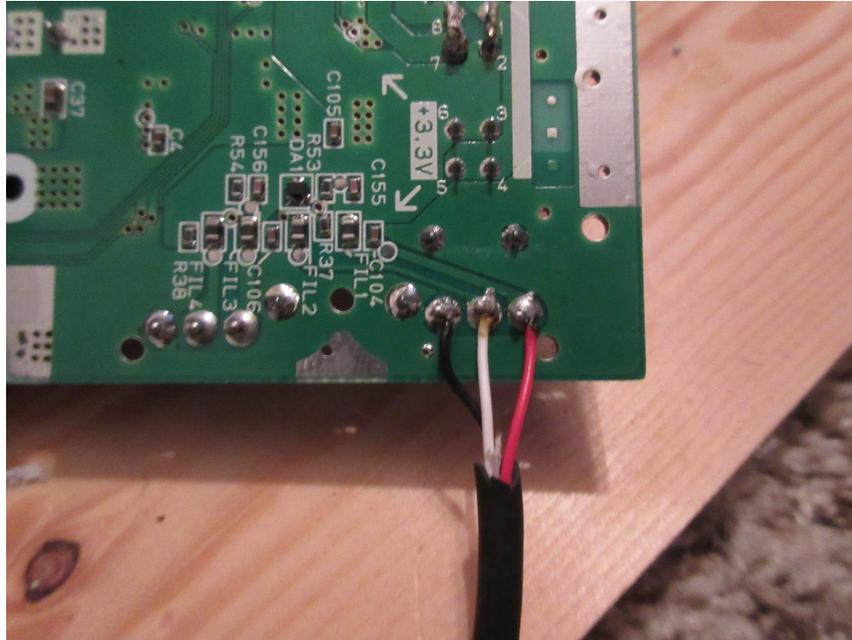
**Step 2: Controller ports, reset button, power switch, power LED, and jumper pak.**



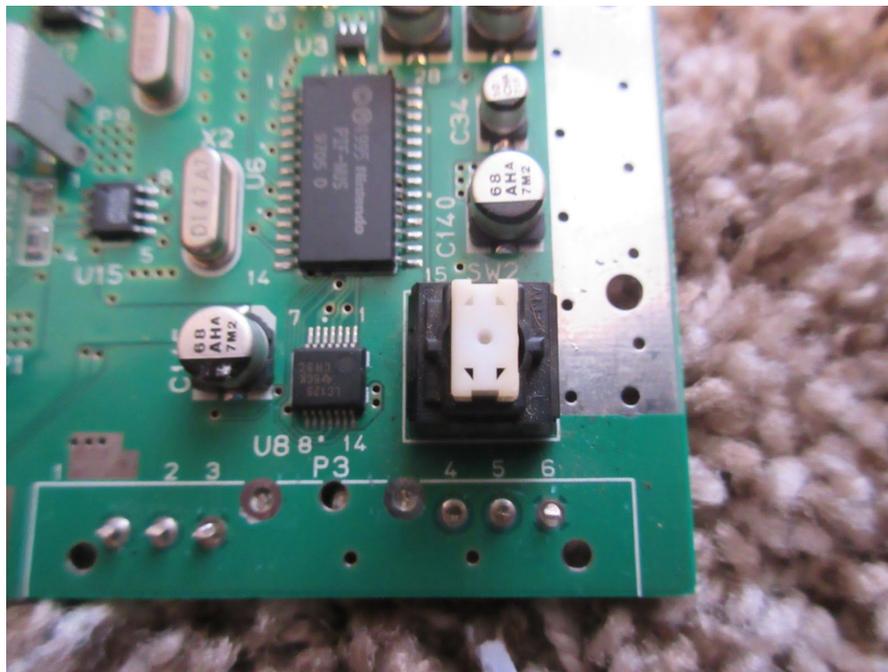
Removing the controller ports is easy enough. Using a dremel or wire cutters, you can hack away the plastic as shown and trim the 3 prongs.



