

**SET UP & INSTRUCTION MANUAL**  
**REV. 0.8**

# MODE

MULTI OPTICAL DISC EMULATOR





# **ATTENTION!**



***This Installation Guide is a work in progress, an advanced revision is forthcoming.***

***Please visit our Discord channel for further assistance:  
<https://discord.gg/JexuJVW> if you have any questions or concerns.***

# MODE

MULTI OPTICAL DISC EMULATOR

***MODE is an Optical Disc Emulator for both the Sega Saturn and Dreamcast consoles.***

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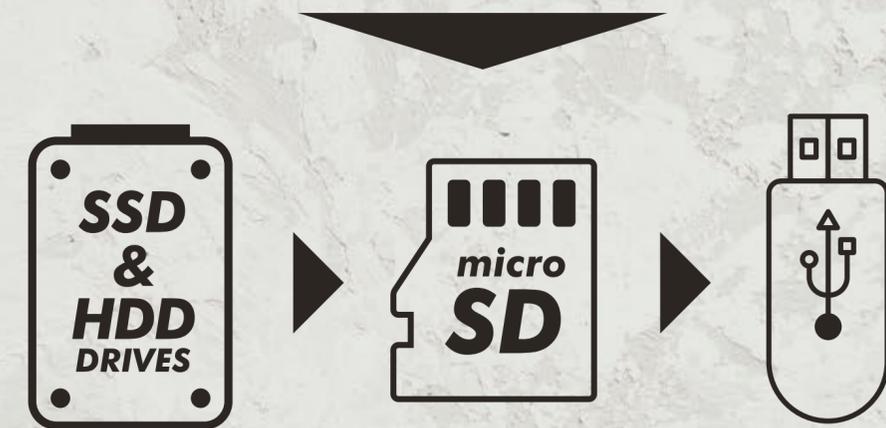
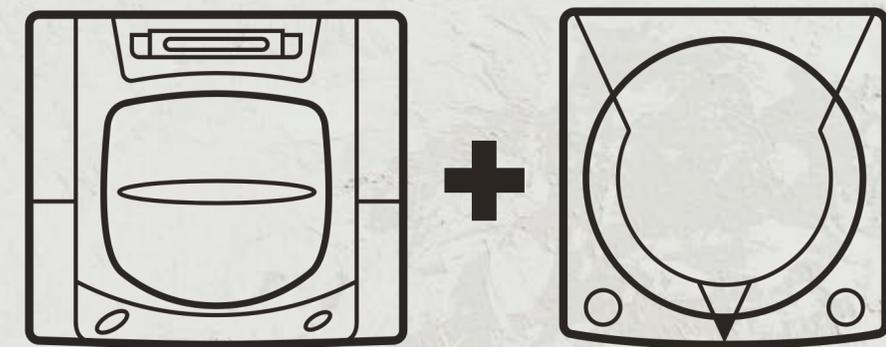


***WARNING!***

***PLEASE READ THE ASSEMBLY  
INSTRUCTIONS CAREFULLY  
BEFORE INSTALLING MODE  
IN YOUR SYSTEM***

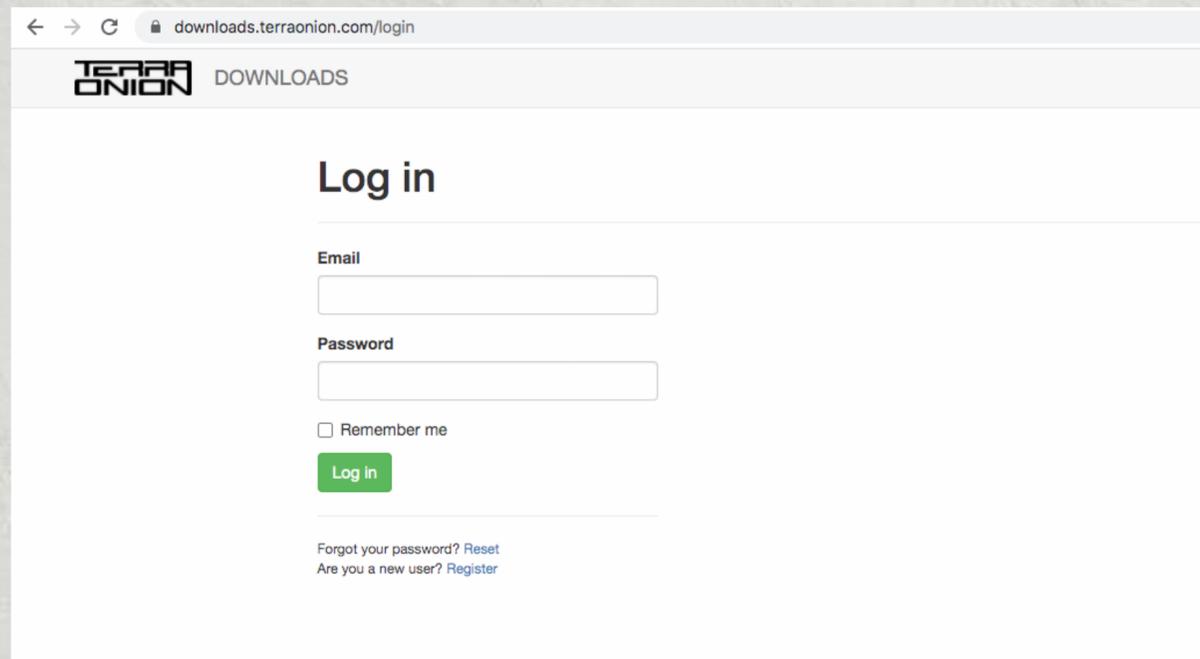
## Key Features

- Supports both 20 and 21 pin Sega Saturn models
- Supports VA0 and VA1 Dreamcast models (VA2 not supported)
- Auto region patching (loads games from different regions without patching games)
- **Auto detects the console that it's plugged into. No jumpers to configure**
- SATA port for 2.5 inch laptop style Hard Drive or SSD
- USB port for thumb drives
- MicroSD card slot
- Supports both exFAT and FAT32 formats of greater than 2TB
- Compatible with Redump and Tosec images (for both Dreamcast/Saturn)
- Compatible with CDI, GDI, CCD, MDF, BIN/ISO/WAV +CUE images
- **Plug and play with no soldering required**
- 2 User interfaces: Simple list view and Advanced Cover Art
- Supports multiple disc games
- Zero seek times providing faster load times
- Supports MPEG card, ActionReplay/PseudoSaturnKai and Saturn RAM cart
- DC Digital, DreamPSU and PicoPSU compatible



**SEGA Saturn & Dreamcast compatible  
HDD/SSD, MicroSD & USB Drive storage**

## Registering your MODE device



← → ↻ 🔒 downloads.terraonion.com/login

**TERRA ONION** DOWNLOADS

### Log in

Email

Password

Remember me

**Log in**

[Forgot your password? Reset](#)  
[Are you a new user? Register](#)

Go to <https://downloads.terraonion.com/> and login with your username and password.

