Mod Guide: Woozle Game Boy Advance Consolizer

This summer, as part of our activities with the Residual Media Depot, Alex Custodio and I are modding several videogame consoles while closely documenting our work. The goal of this project is to create a series of succinct, approachable modding guides that detail the tools and techniques needed for hardware modding.

We highly recommend reading the entire tutorial through at least once before beginning the mod!

Woozle Game Boy Advance Consolizer

The Game Boy Advance Consolizer (GBAConsolizer) is something of an outlier among the mods we've completed at the Residual Media Depot. Typically, we have focused on altering the audiovisual output of the device with the specific goal of maintaining more-or-less seamless embodied engagement with the platform (ex. HDMI modding a Wii to use it on modern flat screen television). The full GBAConsolizer mod, however, radically reconfigures the experience of the so-called original hardware, allowing the GBA to connect to a television via HDMI and accepting input through a Super Nintendo Entertainment System (SNES) controller rather than the GBA's embedded buttons.

Nintendo aficionados might remember the Game Boy Player, an official peripheral that connected to the GameCube via the high-speed parallel port and a dedicated boot disk and enabled the system to play Game Boy, Game Boy Color, and Game Boy Advance cartridges. Unlike the Super Game Boy—a cartridge-shaped peripheral that served a similar function on the SNES—the Game Boy Player used near-identical hardware to that of the Game Boy Advance. Players could use either a GameCube controller or a Game Boy Advance connected via a cable to control their games.

Given the existence of such a peripheral, we found ourselves vexed by the target audience of this mod. Backlight mods serve a very clear purpose: bringing the GBA in line with contemporary standards for consumer electronics. Folks with enough spare cash to purchase a GBA for modding purposes can certainly afford a Game Boy Player. So what gives?

The GAMEBOX website offers the following as a product description:

> 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.

In other words, they're trying to have their cake and eat it too, selling users the idea of authenticity by invoking the retro-fetishistic notion of "original hardware." By "all original hardware," the mod actually means the original printed circuit board (PCB). The full consolizer mod not only discards the screen but also the buttons, drawing input from a SNES controller rather than the GBA itself—all at the cost of gutting a functional handheld.

That said, there are some reasons this mod might be appealing, namely the all-digital HDMI output, sophisticated upscaling, adjustable scanlines (designed to mimic the experience of playing these games on a retro CRT as they would have been played… on the Game Boy Player), and image filtering. In other words, the appeal of this kit lies in deliberately eschewing the "original feels" for an imagined image of what the past looked like. It's worth noting, however, that many of these features can be reproduced with the Game Boy Player by HDMI modding the GameCube, a mod that is much less involved and that allows the GameCube to retain its existing functionality.

That said, this mod is fascinating precisely *because* of how obtuse it is. It's an incredibly tricky mod in that soldering to the test points on the mainboard requires proficiency well beyond most contemporary GBA mods, with a high chance of irreparably damaging the contacts. Between sourcing a functional GBA, performing the mod, and sacrificing the handheld's iconic form factor and portability in favor of a 3D printed box that sits beside the television, this mod is a brilliant case study in modders' technical and aesthetic

priorities.

Materials

- Game Boy Advance
- GBA Consolizer Kit (Full)
- GBA 40/32 Pin Adapter (if you are modding a 32 pin GBA)
- Double-sided tape
- Tri-Wing and Philips Head screwdrivers
- Soldering iron
- Solder
- Wire *note on gauge

- Wire strippers
- Kapton tape
- Cotton swabs and isopropyl alcohol
- Multimeter
- Flux (optional)
- Solder pump (optional)
- Compressed air

Step 1: Test the Game Boy Advance

Unlike most mods, the GBAConsolizer doesn’t require a perfectly functional system. Before getting started, test the GBA to make sure it turns on, that the game loads, and that there’s sound. You can still complete this mod if:

- The LCD is broken (i.e. if you hear the system boot up but see nothing on the LCD)
- The volume wheel doesn’t work (i.e. the sound is stuck at a specific level)
- The power switch is slightly corroded (i.e. it’s difficult to slide the switch back and forth)

Step 2: Open the Game Boy Advance

Using the Tri-Wing screwdriver, remove the six screws marked in the photo below. Then, remove the battery door, switch to a Philips Head screwdriver, and remove the last screw at the bottom of the battery slot.

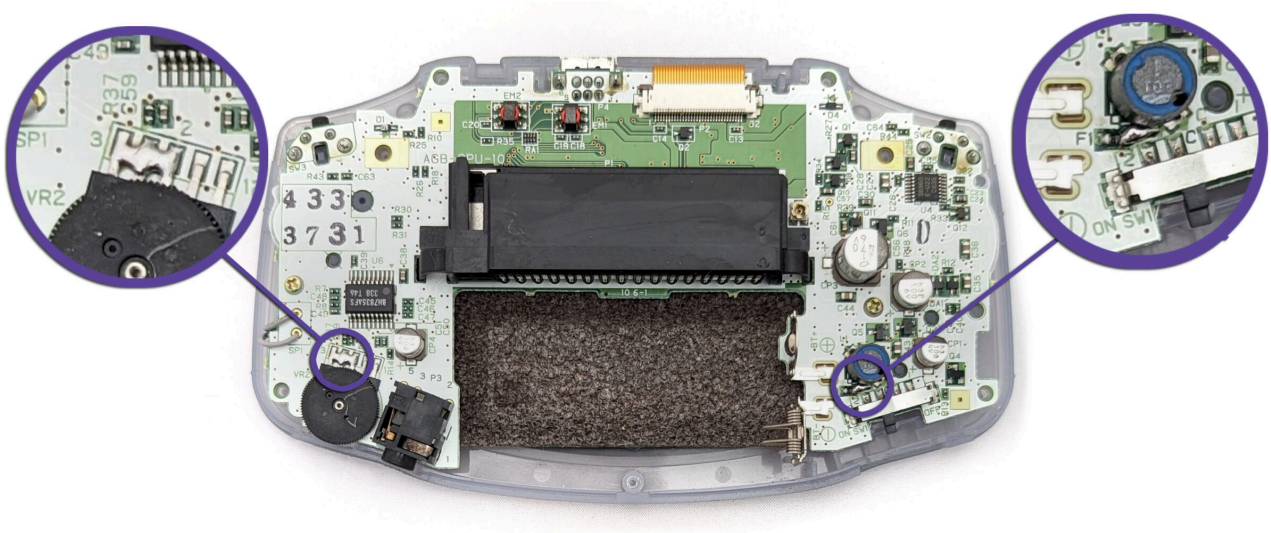
Tri-Wing screwdrivers are specifically designed to open up anti-tamper screws on home electronics. You can buy them numerous places online, but we recommend an iFixit Kit (if you have the budget).

Note: we highly recommend placing the screws in a small container to keep from losing them!

For the full case version of mod—which is the one we're doing here—you can put the buttons away when you remove the back half of the shell. We'll be placing the board in the 3D-printed case with a SNES controller port, so these buttons won't be necessary.

Step 3: Bypass the Power Switch and Volume Potentiometer

Before beginning the mod itself, we're going to complete two bypasses on the board: one for the power switch and one for the volume potentiometer.



Since we're no longer using batteries, we can bypass the F1 fuse by bridging it to the inductor. Add a generous amount of

solder to the board to create that bridge. This bypass eliminates the need for the power switch. If you elect to skip this step, make sure the power switch **will not move** to the off position, since that will cause a short!

