XCVG's Guide to the N64

Originally written 2009-2010

Edited and reformatted 2020-01-05

Note: This was originally written a long time ago. It's not up to my current standards, and some of the information is probably outdated. The content of the guide has been preserved as it was originally written, but I have added a few notes inline.
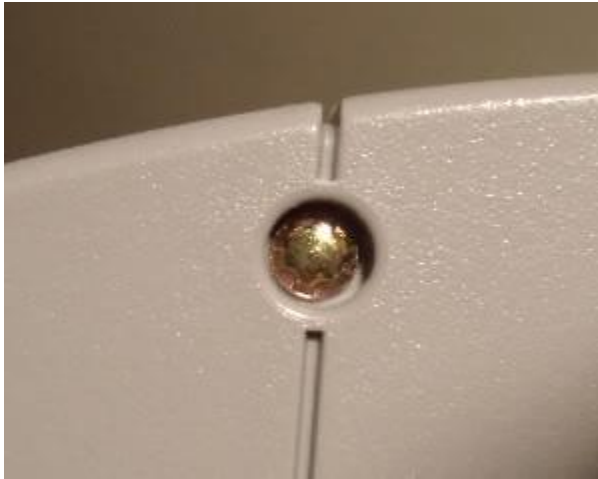
Contents

Section 1: Step-by-Step For Beginners

Part I: Open, OPEN, OPEN YOU BASTARD

First, stop shoving the Philips driver blindly down the hole and twisting, it's not going to work. Nintendo used strange screws instead of normal ones.

(image ~~stolen~~ borrowed from internet, will replace with my own eventually)

That's one of two types of Nintendo screw. The other one is a tri-wing, and looks like a Philips but with only three "wings". Tri-wings are irrelevant to this guide, because Nintendo didn't use them on the N64 or any of it's related devices (that I know of). No, we're talking about this strange hex-like... thing. Nintendo used it for the SNES, N64, and I believe the GameCube. It's sometimes called a Gamebit screw (erroneously, "gamebit" is a term originally coined for the *driver*) or a Linehead screw (possibly the most correct), but is usually simply known as a Nintendo screw. There are (at least) two sizes: 3.8mm and 4.5mm. I believe the N64 uses 3.8mm screws but I'm not sure. If you plan on doing a lot of Nintendo modding, the right way, you will need drivers for both anyway. If you don't plan on doing a lot or are a ~~cheap prick~~ frugal personality you probably won't bother at all. There's also the Zoozen Access tool kit, which has all the necessary tools for opening (and hopefully closing) consoles. Do a search for Gamebit and you will find the drivers, usually just bits that you will have to find a handle for.

Ed: The screws actually have 4.5mm heads, not 3.8mm heads. I don't think the Access tool kit has been available for the better part of a decade, but you can get the correct drivers on their own online for cheap now. There's not a lot of point to the other methods unless you're in a big hurry or live in a corner of the world where you can't get the proper drivers.

If you are a cheap prick like me you probably don't want a driver. Thankfully, there are a few methods for doing without it.

1. Pliers: Grab and twist. This worked for me for 5 of the 6 screw wells. It works fine on cartridges and such, but you need really narrow pliers to get into most of the screw wells of the N64.
2. Screw the Screws: Just cut, snap and break the case AROUND the screws. It works, but it's a bit risky (you might damage the board, though the risk isn't as great on the N64 as some others) and you destroy the case.
3. Pen Trick: Get a pen. It has to be a polycarbonate or acrylic pen, you know, the cheap clear BIC pens everyone seems to have a million of. Heat up the pen with a lighter, torch (American

definition, I believe that's blowlamp for you Brits), candle, or other flame. Then slam it down on the screw. Easy in theory but it takes practice to do it right. You have to get the pen hot enough, but not too hot. Here's an important tip. Slam the pen down into the well, then hold it tight and don't let it wiggle around until it cools. Don't worry about it sticking to the case. A single pen driver will last for a few screws.

4. Modded Screwdriver: Get a really crappy blade screwdriver. Grind it down so that the end forms two prongs that engage the outer dimples in the screw. I've never done this.

Robm's Suggestion: *One suggestion, for the removal of the screws: If the portabalizer doesn't need the casing, they can just use a soldering iron to apply heat straight to the screws. Melts the surrounding case, and it just comes apart.*

I don't believe I forgot to mention that! It works, but like he said it does damage the case, though not THAT badly.

Now that I've told you how to get the screws out, I should probably tell you where they are. You know, in case you are too dumb to find them. It should be obvious, but for some reason people ask about the most obvious of things anyway.


The screws are in the red circles. Remove them, and you should be able to separate the two halves. Oh, and don't panic when the front feet come off. It's supposed to happen.

Part II: Some Disassembly Required

Let's start from the top. The top of the case that is. The cart door assembly is about the only thing of note. It's held on by two Philips (phew) screws. Basically it consists of two door flaps with springs and a holder. The top case plays a part in holding it in, too. Most portables omit the cart doors, but if you are just LED modding and N64 this might be important. Also, it is the focal point of the region mod, which I'll describe later in the guide.

