



RCA Studio II Teardown

RCA Studio II Home TV Programmer Teardown

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INTRODUCTION

Touted by PC World as "[the worst video game system of all time](#)," the RCA Studio II certainly didn't attract much of a fan base during its short two year tenure.

RCA originally passed on the first game console ever made -- the [Odyssey](#) -- which Magnavox started selling with great success. Consequently, they rushed the Studio II to market, which ended up being obsolete (no color and no controllers in an age where competitors had both) when it was introduced in early 1977. RCA discontinued the system by 1979, and the rest is history.

This console is quite rare given the small production number. We managed to acquire this pristine unit at Flash Summit 2010. It was on its way to the [Computer History Museum](#) but we kindly asked to "take some photographs" of it before its final resting place :)

TOOLS:

- [Phillips #1 Screwdriver \(1\)](#)

Step 1 — RCA Studio II Teardown



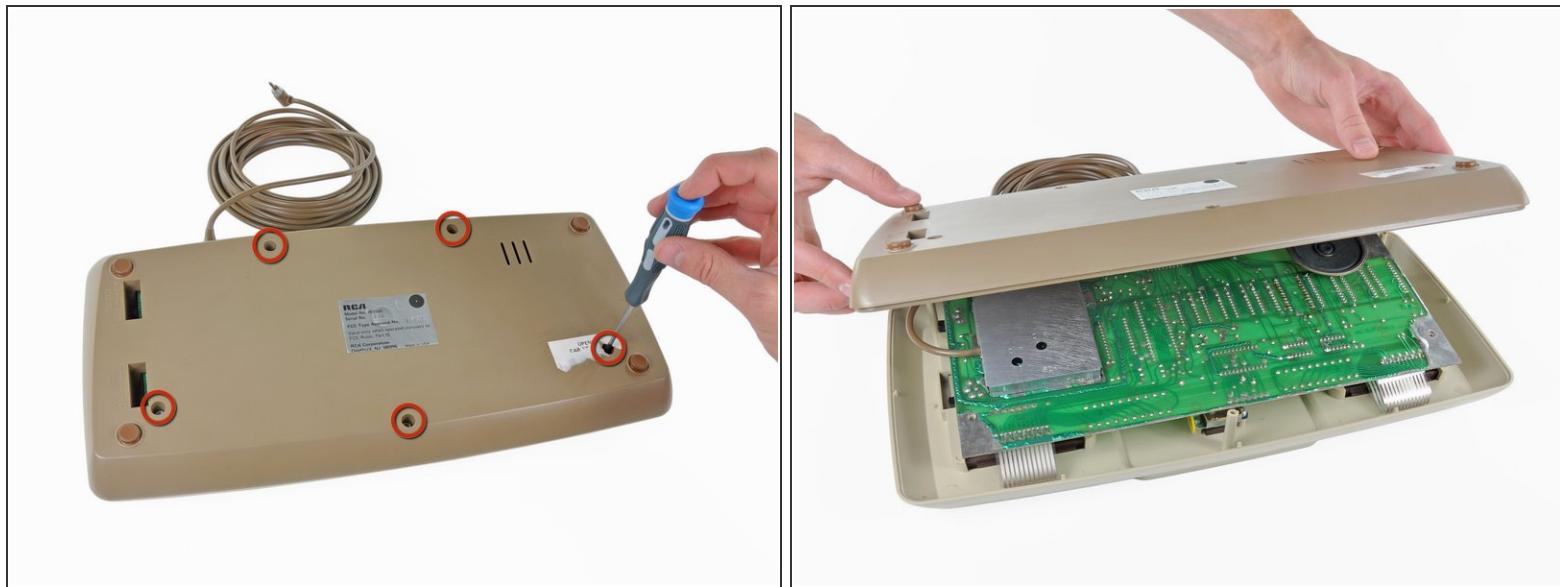
- RCA's first video game system, the Studio II, was released in 1977 with a reported retail price of \$149.95 (about \$525 in today's dollars), which was about \$20 less than its [competitors](#) at the time.
- The Studio II came with five games preinstalled and also had a slot for external cartridges, each one setting you back about \$20 in 1977 (\$70 dollars today).
- One of the Studio II's most redeeming features is its box! Tell me you don't want that guy's red and blue striped polyester shirt.