The second bypass ensures a full volume output. The potentiometer is connected to five pins, three of which are labeled (Pin 1, Pin 2, Pin 3) and two of which are not. To get full volume at all times, Pin 2 needs to be connected to Pin 3, which can be done by bridging the pins with a lot of solder. We do this bypass because this potentiometer isn't accessible in the full case version; this ensures we send the strongest audio signal to the television.

Before continuing, test both bypass mods by putting the back shell on. You can use two screws to hold it in place, but you don't need to fully close it. When the batteries slide in, the console should power up immediately without you having to touch the power switch; if it doesn't the switch was not bypassed. The handheld should also be at full volume. If the bypass mod worked, you should not be able to lower the volume with the potentiometer.

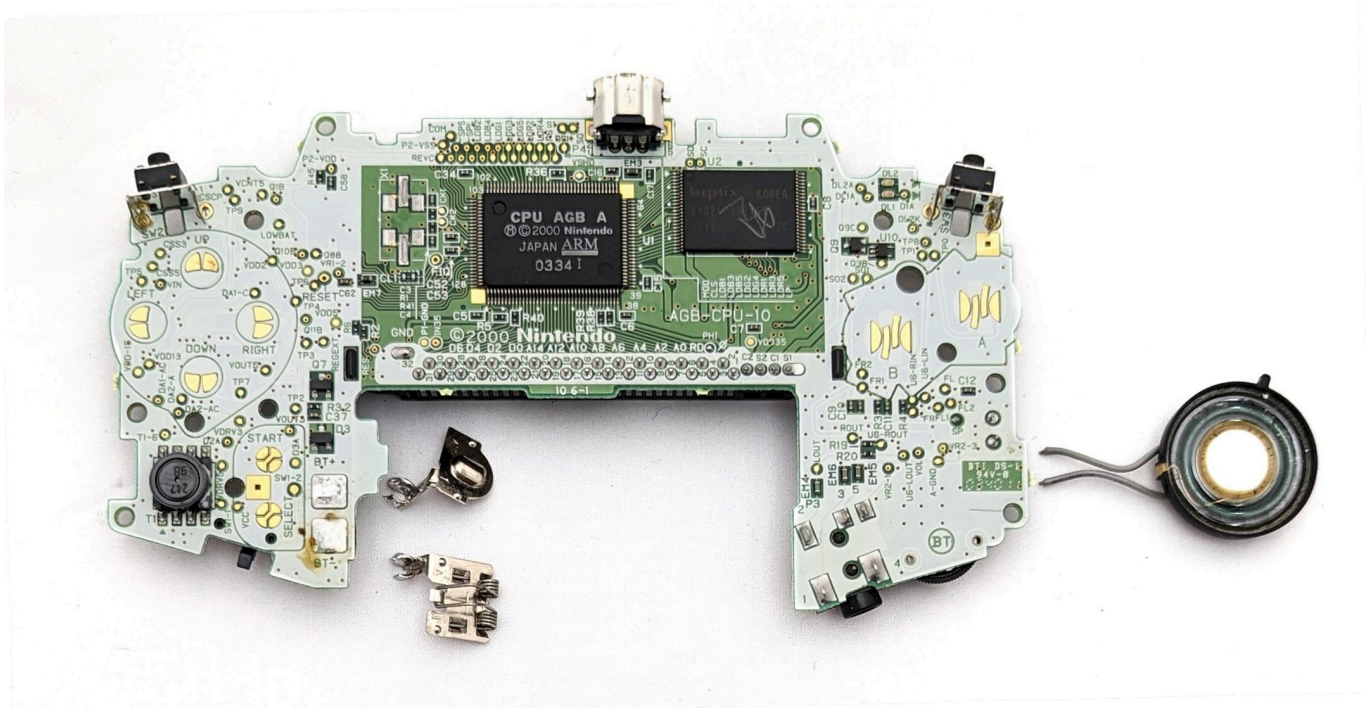
Step 4: Finish Disassembling the GBA

Using a Philips Head screwdriver, remove the three screws holding the mainboard to the front shell (see image below). Remove the ribbon cable by pulling the lock tabs up and very gently tugging the cable free. You can now lift the mainboard from the shell and put the rest of the parts away. We won't be using them for this mod.

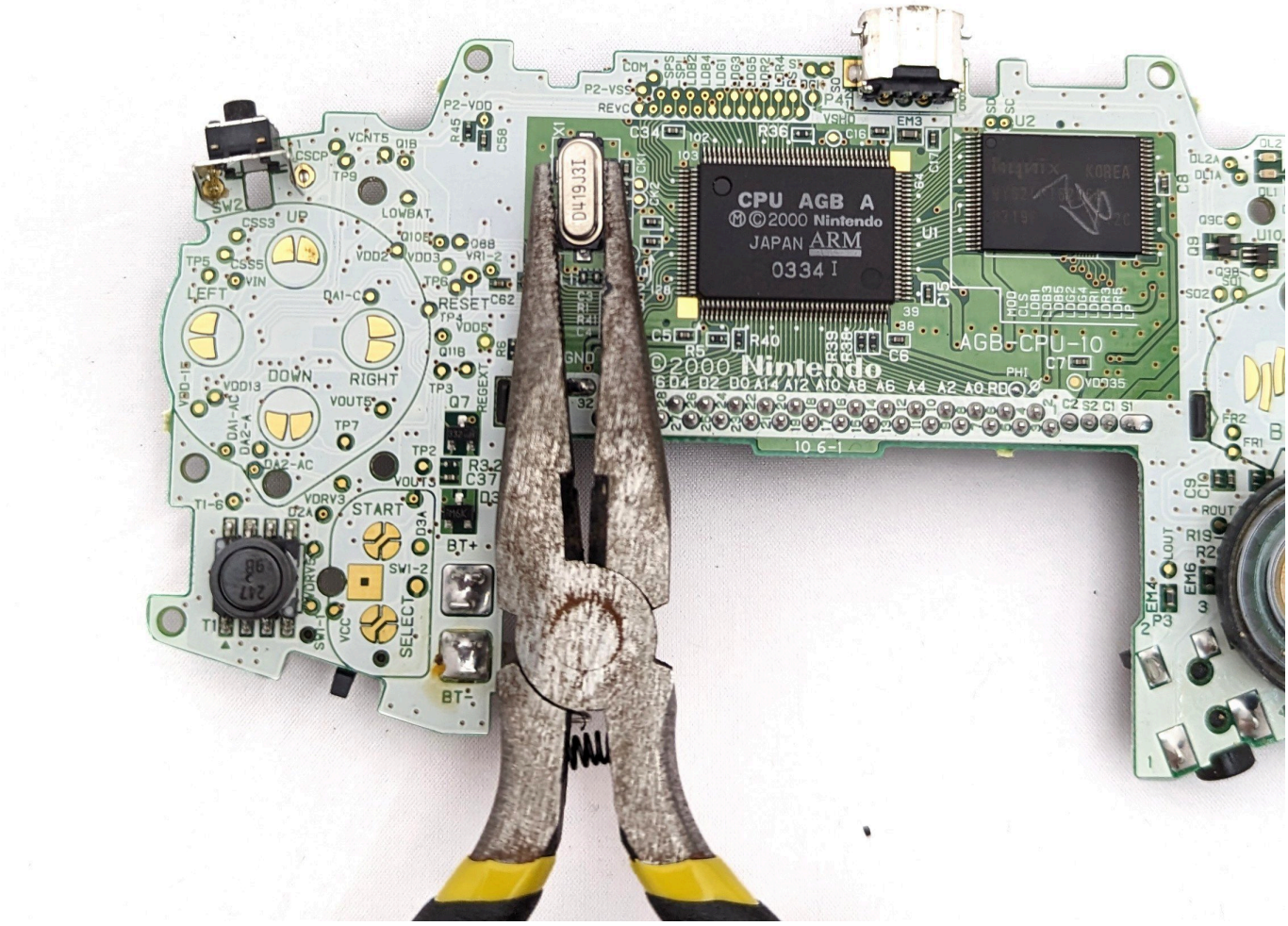
Note: be careful when handling ribbon cables as they are extremely fragile and difficult to replace.