On to the fun bit, the board.
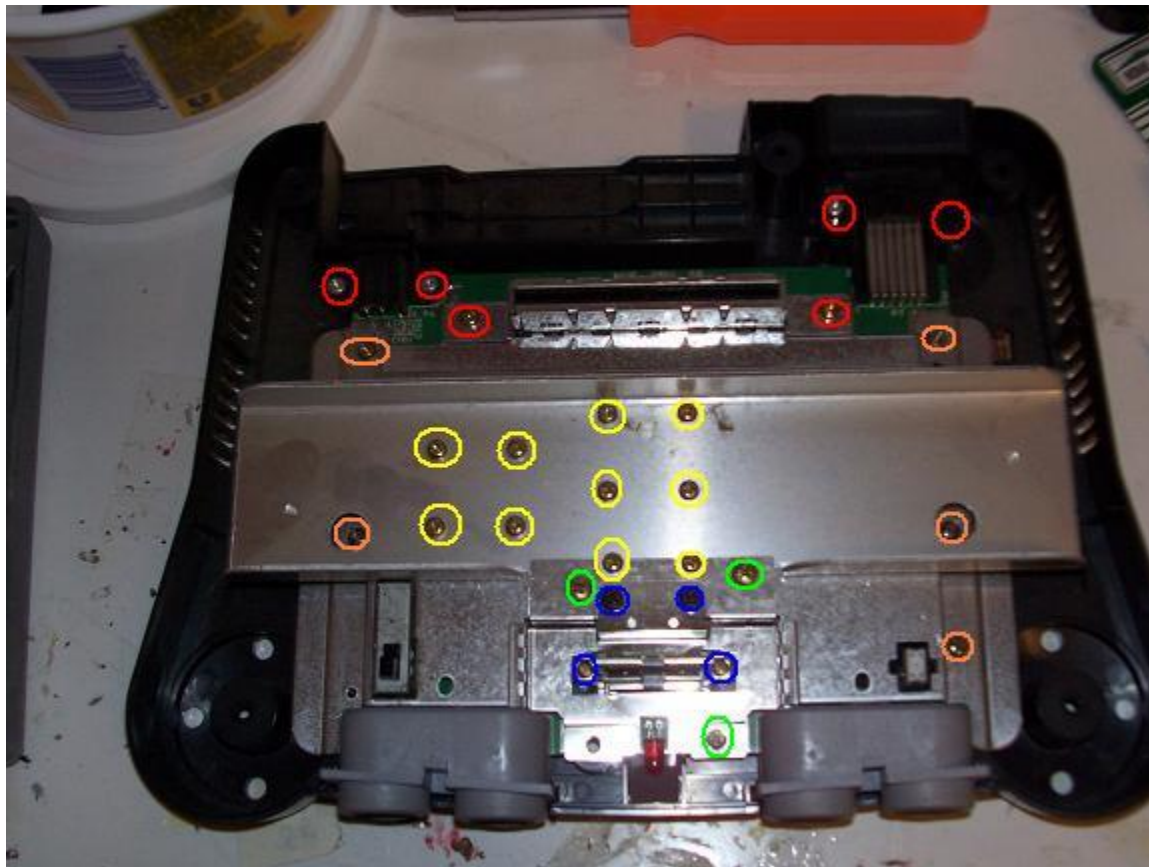
That's right, A WHOLE BUNCH OF SCREWS! Thankfully, they are all Philips screws. Now this picture is a bit old and I might have already removed some screws before taking it. But most of them are there. I also added a suggested removal order, which is probably crap and will get me flamed half to death.

- **Blue**: Take these out and remove the piece of metal sorta attached to the expansion slot. You may have to do a bit of contortion, but DON'T FORCE IT.
- **Green**: Remove these and you should be able to pry another piece of metal off. Again, don't force it.
- **Yellow**: These hold the heatsink-bar-thingy on. That's pretty much all I can say about these.
- **Orange**: Remove these to free the shielding from the case and board. You can pretty much stop here if your goal is the top of the board.

- **Red**: These are the final pieces of the puzzle (I think). Unscrew these and the board is free. There's a piece of shielding UNDER the board, too.

ShockSlayer's Suggestion *Yellow and the two top blue screws do not have to be removed, the heatsinks are probably gonna be replaced, so it can just pop right off. No worries.*

A neat trick if you don't plan on using the existing heat sinks and blocks.

Here's a picture of the board, for those who have never seen one before. I sat mine in the case for storage. It isn't screwed it- it's just loose in there. Ignore the jumper pak- I was testing it. Don't ignore the heat blocks. Those are what the yellow screws go into. The heat blocks transfer the heat from the chips to the spreader above. They are not adequate as heatsinks for a portable but will do for most testing.

Part III: Slot Cart

A certain semi-known portabilizer recommends in a certain semi-popular book to remove all the things you don't need off the board first. That is one of the dumbest things you can do. I'll tell you why in one word: testing. You will want the power and AV connectors to test your slot relocation right after you do it, instead of wiring it all and finding out it doesn't work, or vice versa. I'll start with the cart slot, because it's usually done first and is the most likely thing to go wrong.

Ed: This is almost certainly referring to Ben Heck and his book Hacking Video Game Consoles: Turn your old video game systems into awesome new portables. *I do stand by this advice.*
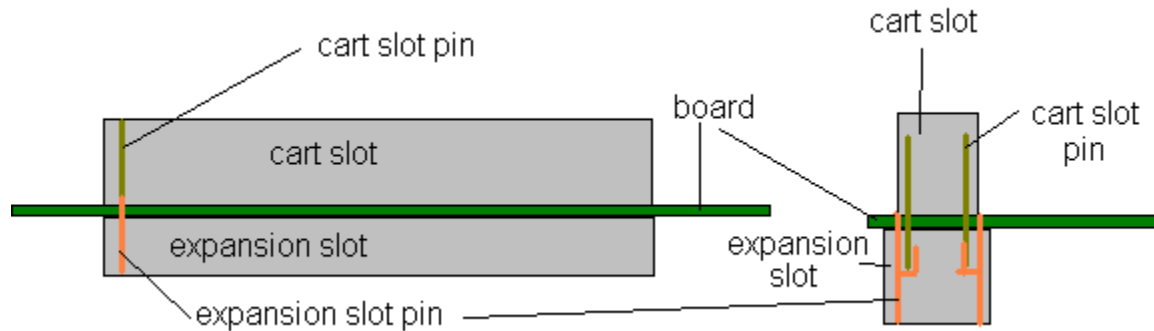
Nintendo did something weird with the cart slot. It's not soldered in. No, the pins of the slot make contact with the pins of the expansion slot underneath (the one you've never heard about before, not the one for the Expansion Pak), which are soldered in. Once unscrewed, the cart slot may be gently pried off. The expansion slot is slightly but not significantly harder. Ideally, you should pry off the metal crap, then gently pry the slot off, then snap off all the pins below. You may want to hold off removing it for a bit though, so I can explain the various methods of dealing with the cart slot.

1. Leave It

This is pretty self-explanatory. Leave the cartridge and expansion slots as they are. The disadvantage is that it's thick and the expansion port is completely useless, unless you plan on mounting an N64DD.

2. De-Location

Rip off the expansion slot but leave the cart slot in. Then, bend the pins over and solder them to the outer set of holes where the expansion slot pins you (hopefully) snapped off were. It's relatively easy, and way better than leaving it.

3. Relocation

If you don't know what a slot relocation is, you REALLY need this guide. It's where a slot is "relocated" by connecting it to the board with wires. In theory, it's easy, but soldering up 50 or so connections is quite a chore. Wires can also break and short, causing problems. Keep the wires as short as possible, use proper sized wire (22-24 gauge or so), and check your work before firing up the board. Oh, and make sure you solder your wires to the OUTER set of holes where the expansion slot pins once were. It's a pain in the you know what, but it's pretty much a rite of passage.

4. RCP Relocation

If you need this guide, you shouldn't be doing this. Seriously. This is an advanced technique where the cart slot section of the board is removed completely and the slot is wired directly to the chip. There'll be some information about this in the advanced section below.

Ed: I think there have been a few other techniques that have come up since 2009. The only one I can think of offhand is the one where you score, bend, and rewire the board.

So, you've got your slot relocated, de-located, or maybe you just left it alone. Test it, seriously, make sure it works.