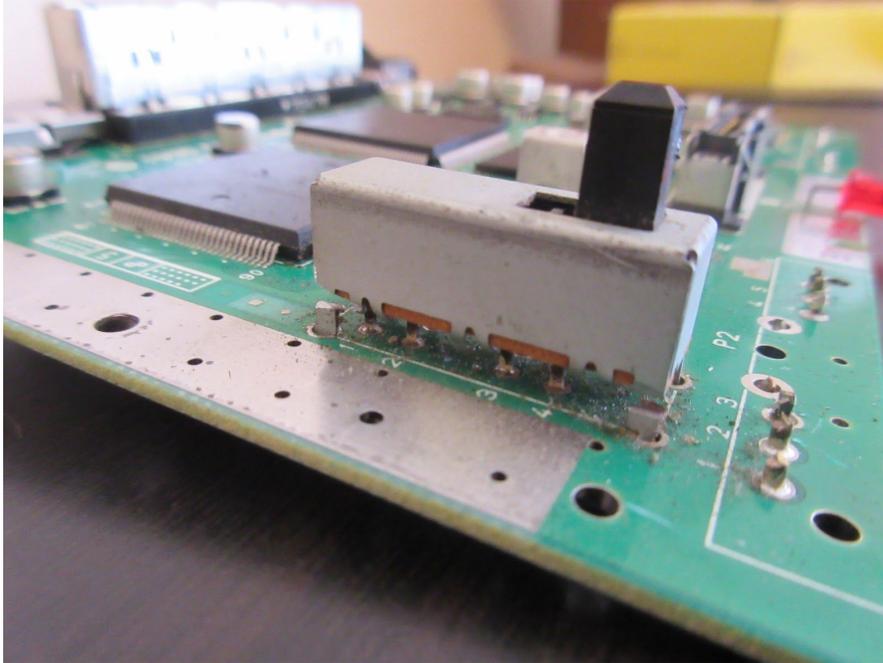
After that, snip off the remainder of the prongs, and bend that metal thing in the middle back and forth until it snaps off.



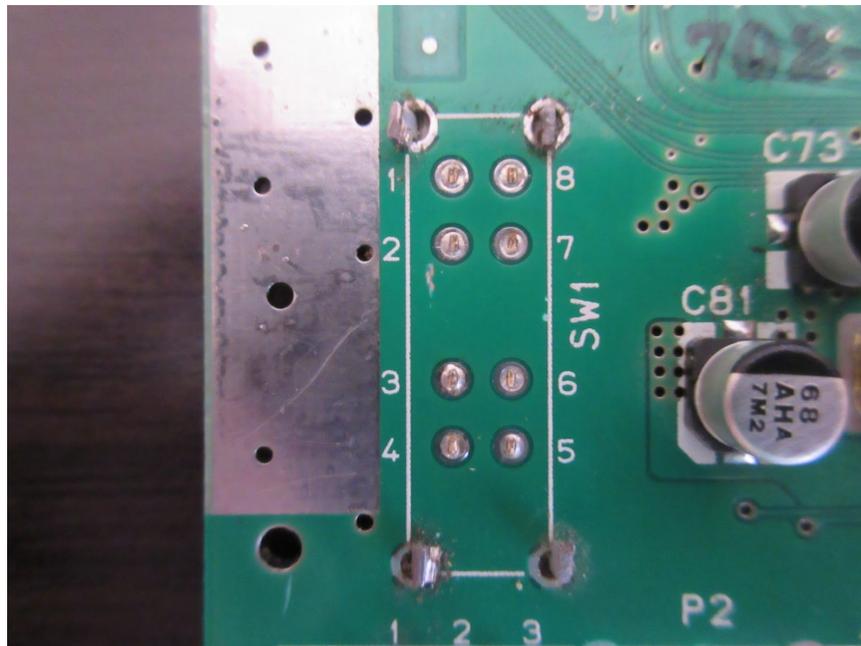
N64 controllers are simple - only 3 wires. Red is 3.3v, White is data, and Black is ground.