Step 2



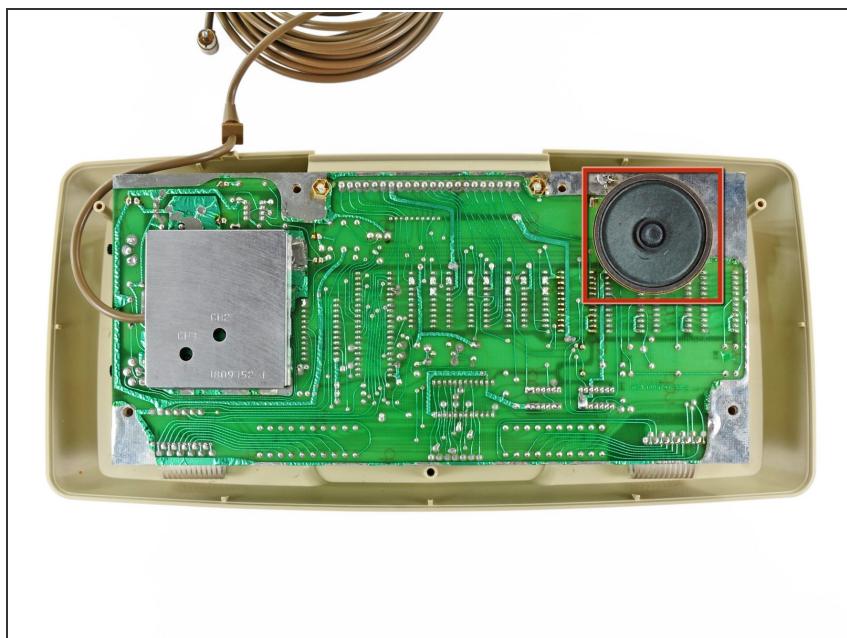
- The '70s vibe continues right onto the sides of the box.
- One side of the box states that it "works on any size Color or Black & White TV." Sweet! Too bad the Studio II puts out a signal in Black & White only.
- The five pre-programmed games stored inside the Studio II include:
 - Freeway
 - Bowling
 - Doodle
 - Addition [Really?]
 - Patterns

Step 3



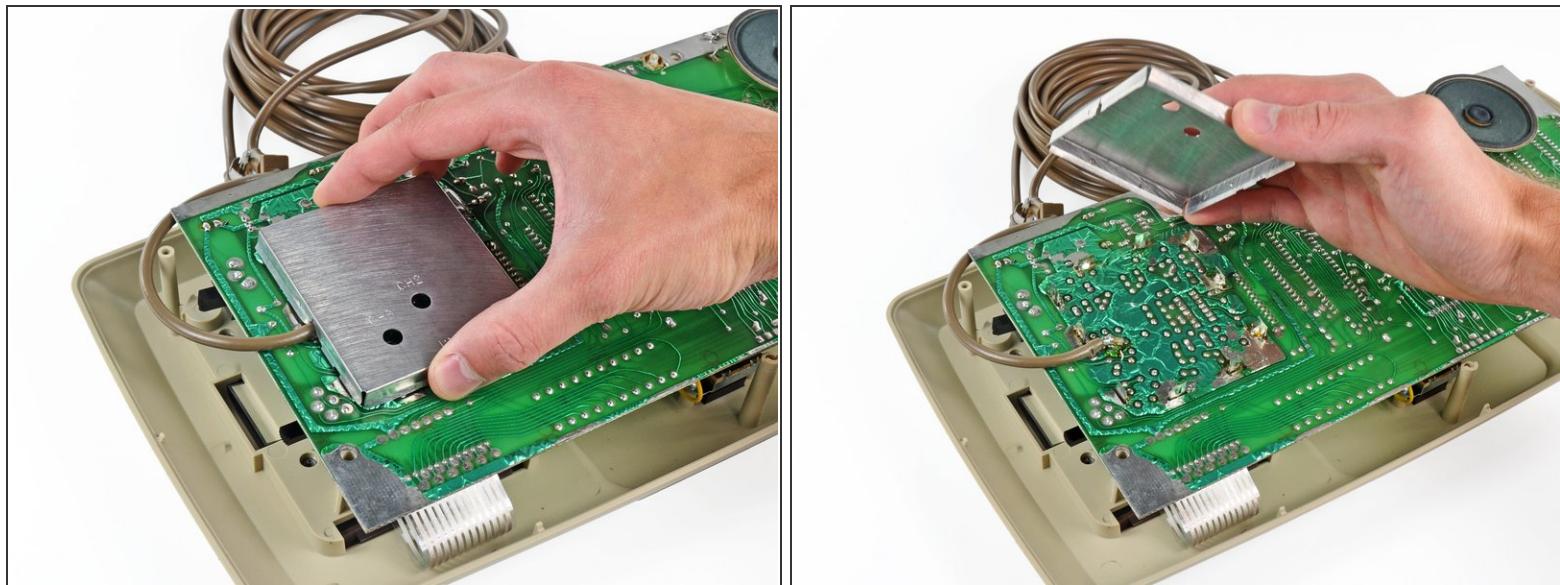
- A meager five screws are all that hold the two halves of the Studio II together. That's 500% more screws than in the [Odyssey 100](#), but half the screws required to open the top cover on a [PS3 Slim](#).
- Lifting off the bottom cover reveals...