If you have never registered a Terraonion device before, please create an account. During the account creation part it will ask you to enter the serial number of your device. Shop account is different than downloads account so a new account has to be created in order to access Downloads section

You can find the serial number one of two ways:

- On the MODE PCB itself there is a box that says serial and it will have a printed serial number label.
- Or if you power on your console and at the MODE menu press the X button (on Dreamcast) or press C button (on Saturn) to bring up the Options menu. From here go down to Version and press the A button. This will bring up a box with serial number info along with firmware information.

By registering your device you gain access to firmware updates.



# MODE PCB Layout and Connectors / Top of MODE PCB

## External Power Connector

(For some Saturn 21 pin models. See Below)

## External Power Connector Switch

## Saturn 21 PIN Data Cable Connector

## SATA Drive Connector

## Saturn 20 PIN Data Connector

## Expansion Connector for JST9 harness

(Not included. See Advanced Install section)

## Saturn 21 PIN Power Connector

## Saturn 20 PIN Power Connector

## Saturn 20 PIN Tray Connector

## MicroSD Slot

## Expansion Port

(Reserved for possible future use)

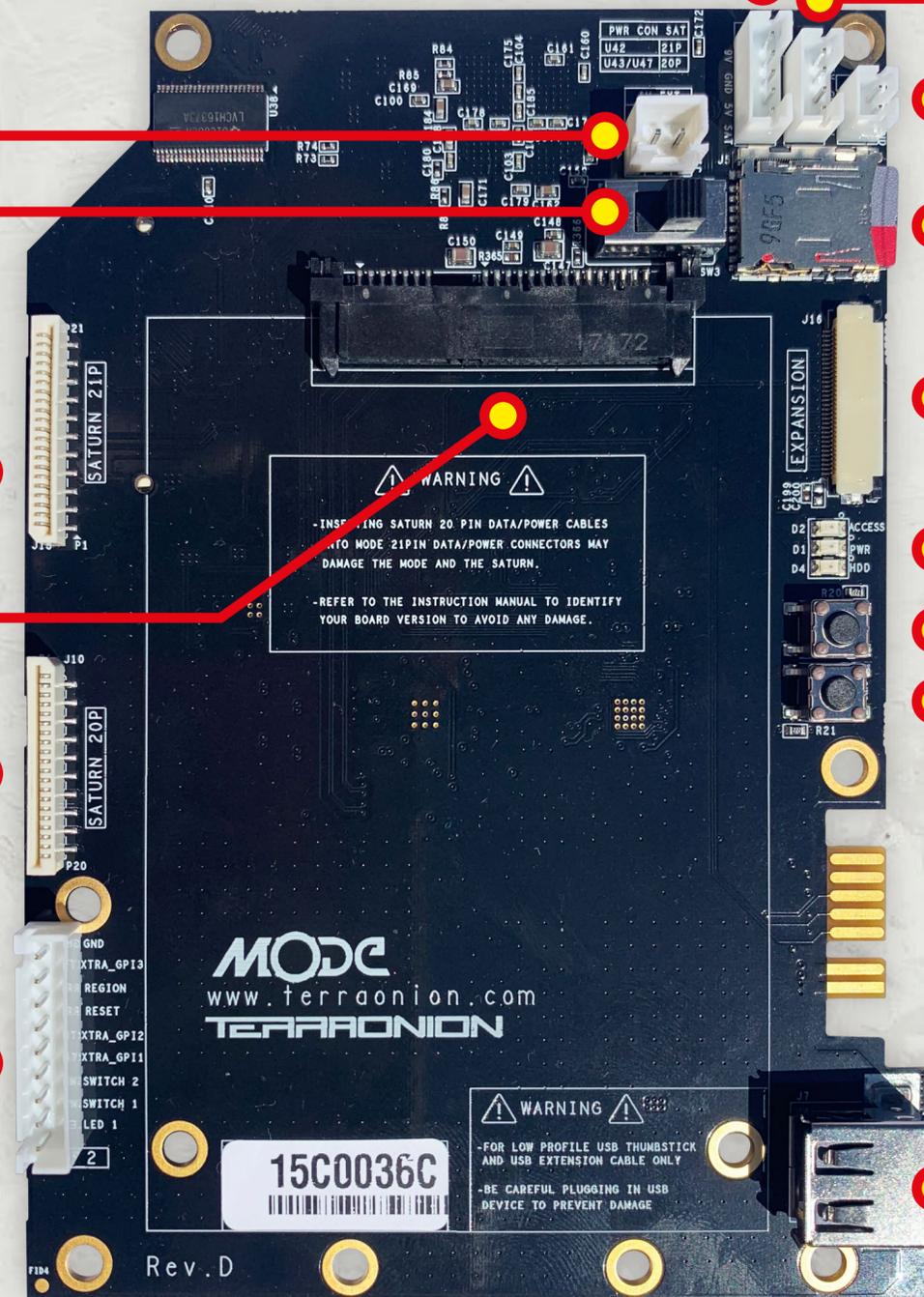
## Leds

## Switch 1 (SW1)

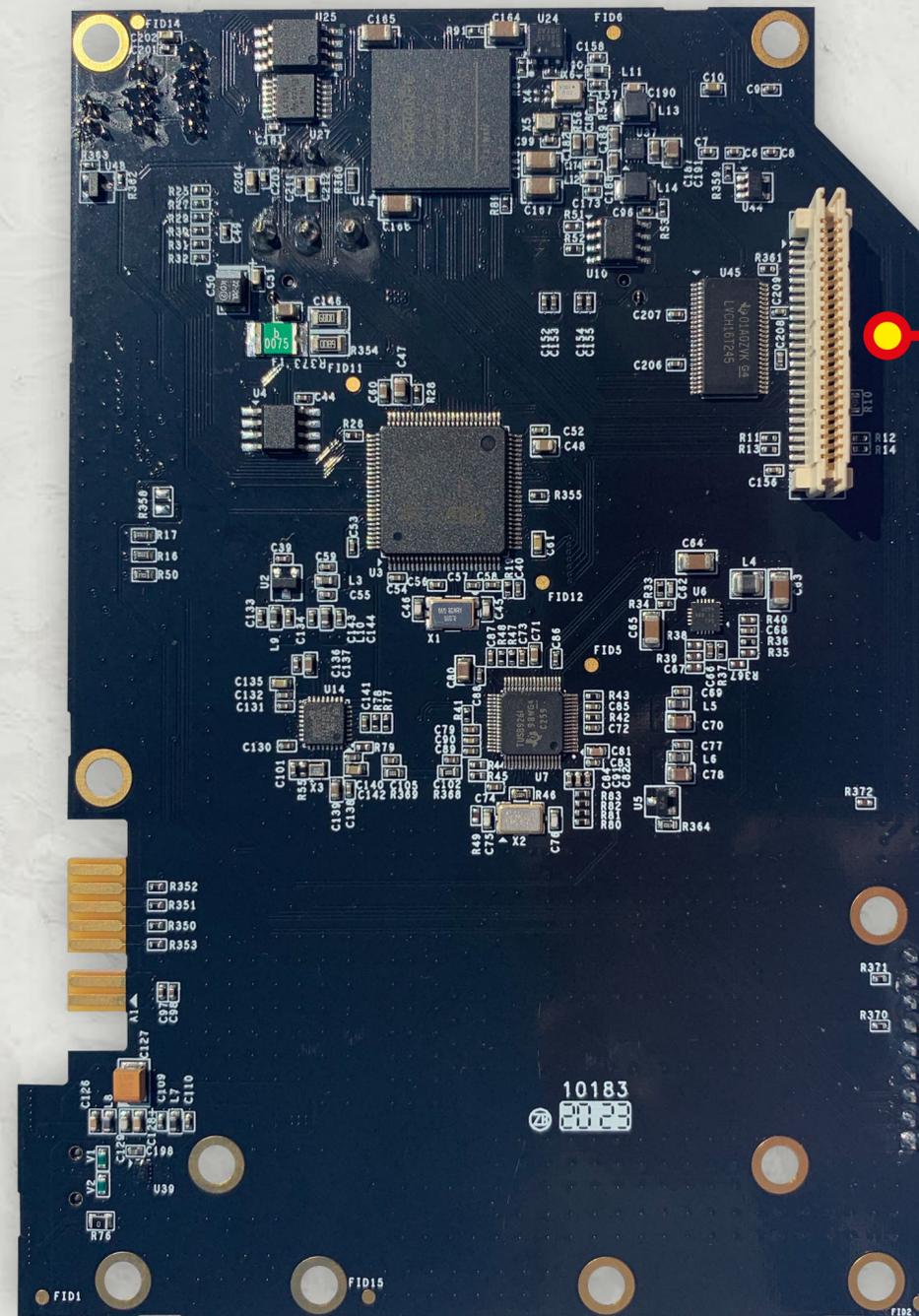
## Switch 2 (SW2)

Disc swap/return to menu button

## USB Connector



# MODE PCB Layout and Connectors / Bottom MODE PCB



Dreamcast Connector



# ***Saturn*** ***Install Instructions***

## General Saturn Install Instructions

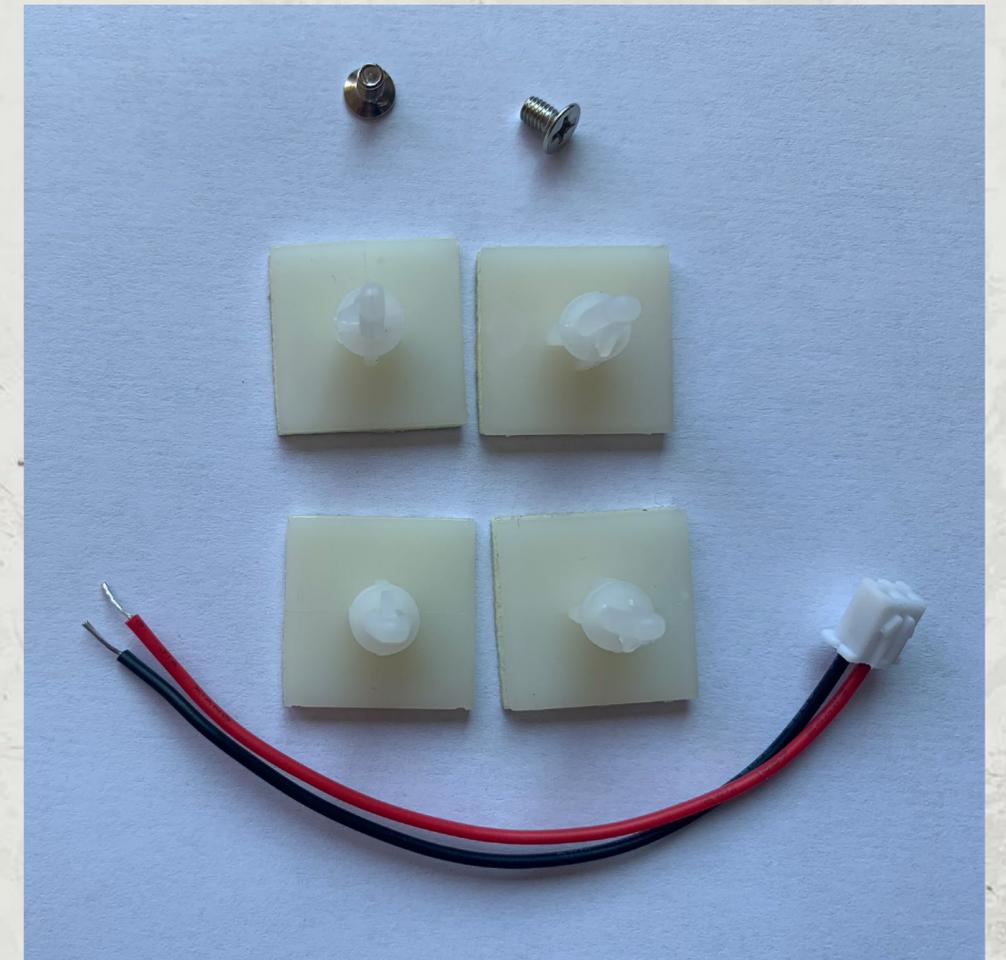
The following represents common Saturn installations for all revisions with the exception of the earliest Saturn model which has the power supply in the lid of the unit.