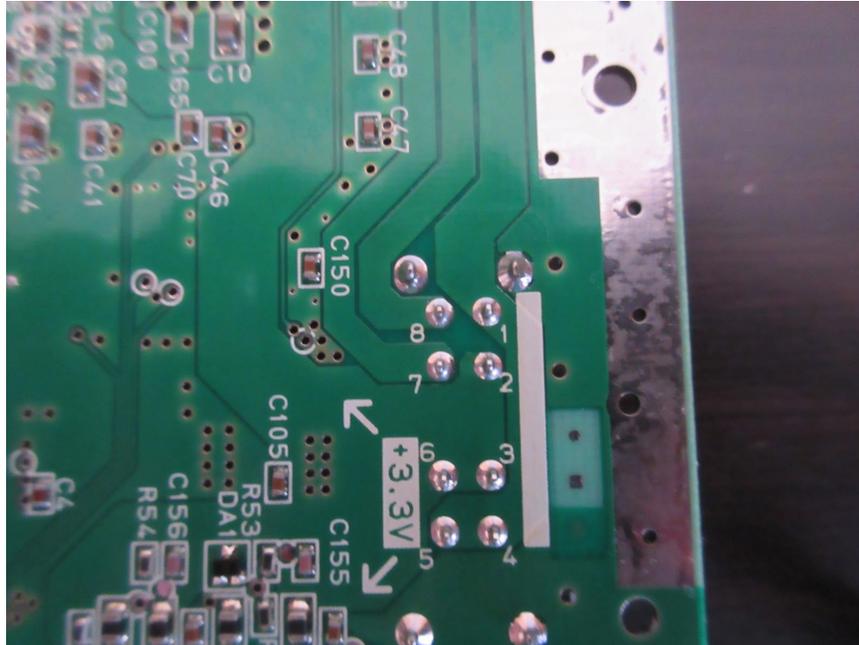
If you have the skills, you can desolder the reset button. Alternatively, use pliers to just break it off, which isn't going to hurt anything unless you go crazy.



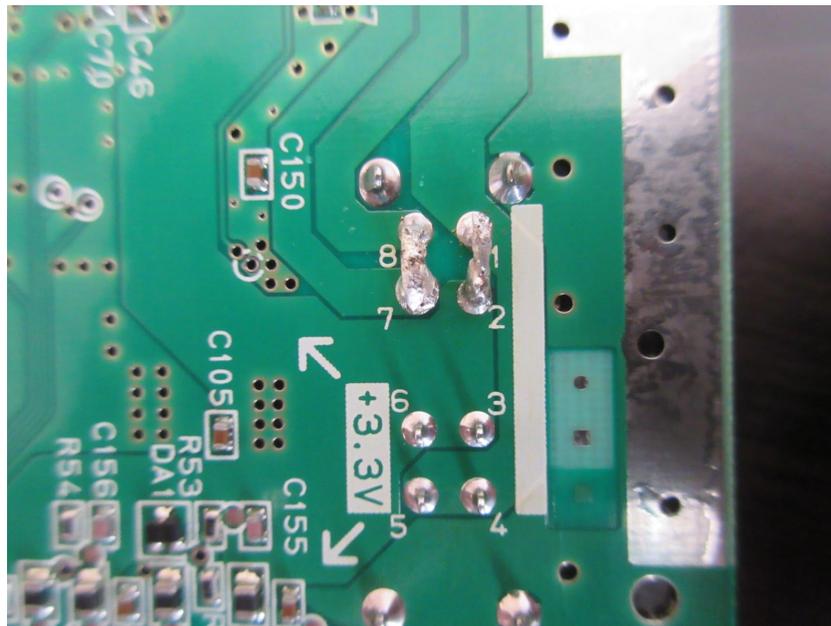
Next is removing the power switch. Best thing to do is to snip the corners with wire cutters, or a dremel if you have it. Try to cut the actual switch connections if you can, although they are further underneath. From this point, you should be able to break it off.