Step 5: Remove the Speaker, Clock Crystal, and Battery Contacts

Next, we're going to remove a few more unnecessary components. First, remove the speaker. You can tug it free, but we prefer to use wire cutters to snip it off close to the board.



Remove the clock crystal from the mainboard. Depending on your board revision, it will either be black or silver. For the black version, touch a blade-tip soldering iron to the two soldering pads under the left side of the oscillator and gently flip it over. If you have the silver version, twist it off with a pair of pliers.



Finally, remove the battery contacts by heating the soldering pads while gently wiggling the contacts with a pair of needle-nose pliers. When the solder melts, the contact will slide out. Do one at a time. If necessary, use a solder pump to remove excess solder to give you more room to work.

Step 6: Install the Breakout Board

Soldering the GBA PCB is finicky! We recommend cleaning the board with alcohol before soldering, applying flux to the test points to allow the solder to stick more easily, and using a slightly lower heat (400-500 degrees) to avoid torching the

contacts.

Now for the fun part! This step involves some extremely difficult soldering. That’s because we’re soldering directly to the test points—tiny, fragile pads that detach from the board if they get too hot! Be very careful. We pulled no fewer than four pads while doing this mod ourselves.

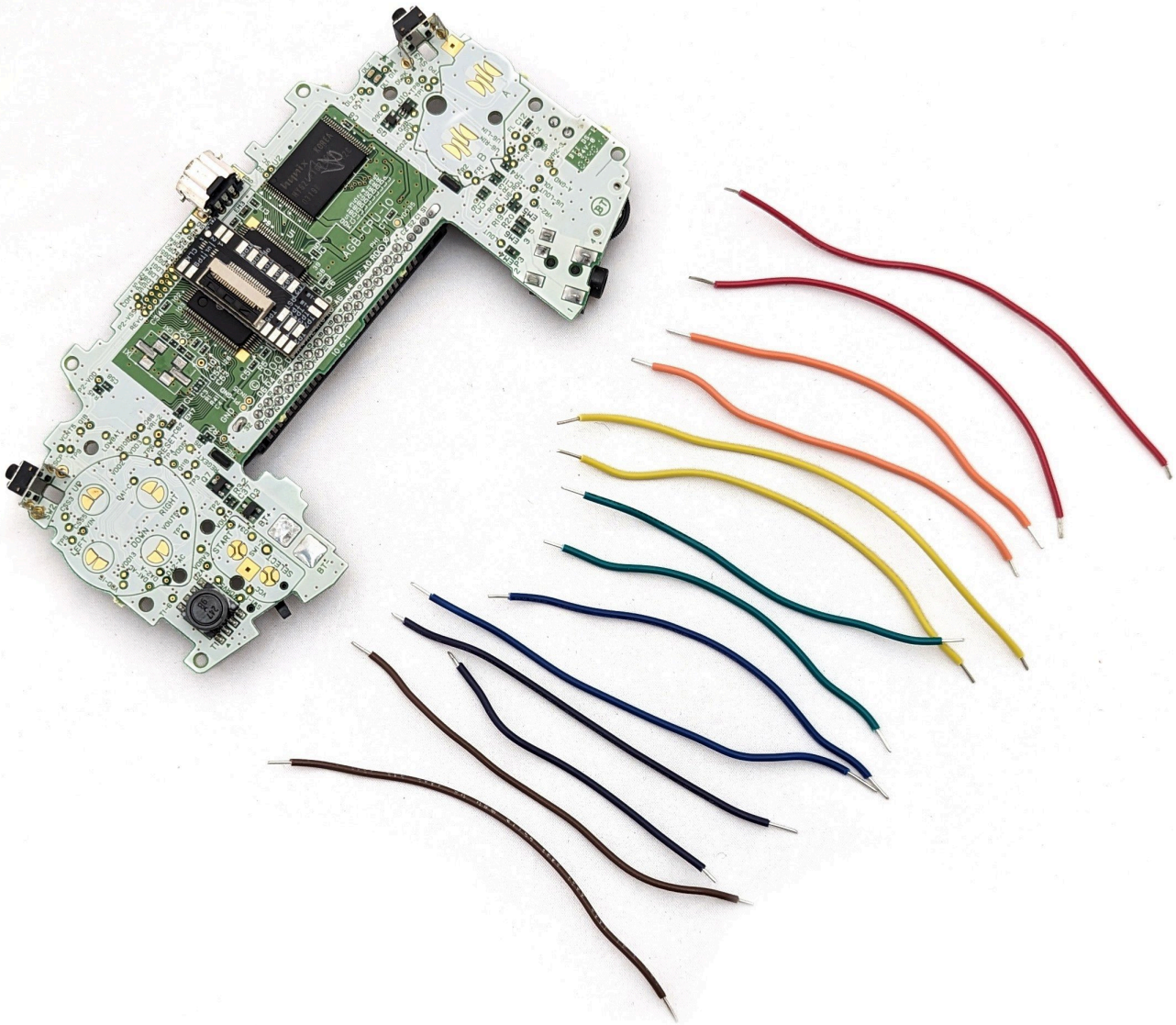
Thankfully, there are alternative approaches as well as solutions to sidestep lifted test pads. We’ll go over multiple options in this tutorial.

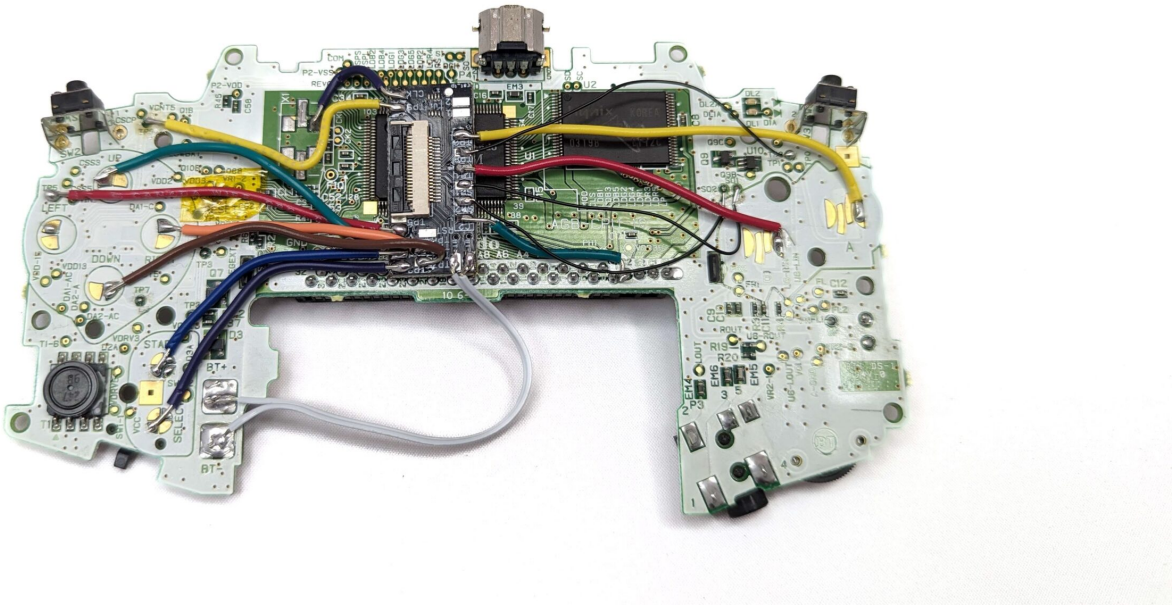
First, if you’re confident in your expert soldering skills, you can follow the straightforward instructions for how to connect the breakout board. For beginner and intermediate modders, we have also included the alternative solution below!