### Accessories included in the MODE box:

- 2 SATA drive screws to hold down a hard disk or SSD
- 4 adhesive feet to secure MODE to the console (enough for 1 console)
- 1 Optional Sega Saturn power cable (Only needed in case your console requires it. See below)

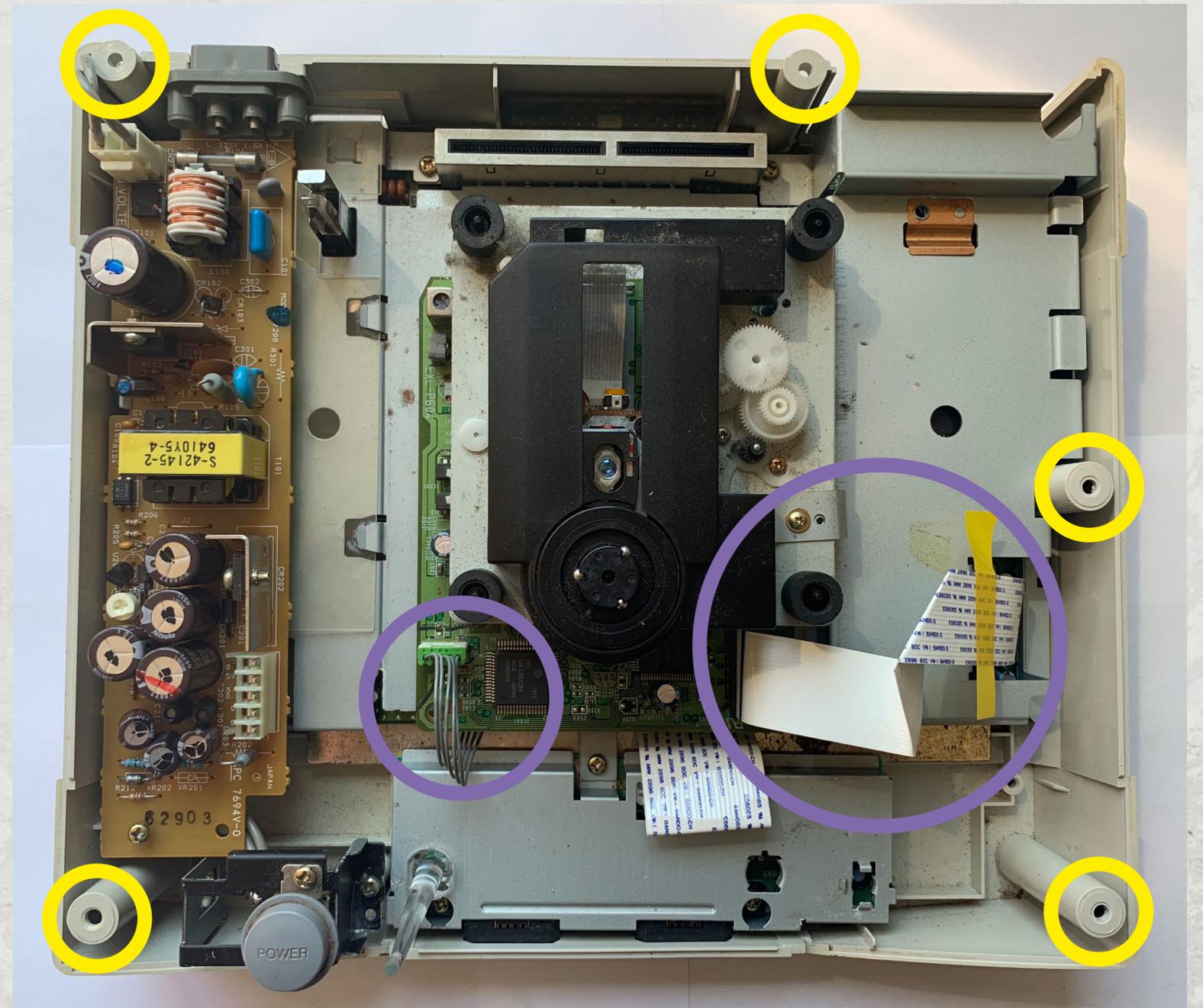


***If at any point in these instructions you have questions about the install please contact [support@terraonion.com](mailto:support@terraonion.com)***