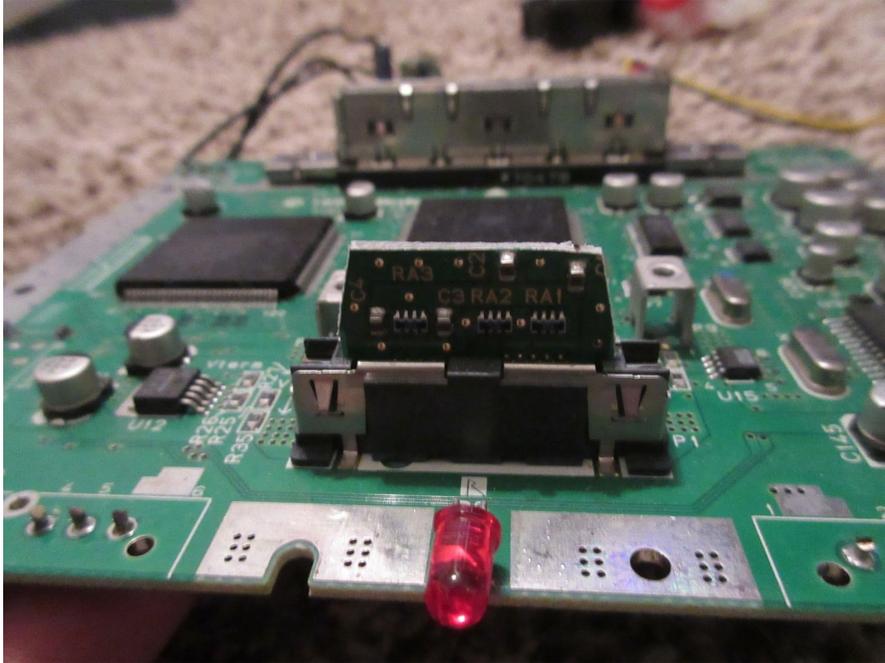
The n64 power switch is quadruple pole, single throw. When on, 1 is connected to 2, 3 to 4, 5 to 6, and 7 to 8.



However, looking on the bottom side of the board reveals that the 3 - 4 and 5 - 6 connections are redundant, because these connections are already being accomplished by 1 - 2. So the only pins that need to be bridged are 1 - 2 and 7 - 8.



Cut a tiny wire, or just bridge it with some solder.



For this part you can use either a jumper pak or an expansion pak. Both of them ought to be removed from its casing, and the jumper pak can be trimmed. Using an expansion pak in your portable has some pros and cons.

**Pros:**

Allows you to play a few more games (Like Majora's Mask, Perfect Dark)  
Some games have better graphics

**Cons:**

Decreased battery life(30 minutes or so)  
You must put heatsinks on the expansion pak or it will fry.

The LED can be relocated, swapped with a different color LED, removed entirely, or left right where it is. Many people will just remove it, and those that MUST have a power led will usually wire their own to the 3.3v regulator.

**NOTE:** The LED is not a good indication of a working board - your board can be long gone before the LED stops working.

\*After each step, plug everything back in to make sure it still works!

**Step 3: Power**

**Part 1 - Powering the 12v line**

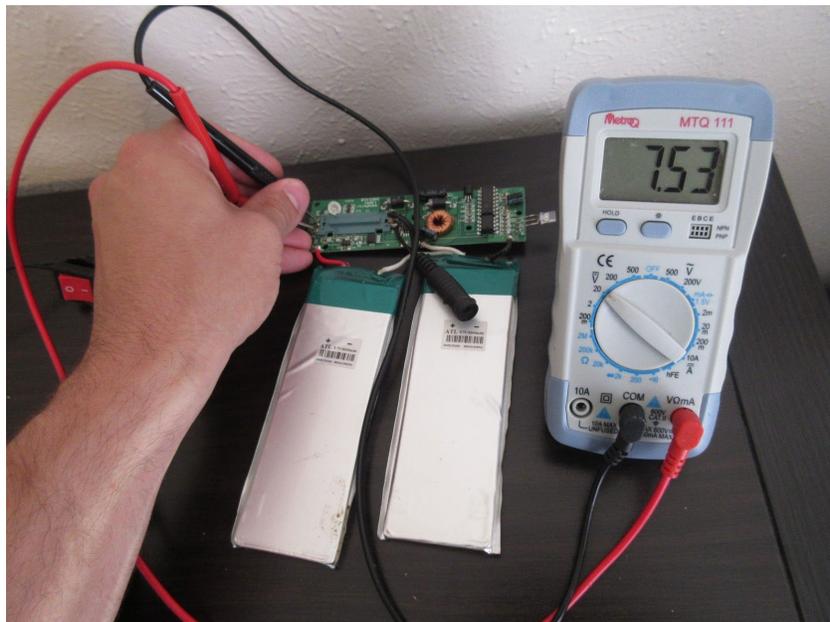
The magical thing that makes portablizing possible is that, although the n64 is run off wall power, it has only two power lines: 12vdc and 3.3vdc, which is provided to it by the power brick. This can be