Place the breakout board over the GBA’s central processing unit (CPU). Place it there using double-sided tape. We insulated our board with Kapton tape before placing it.

There are 8 connections on the left side of the board and 8 on the right. The points on the board each correspond to a pad on the GBA mainboard, indicated in the image below.

The kit comes with wire that you can cut to the appropriate lengths, or you can use your own wire. Try to use a fine gauge wire with decent flexibility. The wire we had at our Maker Space was much too thick and inflexible and tore a couple of the test pads off. Cut the lengths of wire as short as possible to minimize overlap. When stripping the wires, ensure that you don’t expose too much of the wire because many of the test pads are close together. If exposed wires touch or you bridge a connection with solder, the mod will not work properly.

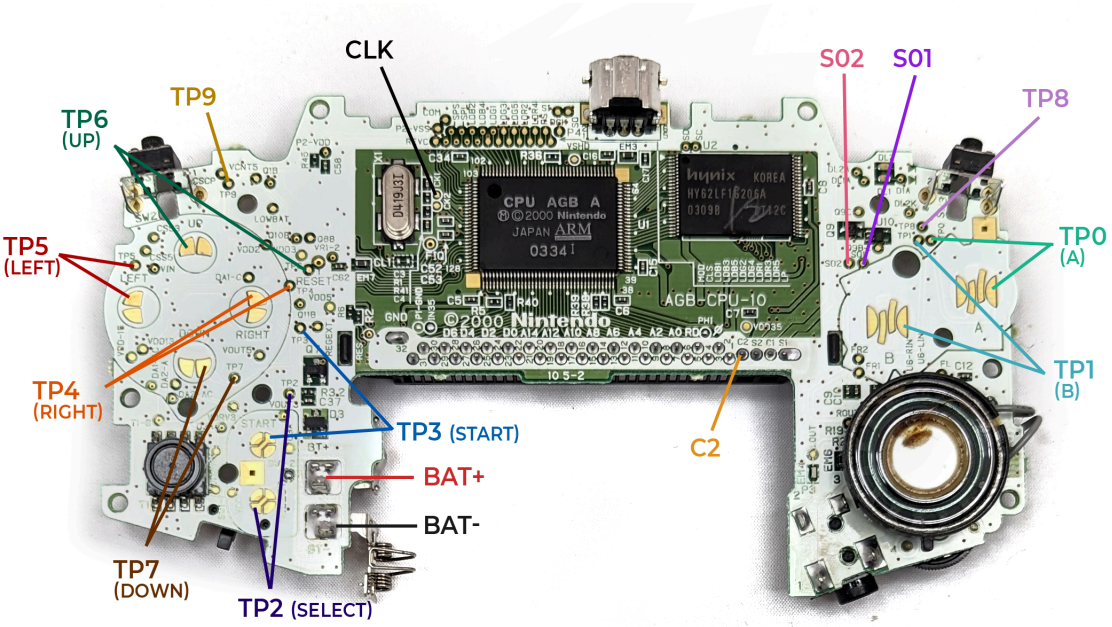

AGB-CPU-10



Alternative Soldering

To make soldering a bit easier, you can sidestep the test points and solder to the larger pads on the mainboard that would usually be covered by the silicone button pads. This is feasible because we won’t be using the GBA as a controller after the full case install; it’s going to be in the 3D printed enclosure anyway.

We used a multimeter set to connectivity to figure out which test point pad connects to which larger contact. We’ve indicated them in the image and table below.



In both cases, don’t forget to solder the battery terminals! The kit includes 3 inches of 28 awg 2 conductor ribbon cable for the power (BT+) and the ground (BT-), the positive and negative battery terminals. Make sure that you don’t switch these or the kit won’t work!

If you lifted a test pad!

Don’t worry! It happened to us, too. There are three solutions to the problem:

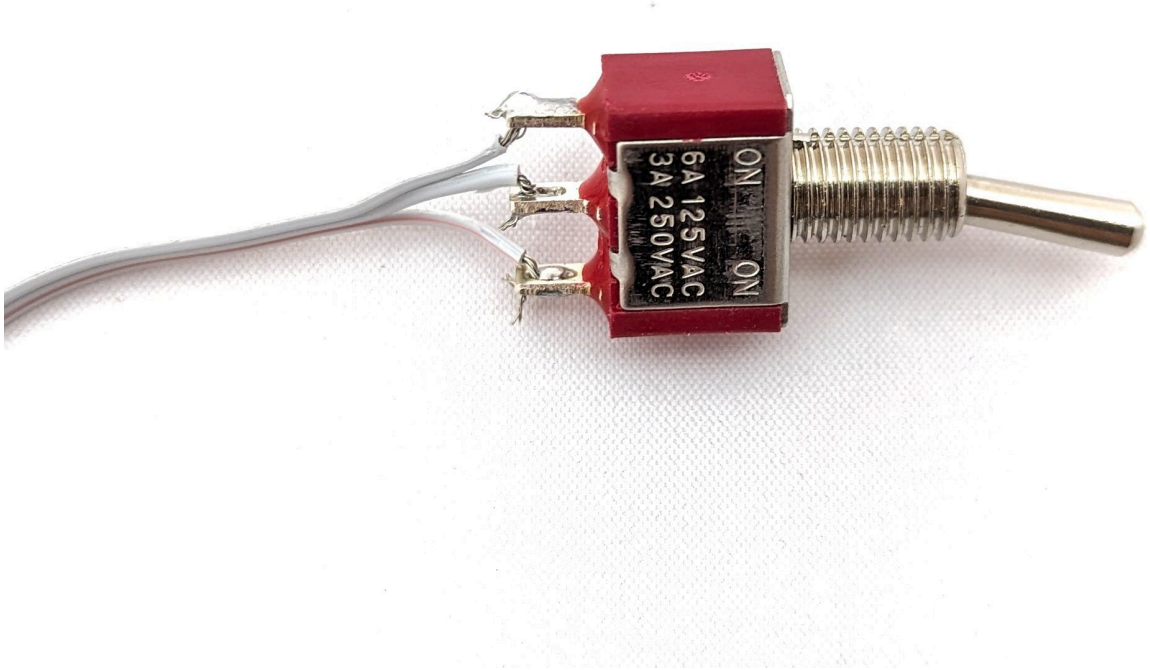
1. Follow the alternative soldering diagram above and solder to one of the large contacts instead.
2. Using a very sharp knife, scrape some of the plastic off the board around the test point to expose the copper trace and solder to that.
3. Follow the trace and solder somewhere else that has continuity. This option will differ depending on the solderpoint. The GBA has a silkscreen over parts of the circuit board that makes it difficult to see the traces all the time. Use a multimeter set to continuity to make sure that you find the right spot!