Part IV: Rip and Desolder

Now you can consider removing some stuff. There's not a lot on the board, just enough to make it annoying. Have a picture, maybe it'll help a bit. Oh, and if you just plan on adding an LED or something, you should probably stop stripping it down now.
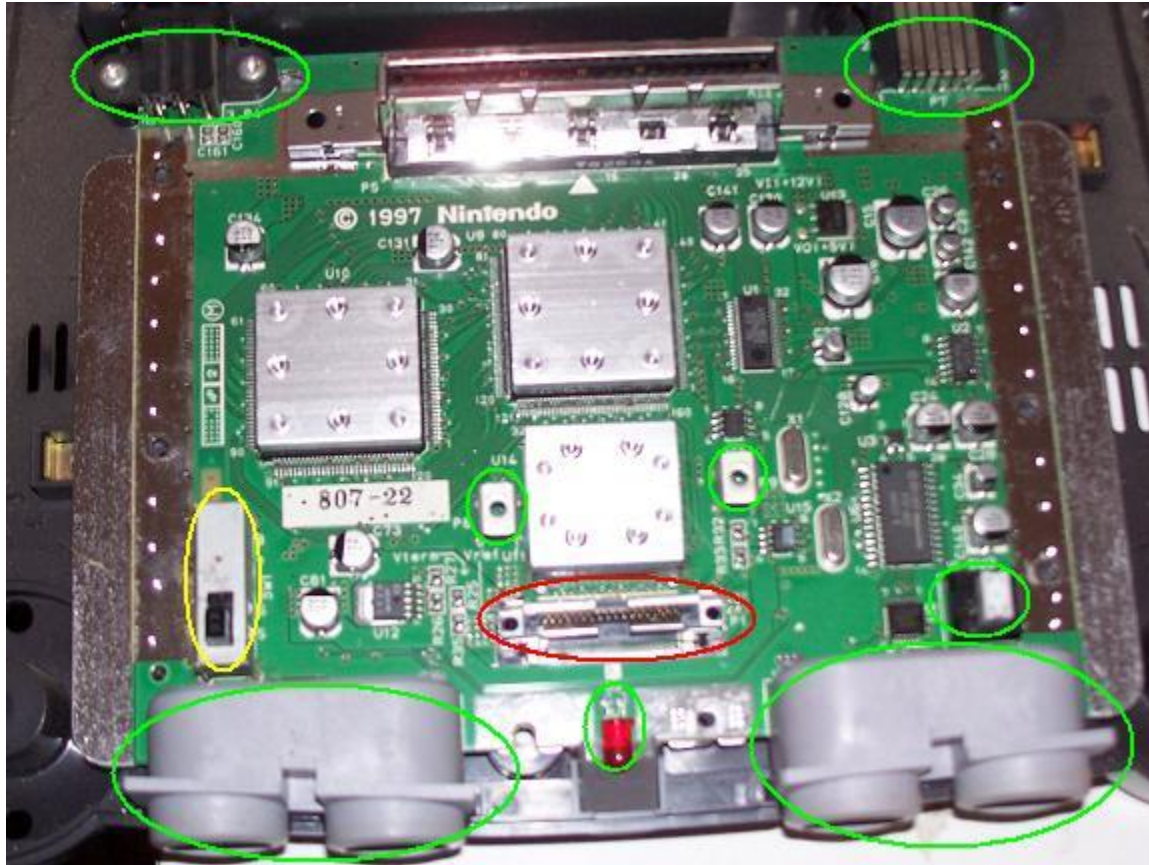
The red circle means DON'T REMOVE. The only thing in a red circle is the slot for the jumper pak or expansion pak (also, confusingly, called the expansion slot). The N64 will not run without either the jumper pak or expansion pak. It IS possible to relocate it, but if you need this guide you shouldn't try it as it is incredibly difficult.

Ed: There have been some crazy jumper pak/expansion pak mods done since this guide was written, but if you're a beginner I highly recommend just leaving it. Those RDRAM traces are sensitive.

Again, only one thing is in the yellow circle. That means you can remove it but you have to bypass it. I probably could have made it green, but I wanted a splash of color. This is the power switch. It turns the N64 on and off. You could just relocate it with some wire, but most portables turn the power on and off somewhere else. Now, if you jump this, get it right. The jumpers should be going from the top of the board to the bottom, connecting only the correct pairs of holes. If you look below the board, you will see that there are traces for 3.3V and 12V, in and out. Make sure you do not connect 12V to 3.3V; it will kill your N64.

There's a lot of green things to remove. Maybe some of them should have been yellow.

First off, the controller ports. From left to right they are player 1, 2, 3, and 4. Arranged in two pairs, as you can probably tell. You can desolder them, but it takes a heftier iron and more patience than I had. I broke away part of the housing (on the top) with diagonal cutters to get to the pins, then cut the pins (leaving enough to solder to) and broke the ports off. With this method they are still usable. That said, desoldering them is probably a better idea. I'll mention this later but I'll say it now too. For each controller connection there are three pins. From left to right these are +3.3V, data, and ground. Data is usually yellow or white, power (+3.3V) and ground are their usual colors of red and black. This will come in handy when you get to modding the controller.

Second, the riser thingies near the bottom heat block. I cut and bent and pried them off, which is a BAD IDEA. It will most likely damage the board. Luckily I only mashed ground plane, but there are a lot of important things nearby. Desolder these if possibly. If not, be VERY carful. You CAN leave these on, but they don't really do anything so you might as well remove them.

The reset button you can just desolder. It's not that hard. You do not have to bypass it as it works by connecting a pin of the PIF to ground. If you REALLY must have a reset button, add a button between the upper-left pin (of the button holes, not the PIF!) and ground. At this point, TEST THE N64 and make sure it still works. Once you remove the power and AV connectors you won't be able to test it until it's rewired.

Okay, time to remove the power and AV ports. The power port can be desoldered if you have the patience and a hefty iron. Desoldering the AV port usually results in lifted and just generally screwed up pads. The easy method for the power plug is to slice through the contacts somewhere and basically snap it off. I used a hacksaw and cut vertically through the port about in the middle. Another portabilizer cut through the contacts horizontally from the somewhat exposed side with a diamond wheel on a dremel. The AV port is similar. Cut through the contacts (making sure to cut through BOTH ROWS) and snap it off. The other halves of both can simply be bent and snapped off. If you want to use the AV port later, cut back from the actual connector part and make sure you don't lose any of the pins; they like sliding out.

The LED can just be removed. As far as I know it's not important to the functioning of the N64 in any way. It's useful for testing, though, so you may want to leave it for now. It's also the focal point of any sort of front-led mod, for those of you who do that sort of thing.