replicated with a 7.4v battery (powers the 12v line just fine), and a regulator that can step this voltage down to 3.3v for the 3.3v line.



Generally, people use two 3.7v cells wired to a protection circuit to prevent overcharging and over discharging. In the picture above, the two cells and pcb are clearly seen as well as a power switch on the +7.4v line.

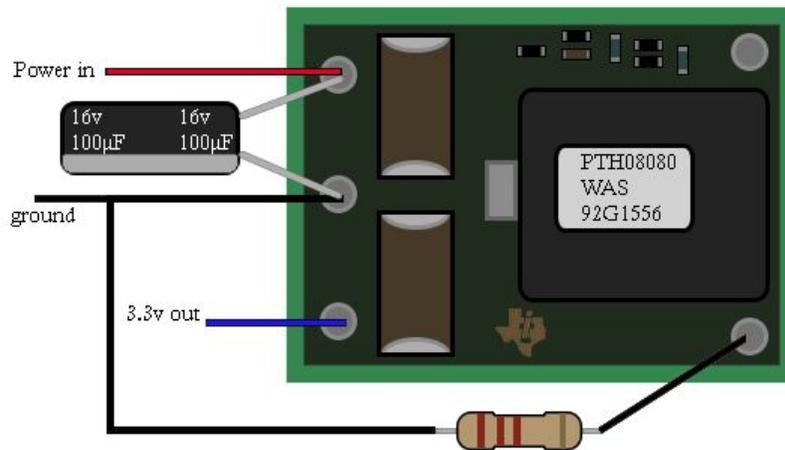
Batteries are a whole topic of their own. More information will be given in the reference section.



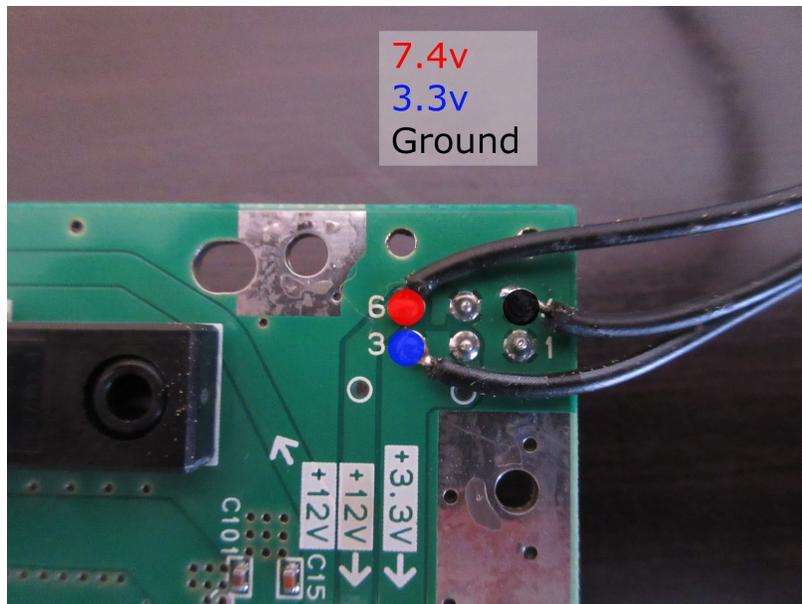
**If at this point you do not have a multimeter, do not go any further until you have obtained one. It is foolish to start connecting voltage to things unless you can be sure they are correct.**

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## Part 2 - Powering the 3.3v Line



For our 3.3v regulator, we will be making our own, from a PTH08080 (Texas instruments), a 100uF 16v or higher capacitor, and a 1.87k resistor. Wire it up as shown in the above diagram, made by Noah. With your multimeter, verify your 3.3v and ~7.4v before continuing.