Breakout Board	GBA PCB Alternate

CLK	N/A
TP 9	N/A
TP 5	Left
TP 6	Right
TP 1	Up
TP 3	Start
TP 7	Down
TP 2	Select
TP 0	A
TP 8	N/A
TP 1	B
S01	N/A
S02	N/A
C2	N/A
BAT +	N/A
BAT –	N/A

Step 7: Connect the Power Switch to the Kit Board

Now we turn to the consolizer kit board itself. First, use the 4-inch three conductor ribbon cable to connect the power switch to the board. Make sure not to twist the cable as you do so. The numbers on the switch should match the numbers on the PCB.



Step 8: Solder the SNES Controller Connector to the Kit Board

The kit includes a SNES controller connector that needs to be soldered onto the board. To do so, slide the pins through the holes and brace the assemblage so that it lies flat. We propped the board up on a piece of plastic to ensure that it stayed level. Be generous with the amount of solder you use to ensure that all the pins connect.

Note: Plug a controller into the connector to help the pins stay aligned during soldering.

Once soldered to the board, cut the legs as close to the board as you can manage. The metal is quite thick, so we recommend using cutting pliers in lieu of flush cutters.

Note: make sure you use safety goggles when cutting the legs! They go flying!

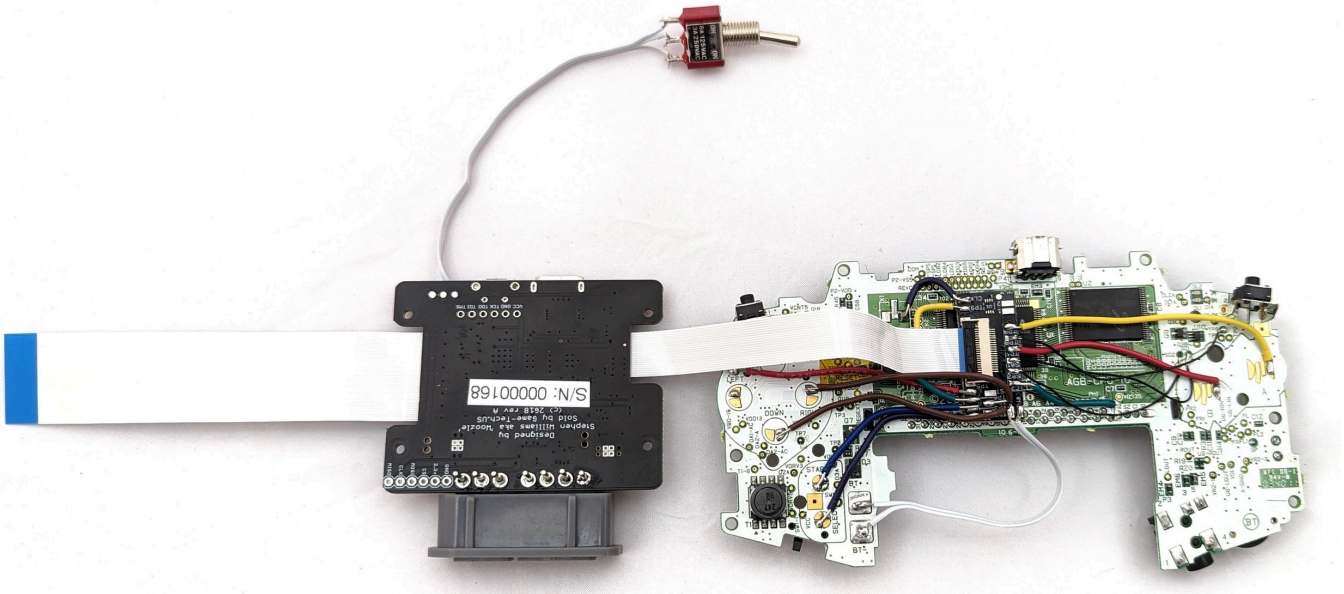
Step 9: Connect the Ribbon Cables

The kit includes two ribbon cables. One connects the breakout board to the kit board, the other connects the kit board to the GBA PCB.

Insert the former by lifting the black lock tabs on the two boards and placing the cable in, blue tab facing up.

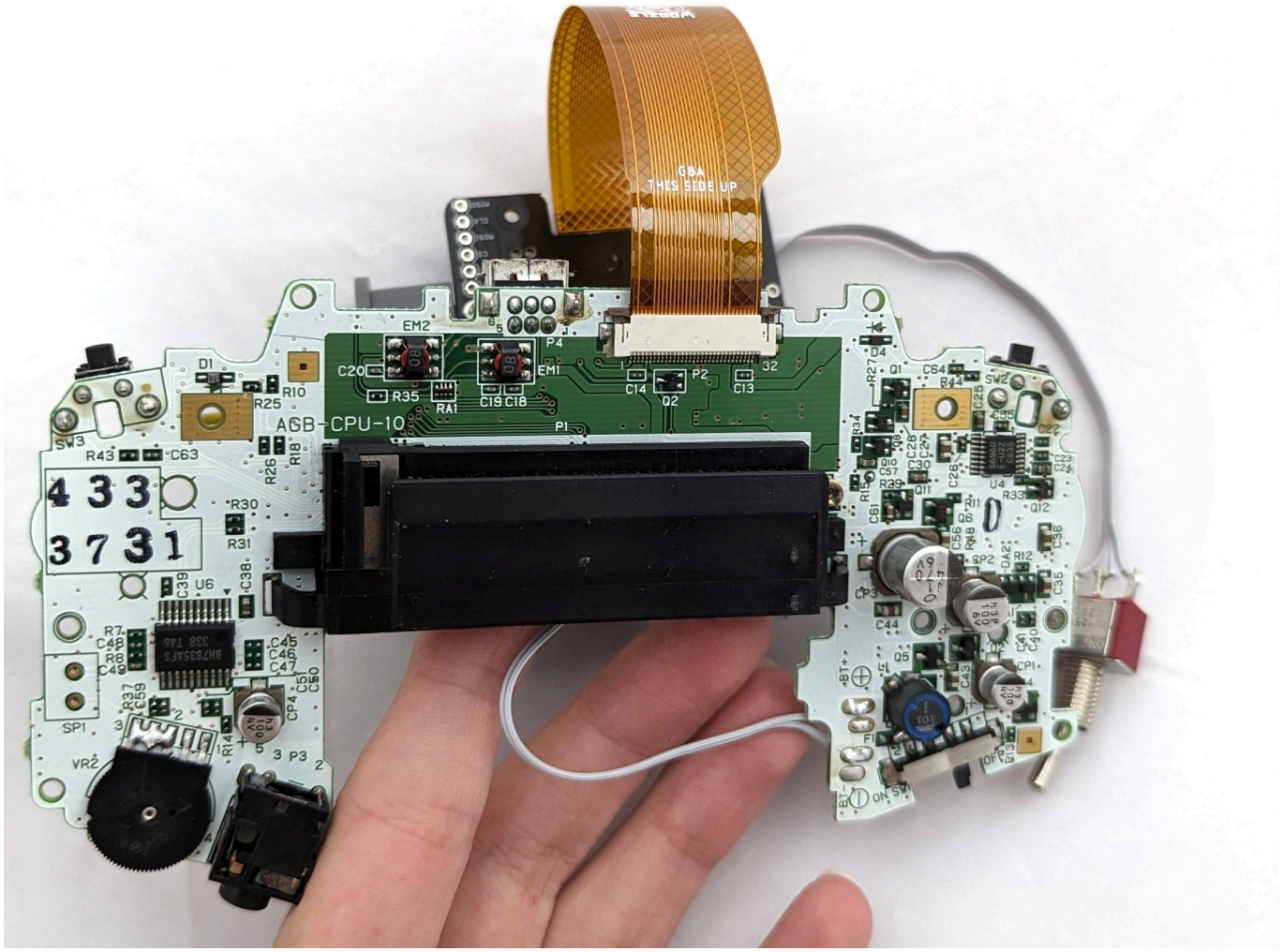
During testing, if the LCD on the kit turns on but you don’t see any picture on the screen, double check that the ribbon cable connecting the kit board to the GBA PCB is facing the appropriate direction! It’s the only one where the blue tab faces down and is an easy mistake to make!