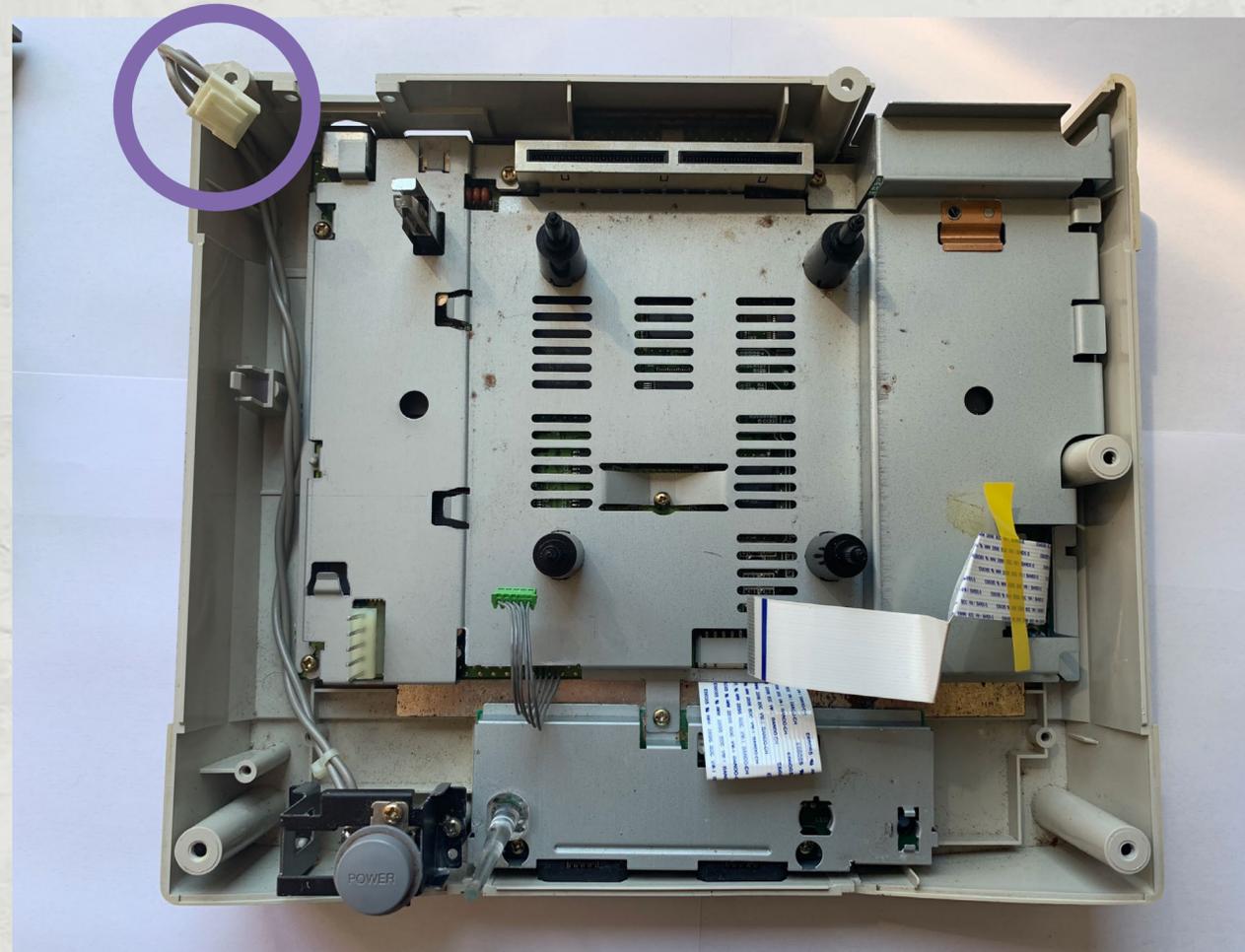
## General Saturn Install Instructions

- Start by removing the rear battery/expansion cover door.
- Flip over your Sega Saturn console and **remove the 5 screws** holding the top to the bottom case.
- Lift off the top cover. If your Saturn has the power supply in the lid please disconnect the wiring from the connected wiring from the CD Assembly. Then set the lid aside.
- **Disconnect any cables and data ribbon cable** from the Saturn optical drive and lift the drive out of the console. Note how many connectors are on the lower left of the CD-ROM if you have a single 5-pin connector you have a 21-pin Saturn (as shown here). If you have 2 connectors (a 2-pin and a 4-pin) you have a 20-pin Saturn. Set the CD Drive aside as it won't be needed again.