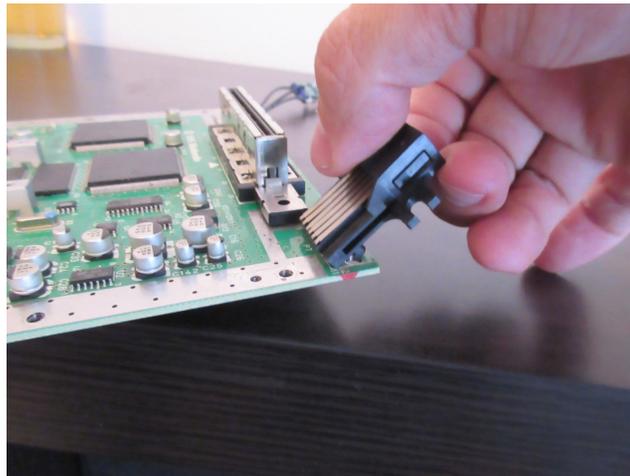
Once you have verified your voltages, snap off the power connector, and wire 7.4v, 3.3v, and ground to your board.

Step 3 is complete! As always, verify that you still have a working board.

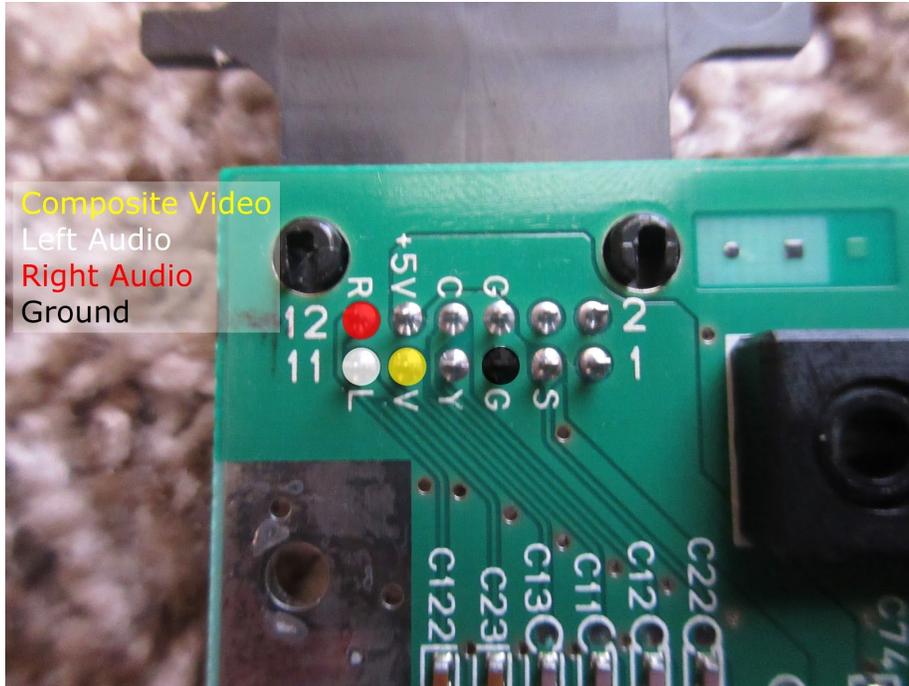


If you have made it this far, congratulations! You are successfully powering your n64 by batteries!