Now you have a board devoid of any ports or switches, and some sort of functioning cart slot arrangement.

Ed: I don't believe there ever was a Part V. I think I just missed a number, or maybe combined sections when writing it.

Part VI: Power Up

I'm not going to go too far in-depth on portable wiring. The reason is that it's different for different portables, and you might not be making a portable. I will tell you the easiest way to power your N64, though.

The N64 has a 12V line and a 3.3V line. The 12V line goes to a 7805, and to an amp as well I believe. This line can be run directly from a battery or power supply anywhere from around 7 volts to 12 volts. It might be possible to go above as well, but try to avoid it. That's easy

The 3.3V line is a bit trickier. You need a voltage regulator. If you don't know what that is, find out then go back to this guide. It's generally okay to undervolt the N64 to about 3.1V, but overvolting will kill it.

So what's the easy way? You will need a PTH08080 voltage regulator module from Texas Instruments. You can order these from Digi-Key, or request a free sample. A PTH08000 will work too, but the pinout is different. Apart from the voltage regulator itself you will need a 100uF capacitor and a 1.8K, 2K, or 2.2K resistor. A 1.8K resistor was thought to be perfect but may result in a slight overvolt. A 2K will result in a slight undervolt, which is almost ideal. A 2.2K resistor is the easiest to find but may result in too much of an undervolt. As most resistors have crappy tolerances, try finding a 2.2K resistor that's actually a bit below 2.2K. You also need some wire. Speaker wire, 18 gauge or so, is probably the best stuff for this. Here's a pictoral diagram of how to wire it.

Diagram created by Noah exclusively for ModRetro

Power in

16v 100μF   16v 100μF

ground

3.3v out

PTH08080 WAS 92G1556
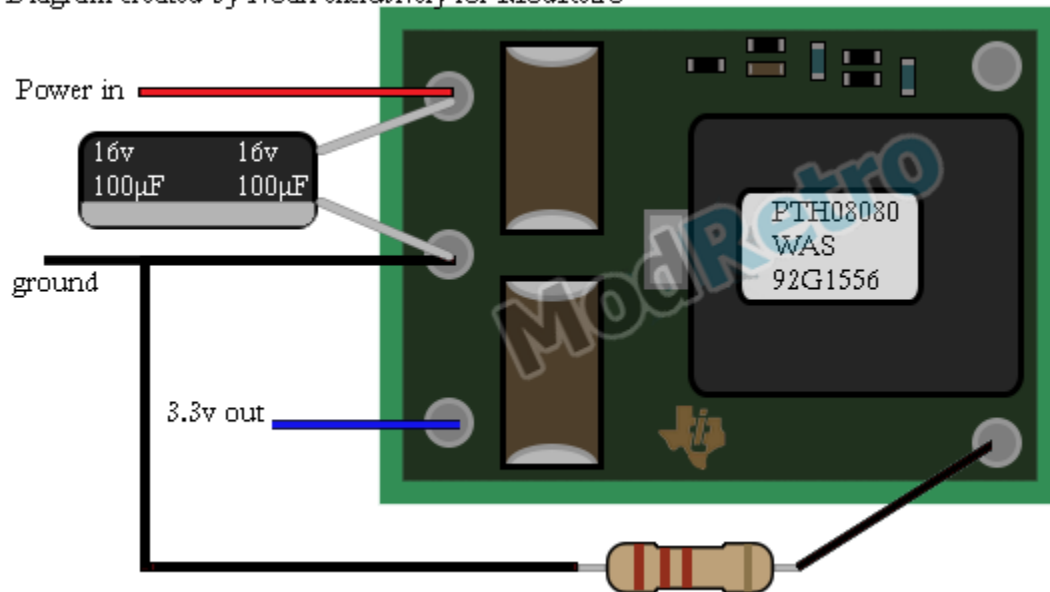
Ed: Almost everyone used a PTH08080 or PTH08000 at the time. While the TI regulators were a great option if not the best option at the time, they're not as compelling today. TI is much more stringent about sampling and likely won't send you these. There are also tons of generic switching regulators available for dirt cheap. While those probably aren't as good as the TI parts, they're probably good enough for this. That being said, a PTH08080 is about $10 on Digi-Key at the time of editing, so if you want the tried and true option it is available.

Now that you've figured out the regulator, you have to connect power to the N64. Here's a picture for you. Just make sure the 12V and 3.3V lines aren't touching. It's very important. If you short them you WILL KILL YOUR N64. It also helps to make sure the regulator is putting out 3.3V BEFORE you connect it to the N64.

Ed: I think there was supposed to be a picture here but there wasn't one in the post. It may have never been made. The traces on the board are labelled.

At this point, you should have power wired up. Try it out, the LED should light up. Unfortunately for you, just because the LED lights up doesn't mean that the N64 works. It could be fried, but you won't know until you wire up AV.

Part VII: Wiring Video (and audio)

A stock N64 will output s-video and composite video. It will of course also output audio. But that said, HOW do you wire up the audio and video? It is kind of important.

I'm not going to tell you what screen to use, how to use it, or anything on that end of the wire. That's up to you. If you are using a PSone screen there is plenty of info out there. If not, well, ask or figure it out yourself. If you don't have a screen yet, just get a cheap set of AV cables and cut one end off so you can plug it into your TV. Okay, on to actually wiring it up to the N64.

There's your pinout. It shouldn't be that hard to follow. Ignore the scary "S/12V" label. That doesn't apply to the N64. The only points you need bother with are the R (right audio), L (left audio) and V (composite video) points. Unless of course you have an s-video capable screen, in which case you should probably note the Y (luma) and C (chroma) points. Just solder some wires on, and don't forget to link up ground if you haven't already done so somewhere else. If the screen and board are powered by the same power source you shouldn't have to connect the ground here, but some screens may need it anyway.

Ed: Note that while RGB is labelled on the diagram, the N64 won't output RGB without a separate mod. It's implied here but not explicitly stated.

At this point, you should have a working N64 board that's been mostly rewired back up. Your journey is not over yet, though. You still must master the art of heatsinking, and discover your inner controller rewiring... thing. Of couse, if it doesn't work, then you should probably check out the troubleshooting section.

Actually, wait a minute. Let me take some time to explain how to properly test the N64. First, put in a game and put in a jumper or expansion pak, making sure all the little contacts face towards the back of

the board. Then connect the AV if you haven't done so. After that you can connect the power. The only real important bit here is the expansion/jumper pak bit. If you plug it in backwards, it can cause problems.

Part VIII: Controller Wiring 101

There are so many controllers to hack. I'm going to try to guide you through hacking a controller, but the fact is that I can't really cover it all here. There's also a casemaking element too. So I'm going to guide you through hacking a dirty old official Nintendo N64 controller. It's not really the best choice, as you are locked into using an official Nintendo joystick. However, these are readily availible, unlike some other choices. It's also pretty simple to hack.