Insert the latter by lifting the black lock tab on the kit board and placing the cable in, blue tab facing up. Insert the other end into the GBA’s LCD connector, blue tab town. Lock it in place by pushing down on the brown tabs on the GBA.



Note: there are two major versions of the GBA, a 40–pin version (identified with serial numbers beginning with a 0) and a 32-pin version (identified with serial numbers beginning with a 1). The kit only includes a ribbon cable for the 40-pin version. The easiest option is to mod a 40-pin GBA. If, however, you only have a 32-pin system, then you will have to order a separate cable to complete the mod.


GBA
THIS SIDE UP
WOOZLE
Stephen Williams
(c) 2019
GBA Consoulizer
32-Pin Adapter
CONSOULIZER
THIS SIDE UP
ON
OFF
SPARTAN 6



Step 10: Testing

This step is extremely important! Before assembling the case, we want to make sure that everything is working as intended. It is extremely tedious to have to take the kit apart after assembly!

Grab a USB micro power cable, mini HDMI cable, SNES controller, and GBA game and hook the frankensteinian monster up to a television. If everything has been connected properly, you should see the game on the screen.

The first time you launch the game, you won’t hear sound unless you’ve hooked a speaker up to the headphone jack. You’ll need to enable DVI+ mode by pulling up the system menu

by pressing Down and Select. Navigate to “system” using the D-pad and press A. Press right on “DVI+ mode” to enable it. You should now hear your game. Save your settings by navigating to the “save” button and pressing A again. This will save your settings for the next time you boot up.

Test all the buttons to ensure that everything is properly soldered.

We ran into a handful of issues during our own testing phase. Here’s how we troubleshooted them!

Finicky controls

We found we had to press the buttons extremely hard to register input, which made the system virtually unplayable. Since our SNES controller is very old, we first took it apart to clean it. That helped a little, but not by much.

Next, we looked at the boards themselves. We triple checked our soldering work with a magnifying glass to make sure that none of our connections were bridged. Some were very close, but we were able to slide a thin knife between the solder, proving that there were no bridges. A bridged connection can cause a variety of issues with the controls, so that’s definitely something to check.

We ended up adding more solder to the pins connecting the SNES controller connector to the PCB. We also removed and reinserted the ribbon cable that connects the breakout board to the kit PCB.

Sound turning on and off

The sound was fussy, turning on and off sporadically. The screen flickered to black each time that happened. We removed and reinserted the ribbon cable connecting the kit pcb to the GBA and that solved the problem.

Note that some televisions are incompatible with DVI mode and will require you to connect a speaker to the headphone jack in order to get audio.

What this tells us is that the ribbon cables need to be inserted very carefully. Try to get it as far into the tab as possible!

Step 11: Assembly – Lower Half

Now that you've confirmed the kit works, it's time to assemble the case around it. During assembly, be very mindful of how you arrange the components. Ideally, you will not have to remove the ribbon cables. If, however, you get the cables twisted, make sure to test the kit again when you remove and reinsert them! In other words, retest the kit each time you touch the cables.

The 3D printed shell comes in five pieces: a flat bottom piece; the lower half of the case with holes for the power switch, HDMI, USB micro, and SNES Controller; the top half of the case with holes for the GBA headphone jack and expansion port; a tab to hold the cartridge slot in place; and a plexiglass cover.

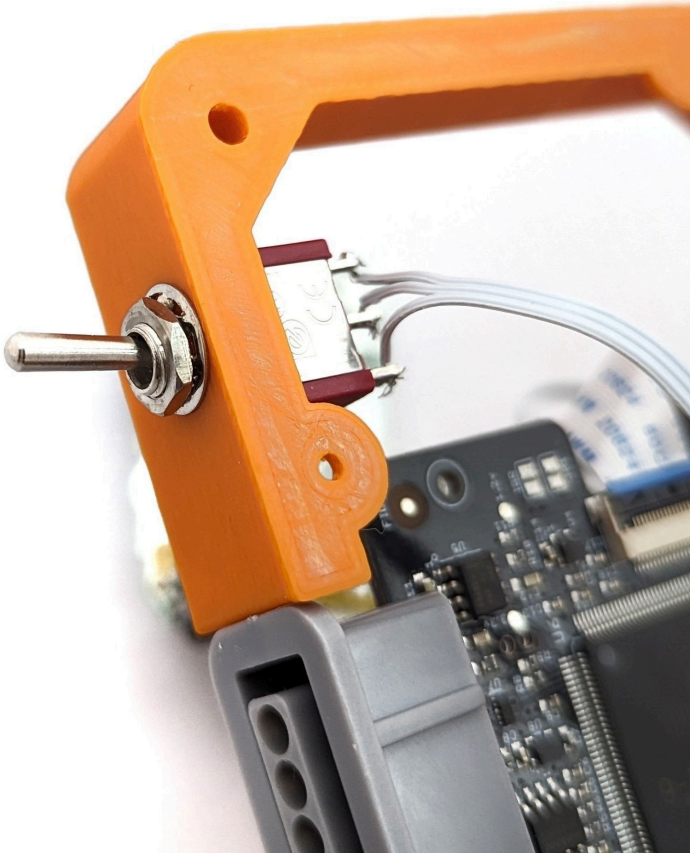
Our first step will be to assemble the lower half of the case.

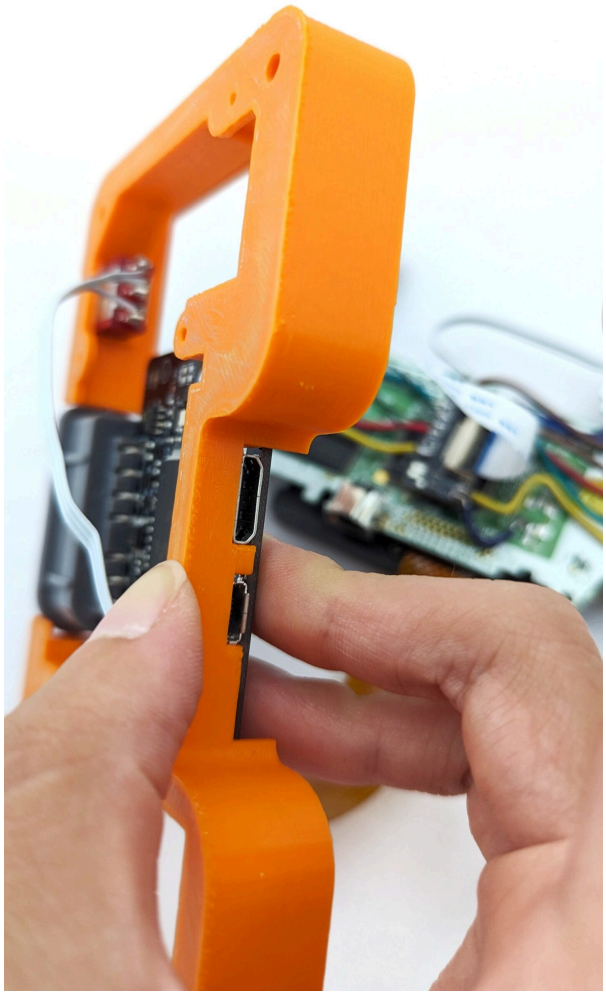
Power Switch

Feed the power switch through the hole. Place the nut washer down over the switch and then tighten the nut over it until it's secure.