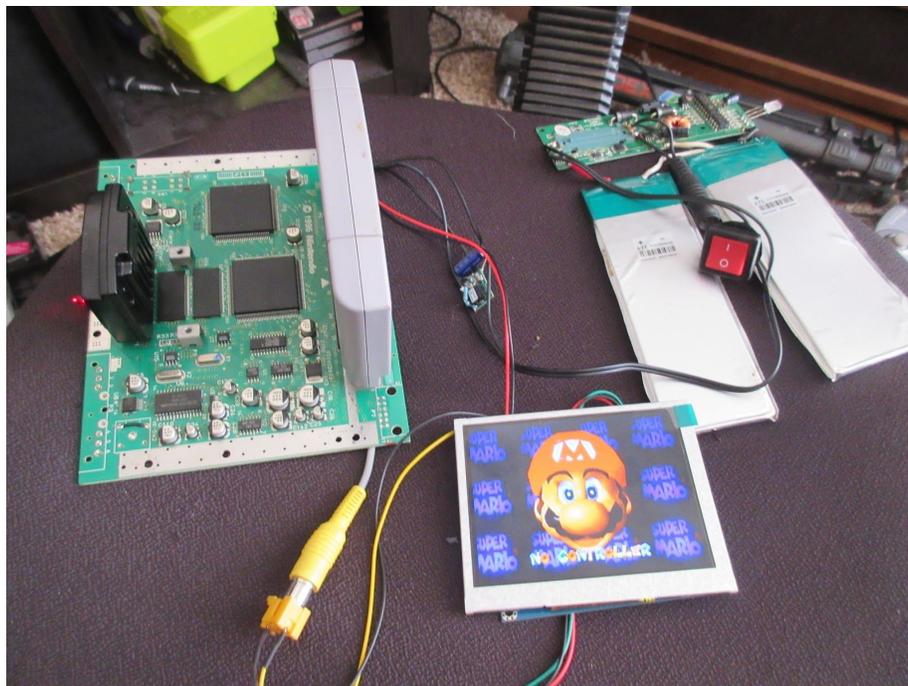
#### **Step 4: Audio/Video Port.**



Finally, audio and video must be extracted from the board. This port is the easiest to remove - just bend it up and down until it snaps off.

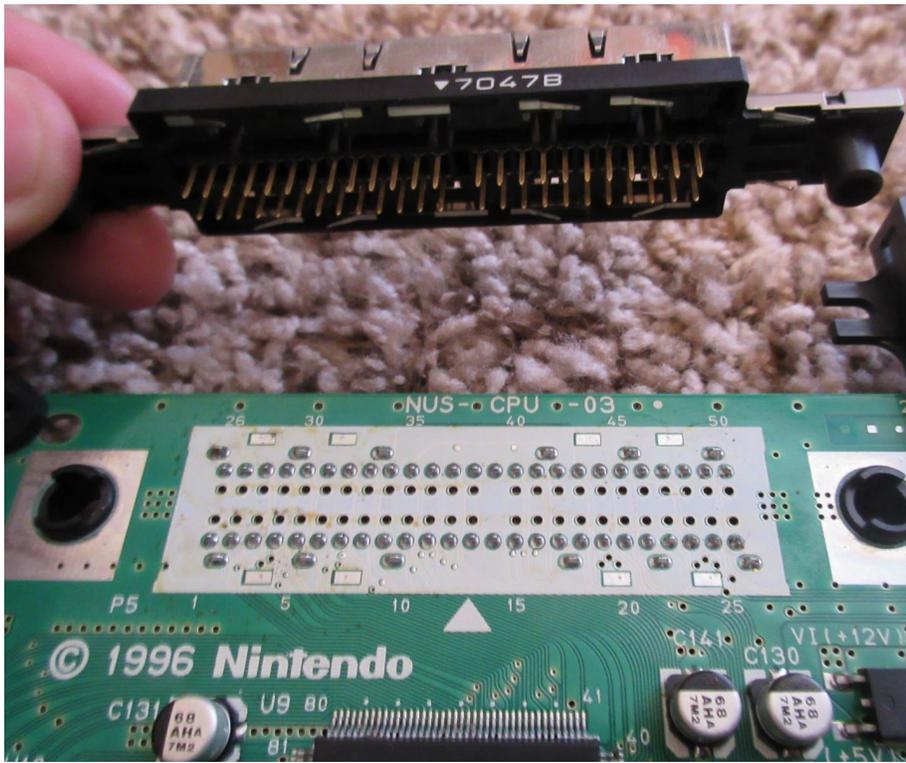


Connect composite video, left audio, right audio, and ground as shown.