Ed: Oddly enough, third-party controllers are cheaper and easier to get now than they were when this guide was written. One of those is probably a better choice; they tend to be more hackable and you're not destroying original hardware.

Ed: This is almost certainly not my image.

Open it up. Thankfully they used Philips screws. Try not to lose any pieces. You will need them later, unless you are really creative. Expose the board and you will end up with something like this.

Using this straight might do for a portrait style handheld, but you will probably have to do quite a bit of rewiring for anything else. Let's start off with rewiring the controller to the N64. Between the chip and the right cluster of button-pad thingies, there is a non-removable connector-like thing for the wires. Here, have a picture.
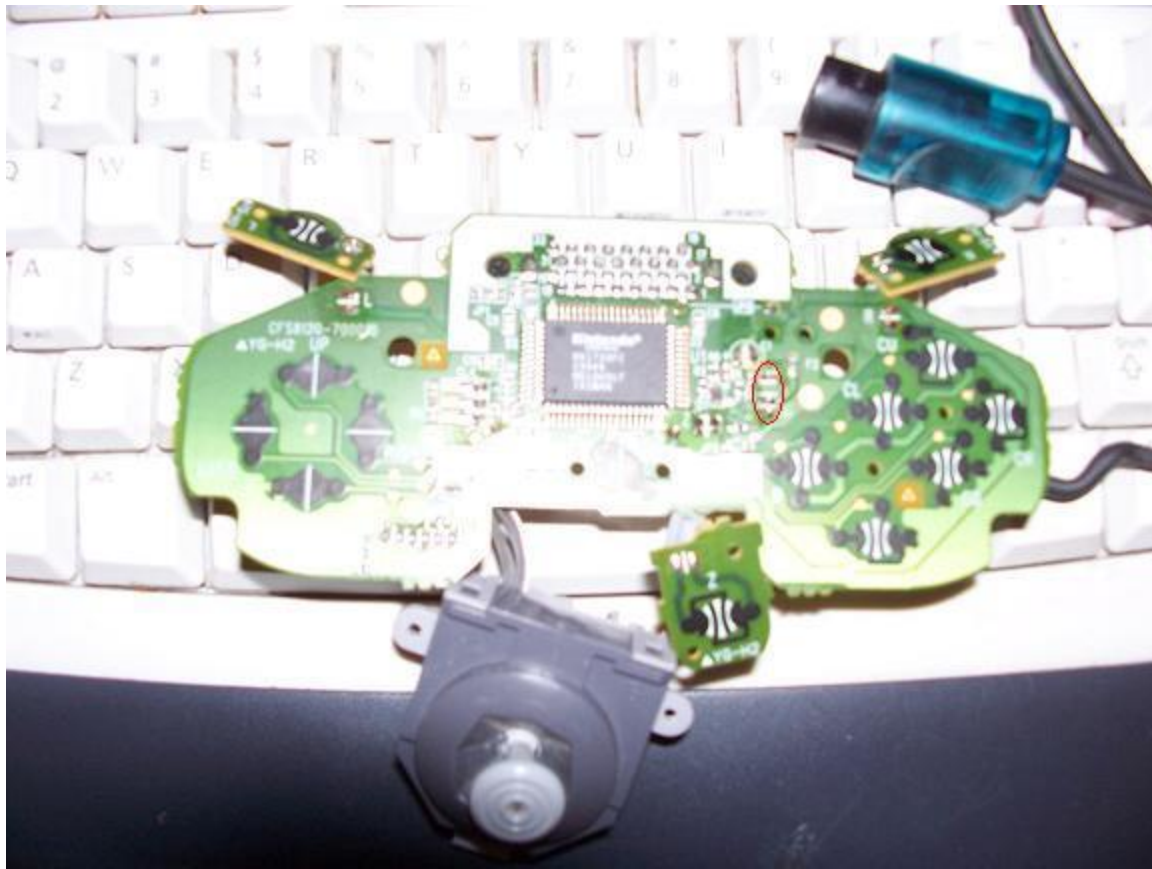
From bottom to top they are data, ground, and power. These go to the points on the N64 motherboard, which are from left to right power, data, and ground. I guess they did that to confuse you. For an integrated controller, you are going to want the data to go to the player one data spot. The power can go to anywhere there is 3.3V power, and the ground to any ground, but the usual points are convenient as any.

Now, on to some more fun stuff, how to rewire the controller. The joystick is easy to move. Unplug it and clip the plug off, then extend the wires with some more wire to where the connector is. Make sure to get the wires to the right spots. The Z, L, and R buttons are on separate boards, which makes things easy no matter how you decide to do the shoulder buttons. If you just want to move the buttons, simply extend the wires. If you want to replace them with your own buttons, the holes are easy to solder to. Now, these buttons go between a leg of the chip and ground, meaning you don't even have to use both points. Simply wire your replacement button between the bottom point for L/R (left point for Z) and ground. For the start button you can't really use the board- you need a different contact pad from another controller or a tact switch or other kind of button. There's a nice copper pad right above the black stuff for the start button, and the other side of course goes to ground. There are plenty of ground points around the board. All the big bare copper circles go to ground.

The d-pad and action buttons are where things get a bit more complicated. You COULD just wire your own button board, tact switches, or whatever to the copper points next to each contact pad. But then you'd have to contend with having a full sized board. The solution? Cut the board. That way, you could

also re-use the contact pads for the d-pad and action buttons, instead of hot-gluing tact switches in, building your own tact board, or sacrificing another controller.

I present to you a labeled picture of the board.

The red lines are where you should cut along. There's some leeway, of course, but try not to cut through anything important. The simplest way to cut a board is by scoring it, on both sides, and snapping. It takes practice but works well. Small chunks of board can be hacked off with diagonal cutters, but by small I mean small. Alternatively, I've heard a bandsaw works quite well. But the score-and-snap method is the common, tried-and-true way.

The yellow arrows point to traces which will have to be rewired. You may also have to rewire the ground area left on the left side of the board, where the lower of the two big copper circles is. There are nice pads to solder to for the d-pad. You will have to solder to traces if you plan to use the section of board for your portable, however. On the other side there are convinient copper pads for soldering to, on the wrong side of the cut, or just the other side if you plan on re-using the part you cut off. You COULD solder to traces but it's probably easier to solder right to the chip, which I have labeled for you.

So for your actual buttons, you have a few choices. You can re-use the cut-off portions as I just said, make your own button board with some perf and some squishy tacts or normal tact switches (little buttons) or simply ghetto-rig it somehow.