Step 4



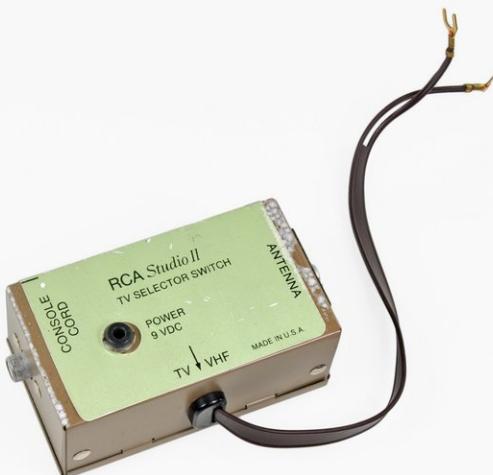
- ...A circuit board!
- The on-board mono speaker is the sole source of the Studio II's sound effects.
- *(i)* Wanna turn down the sound? Too bad -- there's no volume control.
- The extremely large traces and widespread coverage of solder are characteristic of 1970s era electronics; big chips required big boards and a lack of environmental restrictions resulted in boards bathed in lead.

Step 5



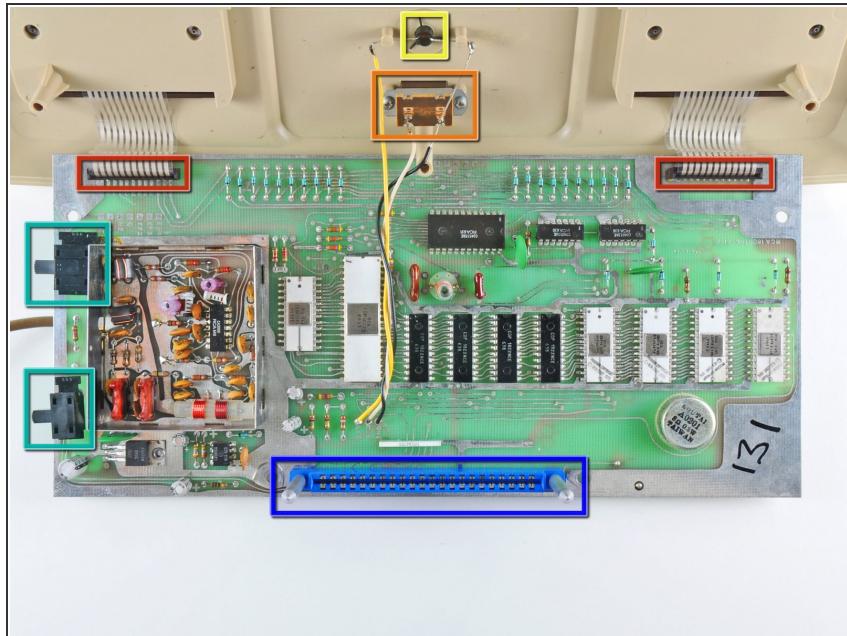
- Ooo, a metal cover. Must be something interesting under there...
- ...Or not. The shield covers the radio frequency section on both sides, and prevents interference from being broadcast.
- *i* The Studio II's singular 18-foot-long [seriously] I/O cable is soldered right to the board. Who needs connectors anyway?