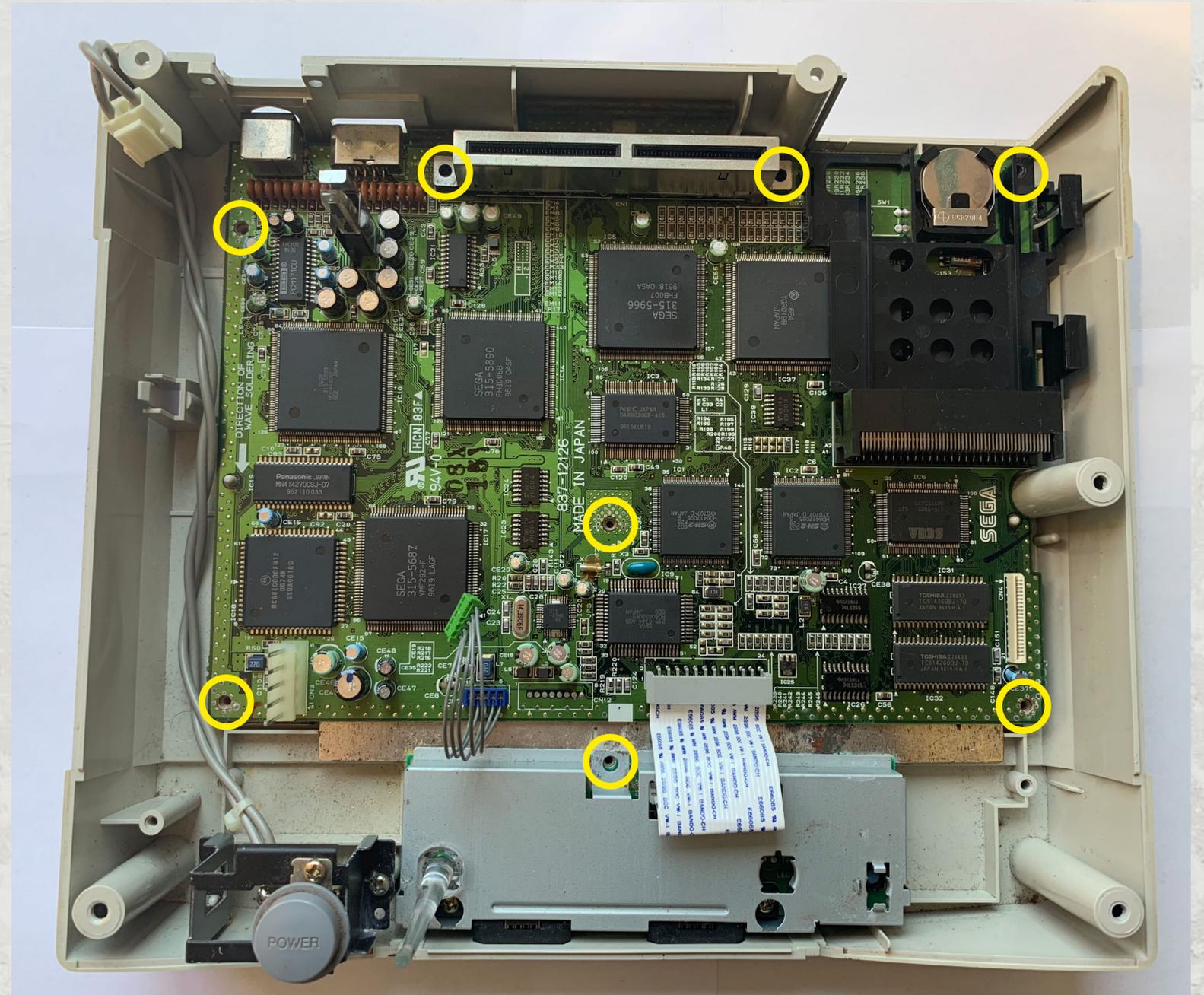
## General Saturn Install Instructions

- On the rear of the console, **remove the 2 black screws** securing the power supply in place.
- Remove the power supply by **unplugging the