You are probably wondering about the expansion slot (about the third slot of that name) on the controller. Well, on some controllers you can just pry it off, and on some you have to desolder it. I think

you have to desolder it on the official one. Or you could just leave it and strategically place the board so the slot sticks out. You could relocate the slot or wire directly to a rumble or memory pak.

At this point, you should have something that works and is playable. But you still have to put some heatsinks on, or it'll overheat and possibly fry.

Part IX: Heat Sink

If you haven't seen or heard of heatsinks before, get your head out of that hole. An N64 needs heatsinks or it'll overheat. Now how much heatsink, and if it needs a fan or not, are more complex questions.

Ed: It's safe to run the N64 for short periods of time for testing with just the aluminum heat blocks.

The CPU (big chip on the left), RCP (big chip in the middle) and RAM (chips below the RCP) all have to be heatsinked. If you have an expansion pack that has to be heatsinked (heatsunk?) too. Of those, the RAM probably gets the hottest, although it is somewhat debatable. Also, running the menu screen of Super Mario 64 puts out a lot less heat than playing 4-player Perfect Dark (less power too).

So, you need some heatsinks, but what kind? Ramsinks, those itty-bitty heatsinks for putting on the memory in your computer are popular because they are small and most importantly thin. You will need more than one for the CPU and RCP, and possibly more than one on each RAM chip depending on the size. Try to cover the whole chip, but you don't have to be OCD about it. Videocard heatsinks are another good choice, as they are thin, and one will likely cover one of the chips or both RAM chips. Re-used pieces of the original N64 heat bar thing, a copper sheet, and probably some other things have been tried. The copper sheet is thin and a neat idea but barely adequate, bordering on inadequate depending on how cool you like your electronics to run. I recommend ramsinks or videocard heatsinks, or a combination of both.

Ed: At the time of editing, ramsinks and similar little heatsinks are readily available, typically marketed for use with Raspberry Pi and other single-board computers. Also note that videocard heatsinks were much smaller when this guide was originally written; only new, high-end cards had dual-slot coolers. I'm not suggesting cooling your N64 with NVTTM here!

Once you have some heatsinks and have made sure they will fit you have to attach them. I recommend you put some thermal paste between the chip and heatsink- just a dab, you don't need much at all. Less is more with thermal paste. Now anyone who used thermal paste before should know that it won't hold anything down. The crudest method is to simply hot-glue the heatsink on to the chip. It shouldn't get hot enough to melt, but it may soften. If you do glue your heatsinks down, glue the EDGES, not the middle of the heatsink, try to get it on tight, and use high-temperature glue if possible. Other glues have probably been tried, but I cannot recall any specifics. Maybe someone can shed some light on that? Another technique is to hold the heatsinks down with (insulated) wire, which is glued or otherwise secured to the board.

Ed: Thermal adhesive was hard to get in 2009.

Do you need a fan? There are two schools of thought on this one. Yes and no. I say maybe. If you have decent ventilation and airflow, you can probably do without. If your portable is all messy, full of wires and loose boards covered in electrical tape, maybe you should consider a fan. Look for a small fan, maybe 40mm, and preferably thin. Also, make sure it'll run on your portable's electrical system.

So, that's the boring section on heatsinking. Notice the lack of picture. At this point you know pretty much everything you need to know about modding the N64, and maybe more. But wait! There's another whole section with more advanced tips and tricks and some reference material!

Section 2: Tips, Tricks, and Techniques

WIP

Index

Ed: This section was never completed. It's also missing pictures that have disappeared from the internet.

1. Board Revisions

Knowing your board revision is a good thing. Only the first few versions can be RGB modded. Also, newer versions tend to be cheaply built and more sensitive. This means an older revision is better. Of course, use what you have, but be aware of the disadvantages of your version... uh, of N64. Please note I only take the highest and lowest known serial numbers. Also note that serial numbers are not a certain method of finding out the revision of your N64.

NTSC

Rev.1 (NUS-CPU-01)
Known Serial Numbers: NUJ10185860 (Japan)
Distinguishing Features: RGB Moddable (VDC-NUS), buffered Csync output
Notes: These have never been seen in North American N64s. However, they have been found in Japanese ones. Possibly used as pre-release demos in game stores.

Rev. 2 (NUS-CPU-02)
Serial Numbers: NUJ10379732, NUJ10961070 (Japan) NS100086232 (USA)
Distinguishing Features: RGB Moddable (VDC-NUS), buffered Csync output
Notes: Only seen as promo/store demo models in the US. Actually sold only in Japan.

Rev. 3 (NUS-CPU-03)
Serial Numbers: NUJ11284943 (Japan) NS100932881, NS133598474 (USA)
Distinguishing Features: RGB Moddable (VDC-NUS or VDC-NUS A), buffered Csync output
Notes: The first models actually sold, in the US anyway.

Rev. 4 (NUS-CPU-04)
Serial Numbers: NUJ13319819 (Japan) NS136718770, NS180431212 (USA) NS601623141, NS603358522 (Canada)
Distinguishing Features: RGB Moddable (VDC-NUS A)
Notes: No more buffered Csync, and a new CPU revision (CPU-NUS A) that may be better for overclocking. Also the last model that is RGB moddable.

Rev. 5 (NUS-CPU-05/NUS-CPU-05-1)
Serial Numbers: NUJ13624446, NUJ14712392 (Japan) NS205730658, NS254977622 (USA) NS605180732, NS610192102 (Canada)
Distinguishing Features: Not RGB Moddable (AVDC-NUS, MAV-NUS)
Notes: Guess what? No more RGB! This revision features the AVDC-NUS chip and later the MAV-NUS chip. Also, there is a sub-revision (NUS-CPU-05-1) with a MAV-NUS chip and no significant differences.

Rev. 6 (NUS-CPU-06)
Serial Numbers: Unknown
Distinguishing Features: Not RGB Moddable (MAV-NUS), Single RAM Chip
Notes: This one is so rare that the Benheck versions guide states that it does not exist. It is the first version with a single 4MB RAM chip.

Rev. 7 (NUS-CPU-07)
Serial Numbers: NS245115552 (USA)
Distinguishing Features: Not RGB Moddable (MAV-NUS), Single RAM Chip
Notes: Not much different than the prior revision. Still rare, but common enough for it's exsistence to be confirmed. According to marshallh, this is where the N64 starts to get less stable.

Rev. 8 (NUS-CPU-08/NUS-CPU-08-1)
Serial Numbers: NS270238981, NS292228809 (USA)
Distinguishing Features: Not RGB Moddable (MAV-NUS), Single RAM Chip
Notes: Apparently these are real junk. These are the ones in the clear "Funtastic" cases. Different clock generation IC (is this the reason?). Avoid if possible. Also, has a sub-revision, with no major changes.