Step 6



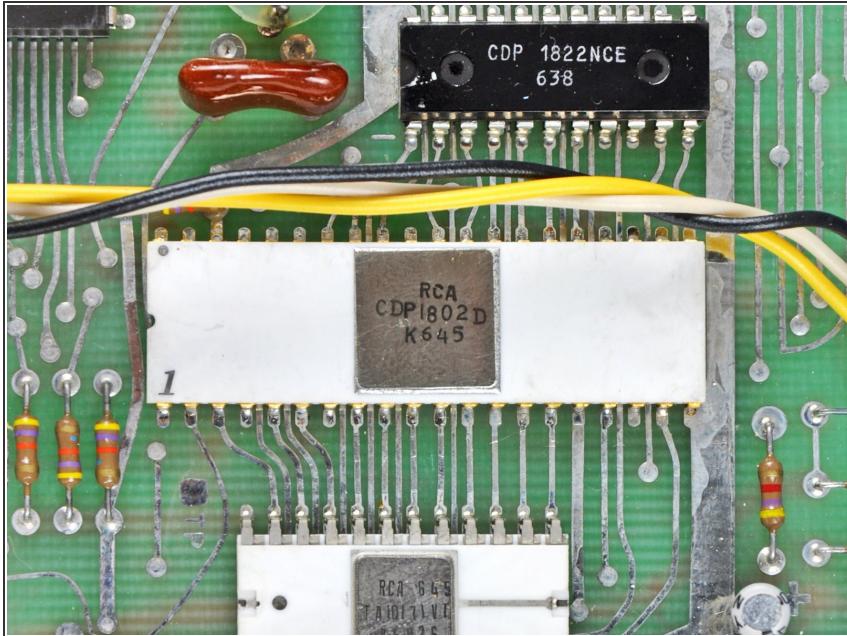
- Speaking of the I/O cable, here's the Studio II's RF switch.
- *(i)* The Studio II has no power button on the unit; instead, it employs a unique method of powering on. When you select "Console Cord" on the RF switch, power goes into the Studio II and data is fed to the TV set. When you select the "Antenna" on the RF switch, the unit powers off and your antenna signal is routed to the television set.
- And inside the RF switch? Some capacitors and inductors that were undoubtedly hand-assembled.

Step 7



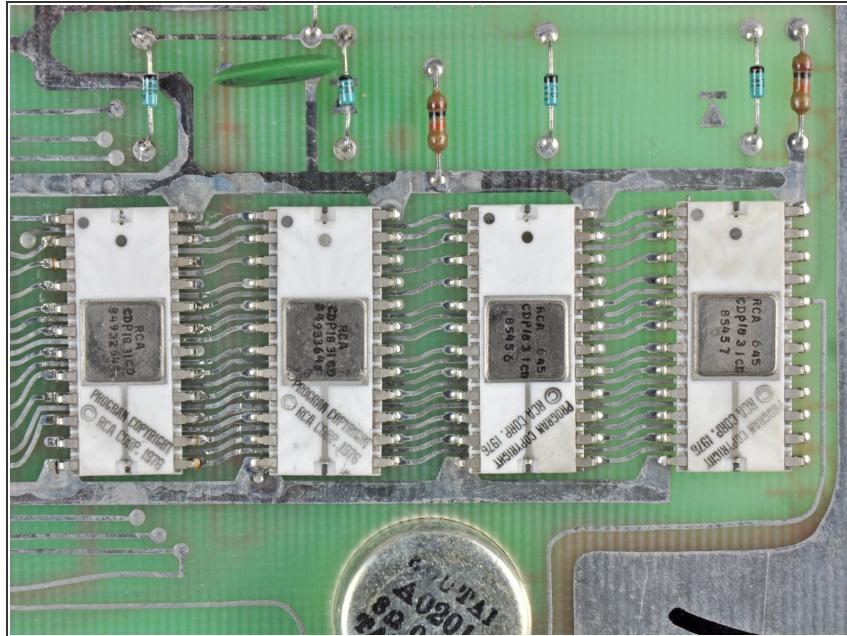
- After the bottom cover is removed, the board can be rotated out of the top case to reveal the ICs hidden on its top face.
- **i** When was the last time you saw white chip packages?
- Some of the major components attached to the board include:
 - Controller inputs
 - Reset switch
 - Status LED
 - Channel select and sound I/O switches
 - Game cartridge socket