Kit Board

Insert the board into the case, components facing up. This should ensure that the HDMI and USB power ports fit into their respective cutouts.





It’s very important to make sure that the ribbon cables are feeding through the case at this point. If they’re not, you’ll have to remove the cables and reattach them to the GBA PCB in order to get it to fit in the case. If you do have to remove the ribbon cables to fit everything in, make sure you test your kit again!

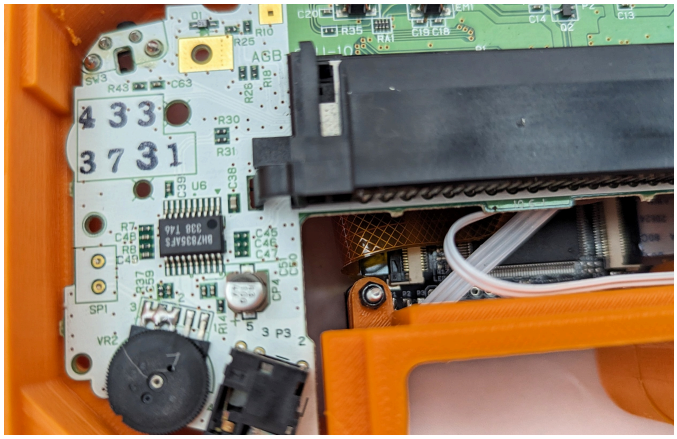
There are three screw bosses that secure the board to the case. Use the three M2 screws to attach them. Secure the one on the bottom right (beside the SNES controller connector) with a nut.

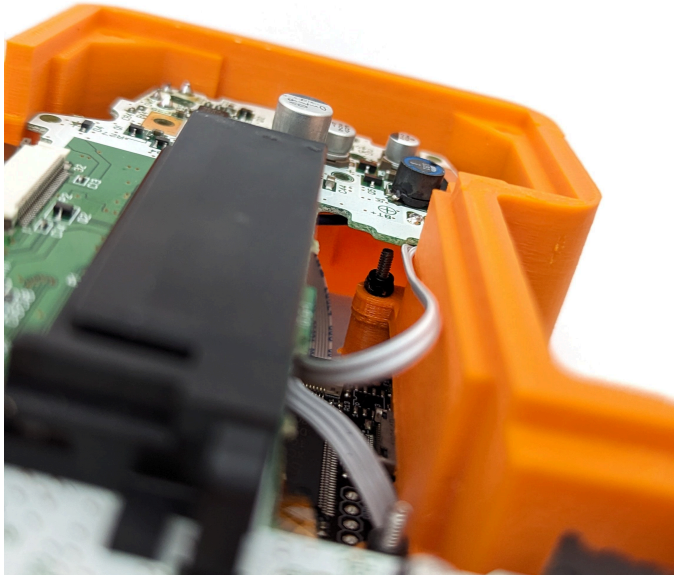
Note: Do not add the nuts for the other two screws yet. You’ll just have to remove it later!

Step 12: Assembly — Top Half

Place the top half of the 3D printed case on top of the lower half. You'll have to feed the body of the GBA through the shell. Do so carefully so as not to strain the ribbon cables. To fix the GBA PCB into place, tilt it at an angle and feed the expansion port into the appropriate hole. Push it down gently until it sits as low as it can.

Note: due to the margin of error in 3D printing these shells, the PCB may scrape the sides of the case. Exert some force to push it into place, but be careful not to push too hard and damage the ribbon cables. If necessary, you can scrape the 3D printed plastic with a sharp x-acto knife.





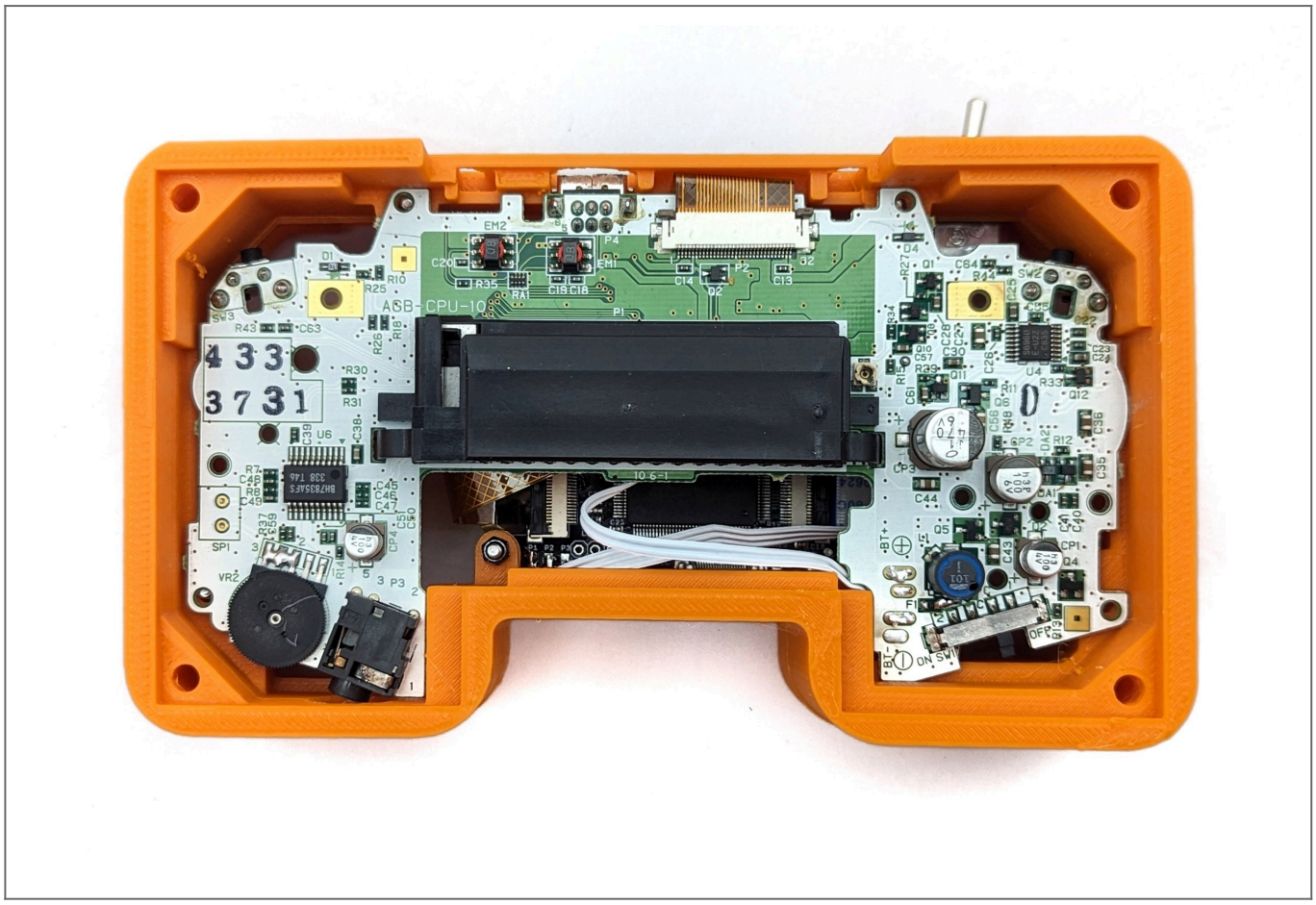
Place the nuts on top of the second layer of plastic and affix them to the screws from the previous step.