Rev. 9 (NUS-CPU-09)

Serial Numbers: NS901672245 (USA)
Distinguishing Features: Not RGB Moddable (MAV-NUS), Single RAM Chip, Stamped Heatsink
Notes: The last revision of N64. Possibly cobbled together from spare parts or are refurbs. Has a completely out of place serial number. The heatsink is stamped instead of having the heat blocks below and the cart slot holder is green, possibly leftover from "Funtastic" N64s. Avoid these, they are unstable junk.

PAL/European

Rev. 1 European (NUS-CPU(P)-01)

Serial Numbers: Unknown
Nearest NTSC Revision: NUS-CPU-05
Distinguishing Features: Not RGB Moddable (DENC-NUS)
Notes: The first European N64 revision. Not RGB moddable; uses a DENC-NUS chip which can be considered the European equivalent of the AVDC-NUS chip. Other than that one caveat, there's nothing really wrong with it.

Rev. 1 French (NUS-CPU(R)-01)

Serial Numbers: Unknown
Nearest NTSC Revision: NUS-CPU-04
Distinguishing Features: RGB Moddable (VDC-NUS), NUS-001 (FRA) on sticker
Notes: A rare France-only revision. The only RGB-moddable PAL version. Uses a VDC-NUS chip and is the only console to contain an S-RGB A video encoder which outputs amplified RGB.

Rev. 2 European (NUS-CPU(P)-02)

Serial Numbers: Unknown
Nearest NTSC Revision: NUS-CPU-07
Distinguishing Features: Not RGB Moddable (MAV-NUS), Single RAM Chip
Notes: The second PAL revision. Also the only version of N64 to use discrete buffers instead of a buffering chip... whatever that means. Not RGB moddable, and uses the MAV-NUS chip. Single RAM chip, so it may be more desireable for some.

Ed: Parts 2 and 3 were never written.

4. RCP Relocation

RCP wiring is where the top of the board is cut off and the cart slot wired directly to the chips. It is called RCP wiring because most (but not all) of the wires connect to the RCP. Here is a stunningly stolen diagram, from some poor sap who goes by the alias of jjhammerstein.
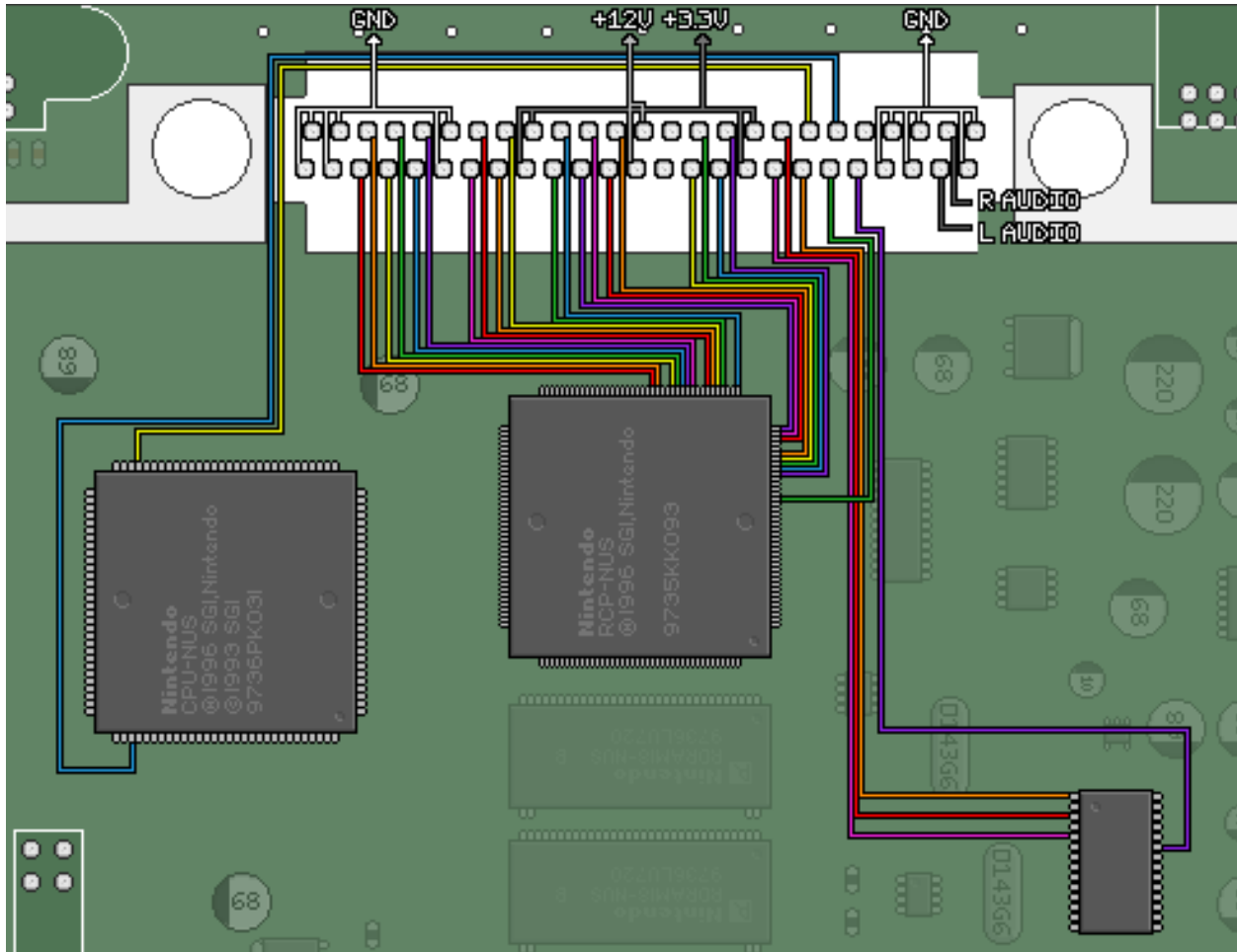
Ed: I'm about 75% sure this is the correct picture. It was long gone from the internet and recovered from a local archive.

And here's the pinout, done by daftmike. Apparently it's inconsistent with the picture and very possibly wrong. I'll get around to fixing it eventually.