Step 8



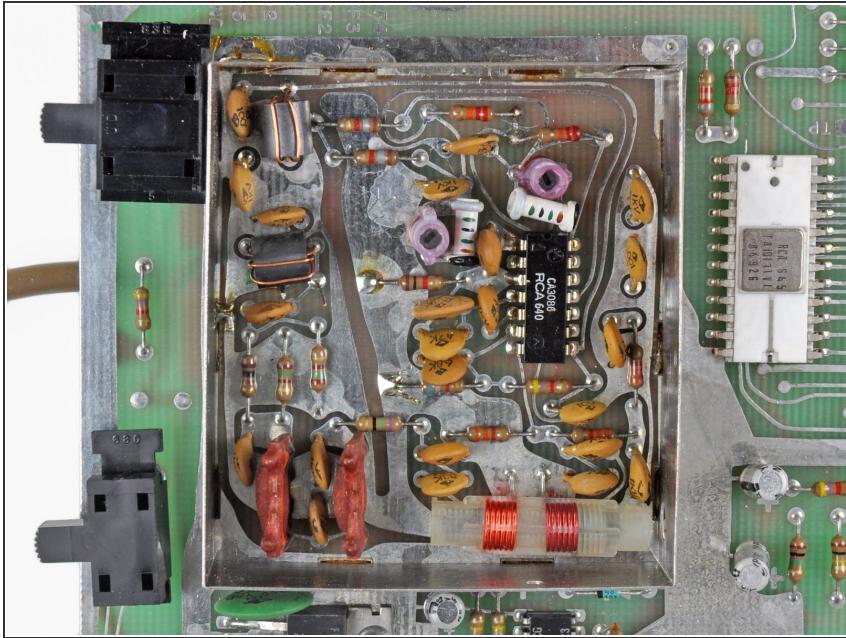
- At the heart of the Studio II lies an RCA CDP1802 microprocessor, running at a scorching 1.78 MHz. Coupled with 2K ROM, 512 bytes RAM, and a 64 x 32 pixel monochrome graphics chip, the Studio II was underwhelming even back in 1977. To put things into perspective, the TI-83 *calculator* (introduced in 1996) operates at 6 MHz and has 32 KB of RAM.
- The RCA CDP1802 was a bit of an unusual chip for its day. A version of the 1802 was [manufactured](#) by depositing a thin film of silicon on a sapphire wafer. The extremely low electrical conductivity of the sapphire wafer prevented any stray electrical current, caused by radiation bombardment, from spreading to (and possibly damaging) nearby transistors on the chip.
- Due to their inherent radiation resistance, six RCA 1802 processors were chosen to control the [Galileo](#) spacecraft during its 14 year trek to Jupiter and its moons. They eventually burned up with the rest of Galileo when it was purposely steered into Jupiter's atmosphere in 2003.

Step 9



- The four ROM chips you see here house the (apparently) copyrighted games that came preinstalled in the Studio II.
- Aside from the five games contained within the system, RCA released an additional nine game cartridges to bring the total count to a staggering 14 games.
- Compare this to the 900+ games made for the Atari 2600 (and its awesome joysticks), and it's not hard to see why the Studio II was such a staggering failure.

Step 10



- Here's a closeup of the Studio II's RF modulator. The power supply also comes in through this cable and is separated here.
- i* It is interesting to note that all the components attached to the circuit board are through-hole. Although surface-mount technology had existed since the '60s, it was still more expensive than the commonly available through-hole components of the day.
- The pattern for the traces connecting components across the board is most definitely hand-drawn. This was very common before computer-aided design programs were used to make very straight, organized traces. Most of the wide solder areas are the ground plane.

Step 11



- For a three decade old console, the RCA Studio II put up quite a fight. But in the end, defeat was imminent for the "worst video game system of all time."
- We showed off the console to Woz the other day. He got a real kick out of it because it was designed at the same time he was designing the Apple II. [Unlike the Apple II](#), the Studio II did not ship with circuit schematics.
- Keep an eye on our [teardown](#) page or [blog](#) for a detailed look at another retro game console tomorrow!

To reassemble your device, follow these instructions in reverse order.