white connector in the rear**, remove any screws from the power supply board, and gently pull upwards.



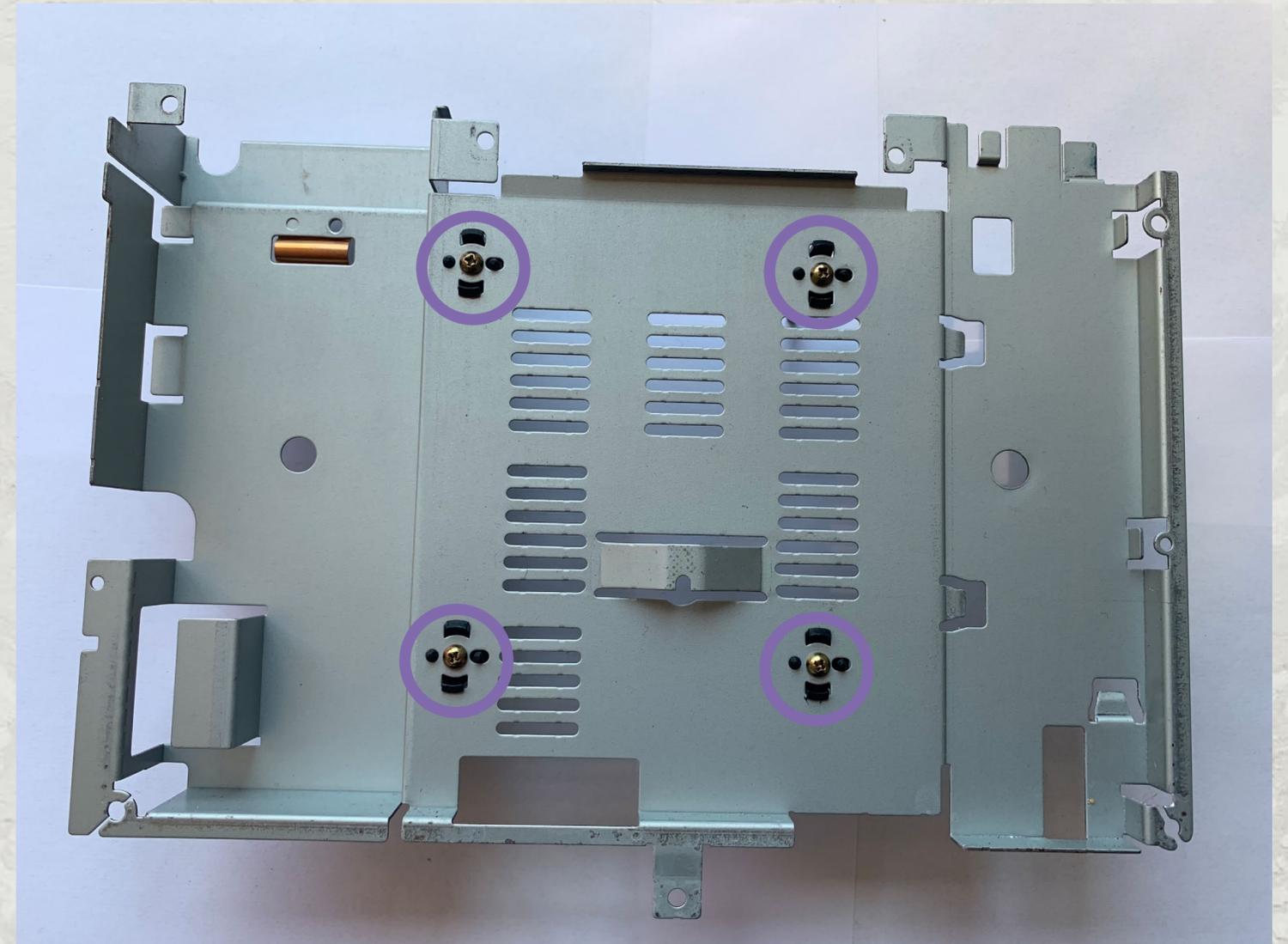
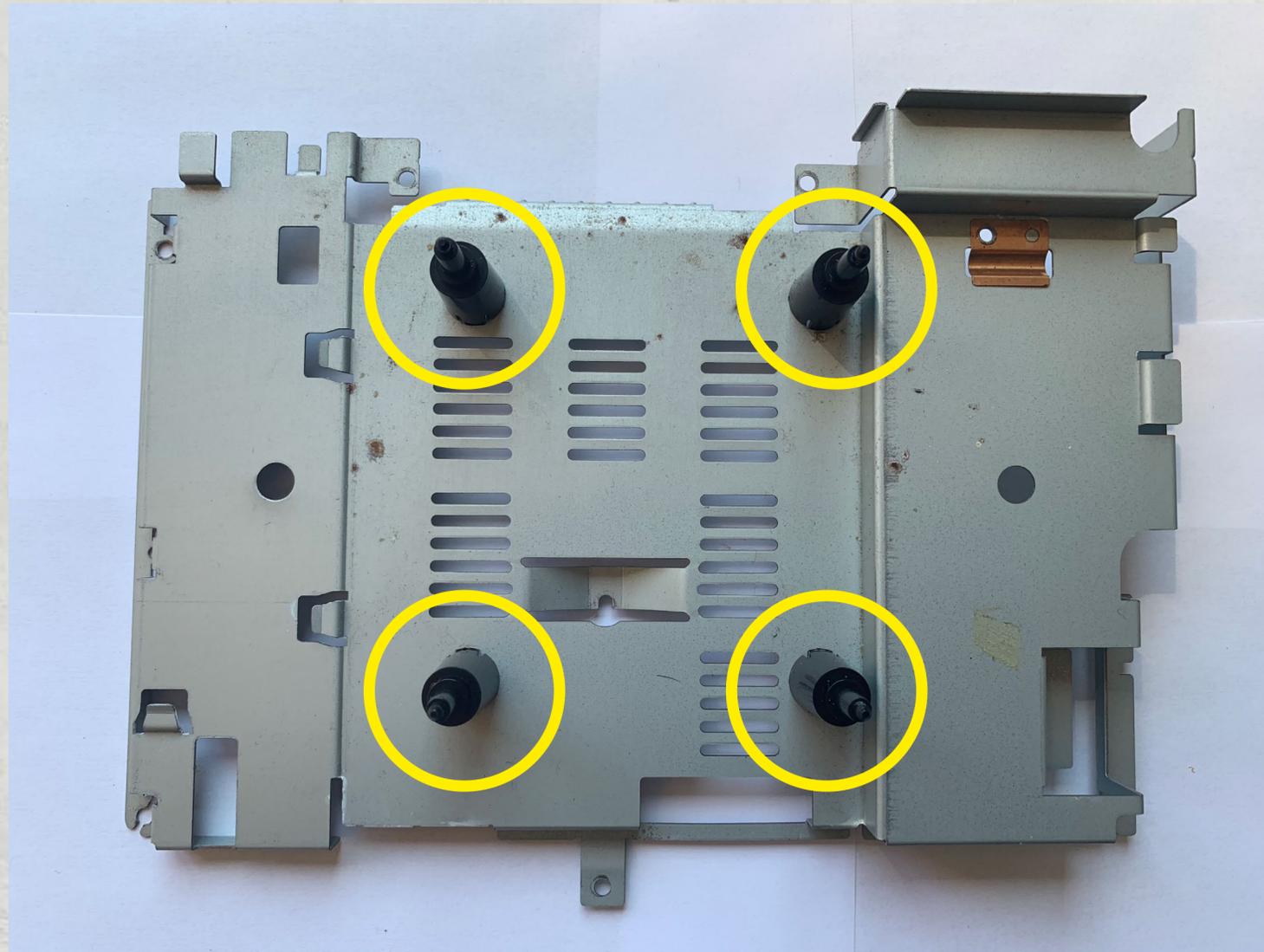
## General Saturn Install Instructions