GROUND: 1 - 26 : GROUND
GROUND: 2 - 27 : GROUND
RCP 58: 3 - 28 : RCP 57
RCP 54: 4 - 29 : RCP 53
RCP 52: 5 - 30 : RCP 51
GROUND: 6 - 31 : GROUND
RCP 50: 7 - 32 : RCP 47
RCP 46: 8 - 33 : RCP 45
+3.3V: 9 - 34 : +3.3V
RCP 44: 10 - 35 : RCP 41

RCP 40: 11 - 36 : RCP 39
RCP 38: 12 - 37 : RCP 35
+12V: 13 - 38 : +12V
N/C: 14 - 39 : N/C
RCP 34: 15 - 40 : RCP 33
RCP 32: 16 - 41 : RCP 31
+3.3V: 17 - 42 : +3.3V
PIF 5: 18 - 43 : PIF 3
PIF 1: 19 - 44 : CPU 57
RCP 26: 20 - 45 : CPU 93
PIF 23: 21 - 46 : N/C
GROUND: 22 - 47 : GROUND
GROUND: 23 - 48 : GROUND
LAUDIO: 24 - 49 : RAUDIO
GROUND: 25 - 50 : GROUND

Any more ideas?

Ed: Part 5 was never written, but has been documented elsewhere.

6. Easy Region Mod

An NTSC N64 will play any NTSC game. However, to keep people from playing Japanese games in US consoles and vice versa, Nintendo implemented a form of physical lockout similar to the SNES. Tabs are molded into the cart slot holder to keep Japanese games out. I can only assume Japanese consoles have similar tabs in a different location.

Ed: There was an image here, but it's gone. Basically, just snip the tabs out.

Removing them is relatively easy. If you don't want to open your N64, you could melt or Dremel away the tabs, but this is not recommended. The best way is to open your N64 and remove the slot guide assembly, then Dremel, cut, file, or saw away the tabs. They should look like the picture above when you're done.

Ed: It looks like you can buy or print a replacement piece instead of hacking up the original one, as of 2020.

7. PIF Mod

This mod is not confirmed working. I've heard it's been done successfully before, but nobody's confirmed that. The theory, however, is sound. Basically, the PIF determines the region of an N64. An N64 with a PAL PIF (Europe and Australia) is PAL region. An N64 with an NTSC PIF (same for Japan and US) is NTSC. I believe the colour format of the output is determined by the video encoder and not the PIF, but I'm not sure as there is very little documentation. I heard the game itself determines the frequency (50/60Hz) and not the PIF, but functionally it has the same effect as you need a PAL N64 to play a PAL 50Hz game. Anyway, some have converted NTSC N64s to PAL by swapping the PIF, usually to get RGB without an expensive and rare French console.
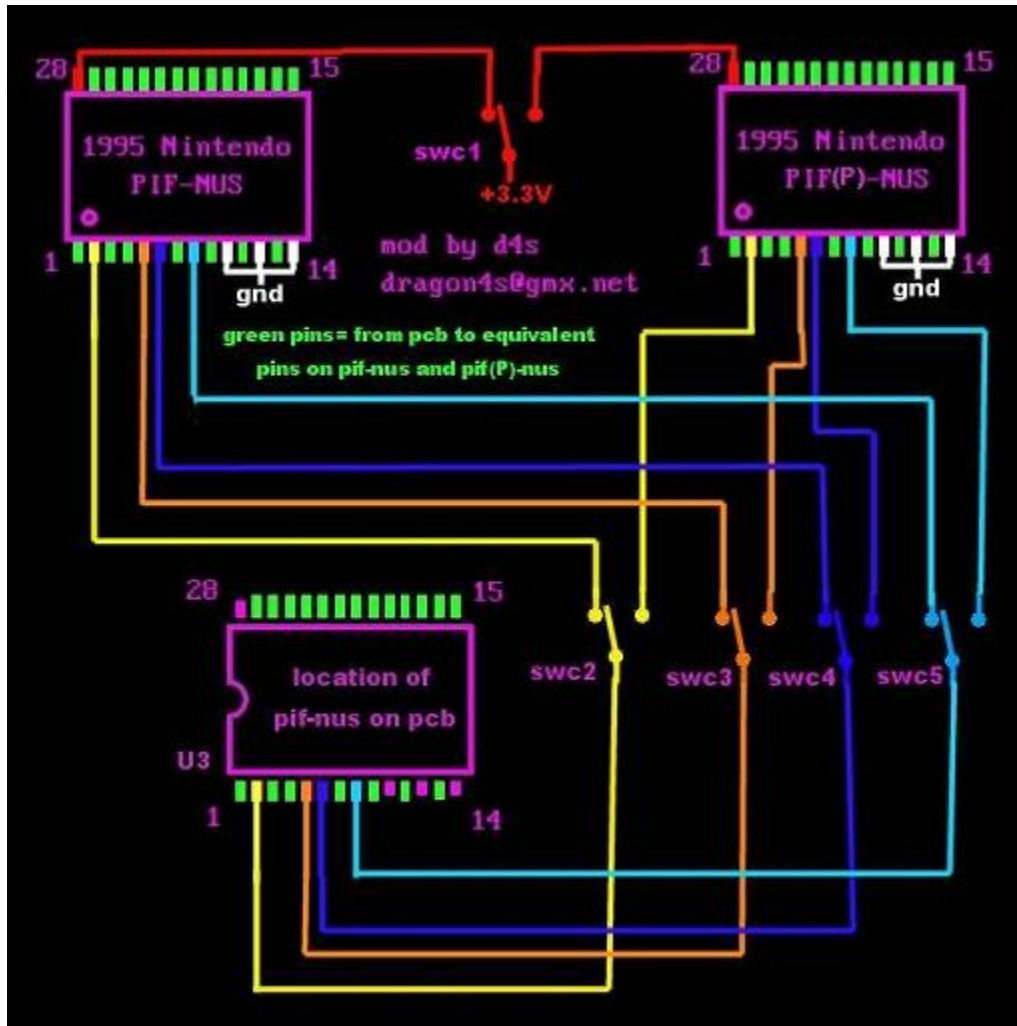
Ed: I'm 90% sure this is the correct picture. Again, this was recovered from a local backup.

This is the closest you'll get to a guide. It's a pinout for wiring up switches. Switching every pin would be ideal, but impractical to actually do. The wires should be kept short and even in length.

This here is the only known source of information:
http://assemblergames.com/forums/archive/index.php/t-19232.html

Ed: Dead link. Try this thread on bitbuilt instead, if it's still up.

It does indeed work and has been done before. Still not recommended for beginners, since it involves SMD soldering (although the PIF isn't that bad).

Ed: Parts 8, 9, 10, and 11 were never written.

Appendix A: Sources and Resources

MBB Nintendo 64 Modding Guide (general information)
GameSX N64 Region Mod (Easy Region Mod)
Nintendo 64 Revisions/Serials Thread by Link83 (revision information)
RCP Relocation Guide by Beta and daftmike (RCP relocation)
Assemblergames PIF Mod Thread (PIF mod) `Ed: Dead link`

`Ed: There are many newer sources of information out there. I'm not familiar`
`with the scene anymore and I can't point you to where they are, but a cursory`
`Google search shows they definitely exist.`