After powering your screen (which because of the many different screens out there, this guide hasn't provided too much detail), connect the composite video, and test it. If you can see an image, congratulate yourself. Your project is now technically "portable"

### Step 5: The cartridge slot relocation.



Unless you are okay with your game jutting out of your portable at an odd angle, you are going to want to relocate it. The cartridge slot pops right off of the board, revealing all the connections that need to be remade. It is 48 different wires, but don't be scared! Basic soldering skills will permit you to do this relocation (however, if you are truly worried about it, consider making this your Step 2, so that if it fails, you have wasted as little time/resources as possible). Make sure the wires aren't crazy long, say, longer than 5-6 inches, as this can introduce latency and more interference in the wires which can make your n64 unable to play games.

## Step 6: Give your project a nice home, and you're done!



This guide has fulfilled its purpose, so we won't go into the detail of crafting a case here. Make it nice - you've put a lot of effort into getting this far, compliment it with a decent looking case!

Troubleshooting/Tip Section

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FAQ

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- What is the difference between the revisions?

The main difference is the revision of the CPU, GPU and video encoders. Older revisions (rev 5 and lower) can be RGB modded while the newer ones can't be RGB modded easily.

- What kind of video outputs can you get on the N64?

240p (320x240), 288p (384x288), 480i (640x480), 576i (720x576), widescreen via letterboxing and anamorphic compression [[source](#)]

- What is the maximum board trim?

This is a really tough question, and a lot of research is going into this at the moment. Honestly, the only trims that I think a beginner should use would be on the trimming guides at Bitbuilt. [[link](#)] and I would stay away from anything except the rev 1 trim.

- What games require an expansion pack?

Donkey Kong 64, Single-player mode of Perfect Dark, Multiplayer mode of Starcraft 64, and The Legend of Zelda: Majora's Mask. Many games will have improved graphics with an expansion pak, but this is not required.

- What is the best controller to use for the N64?

There are several options for controllers with varying opinions on which one is the best. The general consensus is to use a first party controller with a microcontroller to convert the joystick signals into something the N64 understands. The main reason is that it allows you to get away from the not-so-well-made 1st party controller joystick.

- What is a RAM swap?

RAM swapping is when you replace the 2 2mb ram chips on the motherboard with 2 4mb chips. This eliminates the need for expansion pack. HOWEVER, you will still need to have the jumper pak plugged/wired in. For most, this mod really isn't worth it.

- Does the N64 need to have a cartridge slot?

The answer is yes and no. If you want to play games from the cartridge then of course you do, but another option is to hardwire a flashcart (a popular one is Everdrive64) and load games from an sd card. [[Insert link to Noah's flashcart thread maybe](#)]

- What is RCP wiring?

RCP wiring is an old, outdated, and extremely difficult technique that involves wiring the cart slot directly to the RCP in order to trim the cart slot part of the board completely off. There is a newer, better technique called [board bending](#) (unfortunately it's nothing like Firebending.)

- How much does the average N64 portable cost to make?

This is a tough question to answer because it completely depends on what you make your case out of, what kind of batteries you buy, and, well, how many components you end up breaking :P. Consoles nowadays go for about \$40 - \$50 dollars. Best case scenario, the average cost will be roughly around \$200 - \$300 dollars.

- What size screen is best?

This is definitely more of a personal preference, typically most people use 3.5", 5" or 7" screens. The N64 outputs most games at 320x240, so these sizes are best suited for that range.

- Can I remove X component from the board?

Chances are that unless you are removing critical components like the RAM, RCP, CPU, etc that you can remove it. Please reference this more advanced trimming guide [\[link\]](#)

- What regulators are best to power the console?

Most use TI regulators, specifically the PTH08080 regulators, because they are reliable, affordable, provide plenty of current, and come with a lot of documentation. If you are considering another regulator, then stop it (but really though, if you are, make sure it can provide the current needed and that it has positive reviews).

- Does the N64 need a fan?

A n64p with good heat sinks and proper ventilation should not require a fan. But, include one if it makes you feel better!

- Can I charge my portable AND play at the same time?

[Sure, check this out.](#)