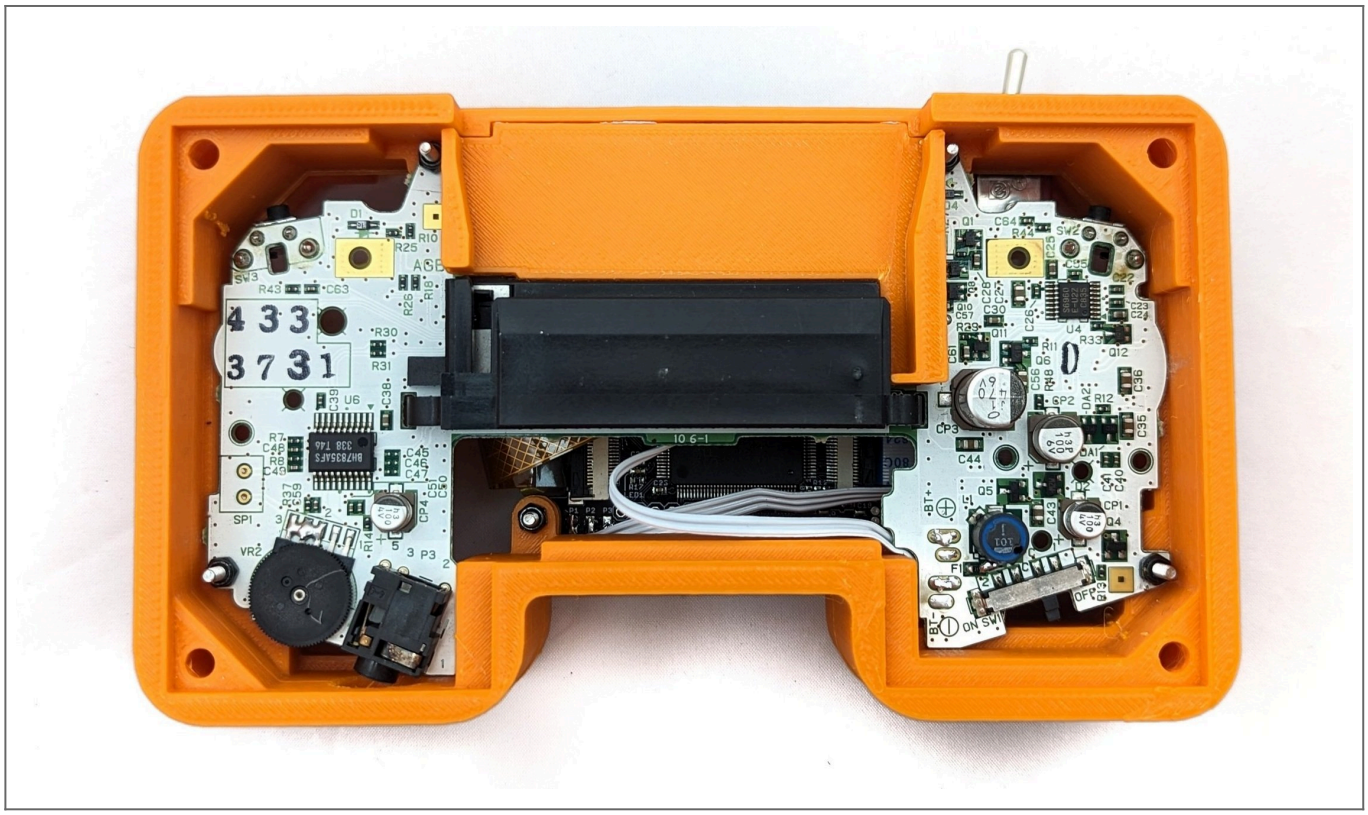
To lock the board in place, feed four M2 screws through the two layers of 3D printed plastic and the board. Secure them with the bolts. Again, this will take some force to keep everything in line.

Note: this part is a lot easier to do with two people: one to tighten the screw, the other to hold the bolt in place with

needle nose pliers.

Next, insert the piece of 3D plastic that acts as a cartridge slot. This piece holds itself in place through tension alone. As a result, it can require moderate force to snap into place.





Step 12: Assembly – Final

If you're as nervous as we were with this mod, test it again before closing the shell!

Once you're certain everything works, place the base of the 3D printed case at the bottom of the shell. Remove the protective film from the plexiglass cover and place that at the top of the case.

We had a lot of difficulty maneuvering the plexiglass lid into the 3D printed case, likely due to the margin of error in 3D printing. While we've seen videos where it just slides in, we ended up having to use small trigger bar clamps to force the plexiglass. Clamps were useful because we could control the tension more than if we had attempted to use a mallet. Be very careful not to place too much force. If necessary, use a very sharp x-acto knife to shave the inside of the case.

Feed the four remaining screws through the holes and fix them in place using the nuts. Try not to exert too much force against the plexiglass when you screw them in.

Last, stick the four feet at the bottom of the case!

And there you have it: you can now play Game Boy Advance games on your television using “original” hardware.

Menu

Open the menu by pressing Down on the D-Pad at the same time as you press select. Navigate through the menu using the Up and Down buttons. Press A to enter a sub-menu and B to back out. Change settings using the Left and Right directions. To reset all settings, press L + R + Start + Select.

The full instruction manual can be found here: https://www.game-tech.us/jason/GBA%20Consolizer%20User%20Manual.pdf

Final Notes

We have very mixed feelings about this mod. On the one hand, it was an exceptional learning experience for us. We ended up studying the GBA's schematics in order to find and expose traces after we accidentally pulled up the PCB's test pads. We learned how the different versions of the GBA (32 vs 40 pin) affect the mod. Everything that could go wrong, did go wrong, so we got some valuable troubleshooting expertise. The fact that the kit uses an HDMI connector makes it easy to connect to modern televisions—something that's becoming increasingly difficult to do with our old consoles now that component and composite connections have been entirely phased out. The visual output is astoundingly crisp—we've never seen such sharp pixels on a GBA game before and we both study emulation for a living. So that's saying something.

On the other hand, the sheer sharpness of the visual output actually confuses the "authenticity" of this mod. While the mod prides itself on using "original" hardware in the form of the GBA PCB, the actual experience of playing the game is so laughably far from anything resembling authenticity. For one thing, GBA pixels were never this sharp on the handheld's LCD. In fact, developers relied on the blurriness to smooth out colors in order to present a cohesive picture. Being able to

pick out all the colored pixels that made up an ostensibly gray arrow is quite an uncanny experience, especially on a large HD television! For another, the kit uses an SNES controller, which predates the GBA by over a decade. Arguably, a more temporally authentic experience would have used the GameCube controller, since the GameCube and GBA were intended to interface with each other from their conception (in a move that anticipates the hybridity of the Nintendo Switch). This mod is thus both backward- and forward-looking, a strange assemblage that seems to speak more to a kind of techno-fetishism than any kind of game preservation.

Ultimately, it’s a fun novelty project, but, if you want to play GBA games on a television, we’d probably just recommend that you pick up a secondhand Wii, which you can mod in under an hour without any complicated soldering.