- Next, you need to remove the metal plate that covers the Sega Saturn motherboard by **unscrewing the 8 screws that hold it** in place. You will also need to temporarily disconnect the ribbon cable connecting the controller board from the main motherboard. This is located at the front of the console. Removing the metal shielding is required because the plastic standoffs that the optical drive sat on block the MODE PCB from being installed and the standoffs are screwed from the underside. Please note the Saturn with the PSU in the lid does not need the metal shielding removed as the pegs can be removed from the top. Please do so now.



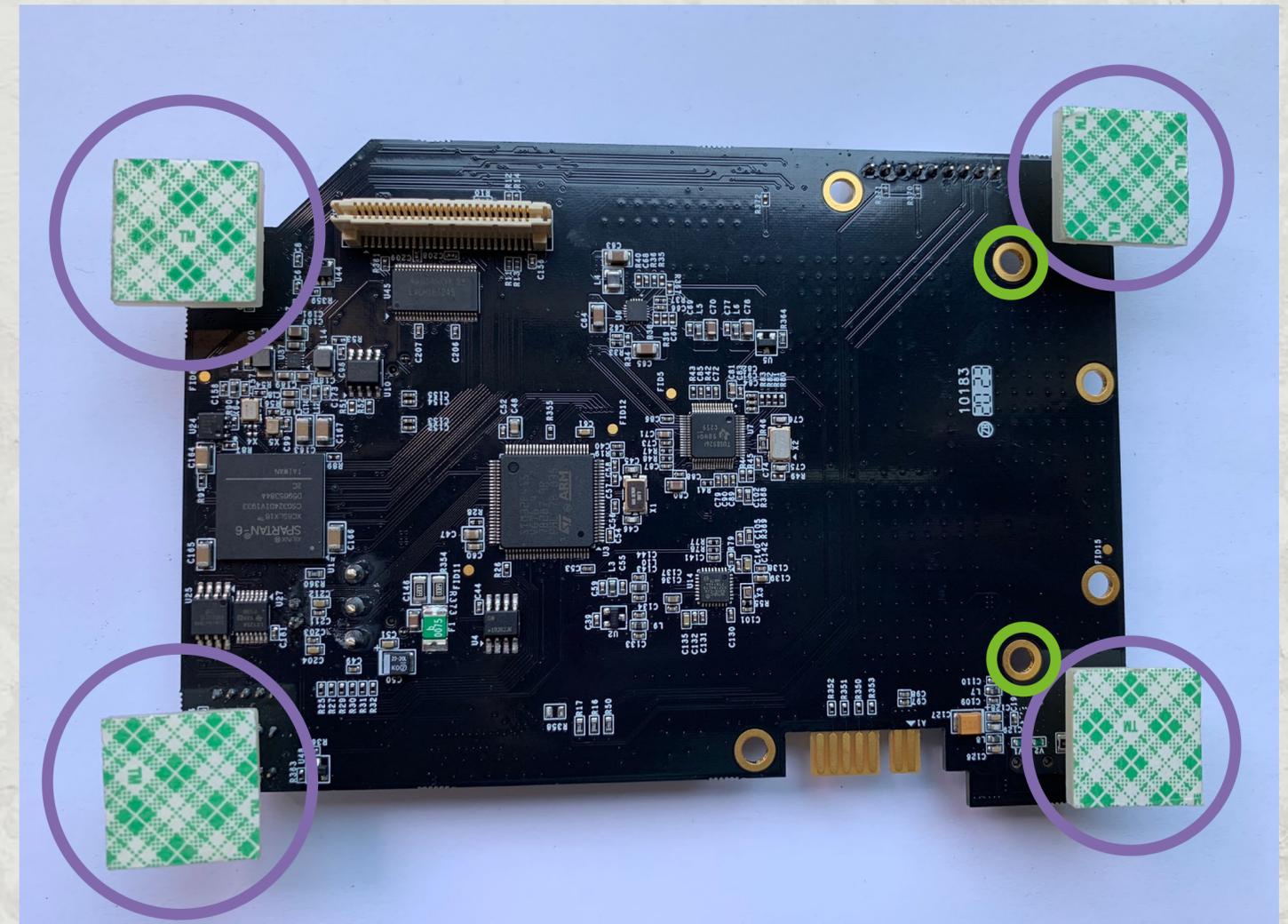
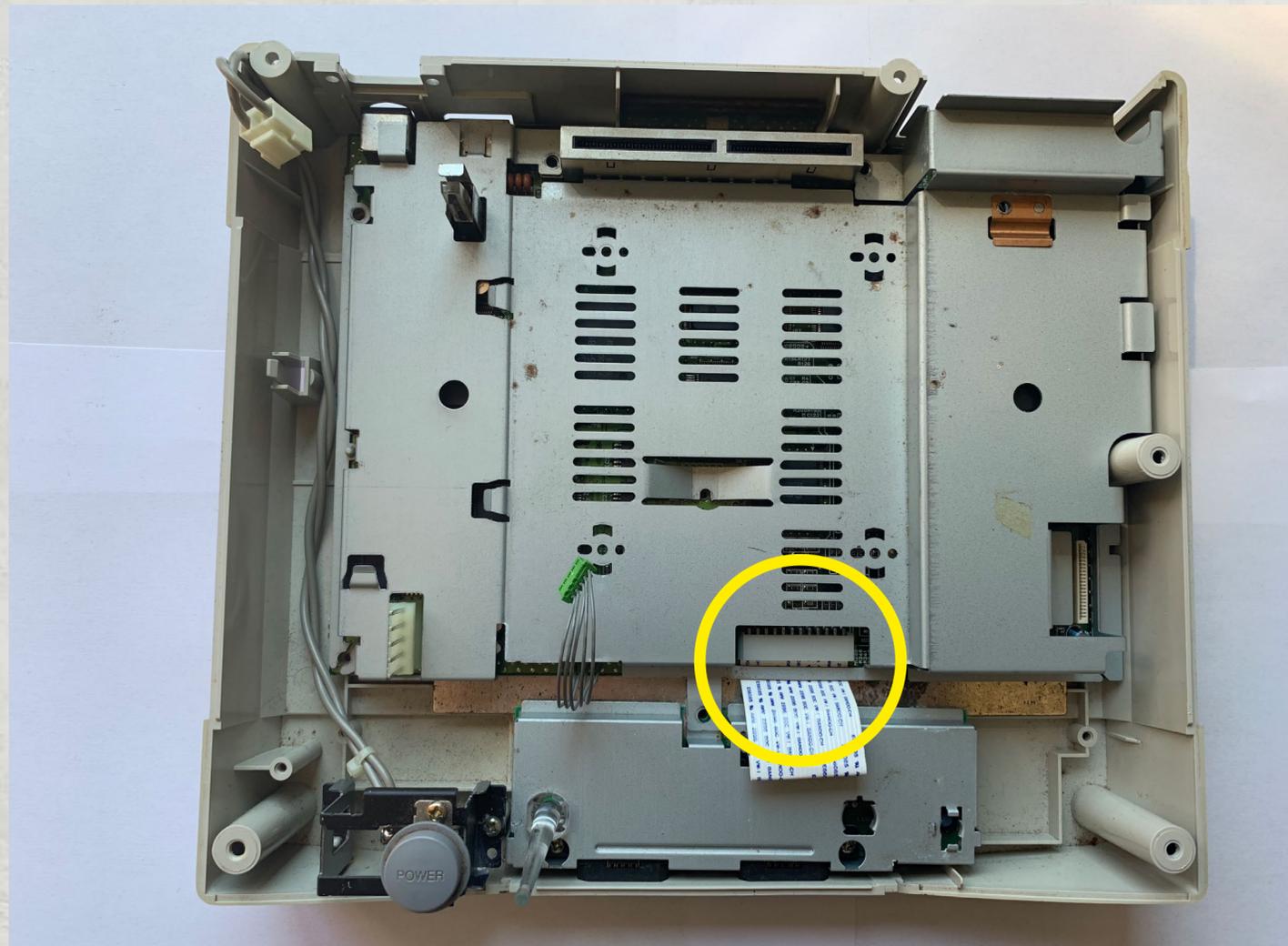
## General Saturn Install Instructions

- Flip the metal plate over and **remove the screws** securing **the posts**.
- You can safely set aside both the posts and screws as they will no longer be needed.



## General Saturn Install Instructions

- Reinstall the metal plate, **controller port data ribbon**, and secure it with the original 8 screws.
- Insert the **four sticky feet into the MODE PCB screw holes**. Then remove the film from the bottom of the sticky feet and install MODE onto the metal plate.
- When using a hard disk or SSD, **use the 2 included screws to mount the SATA drive to the MODE PCB** to keep them from moving.



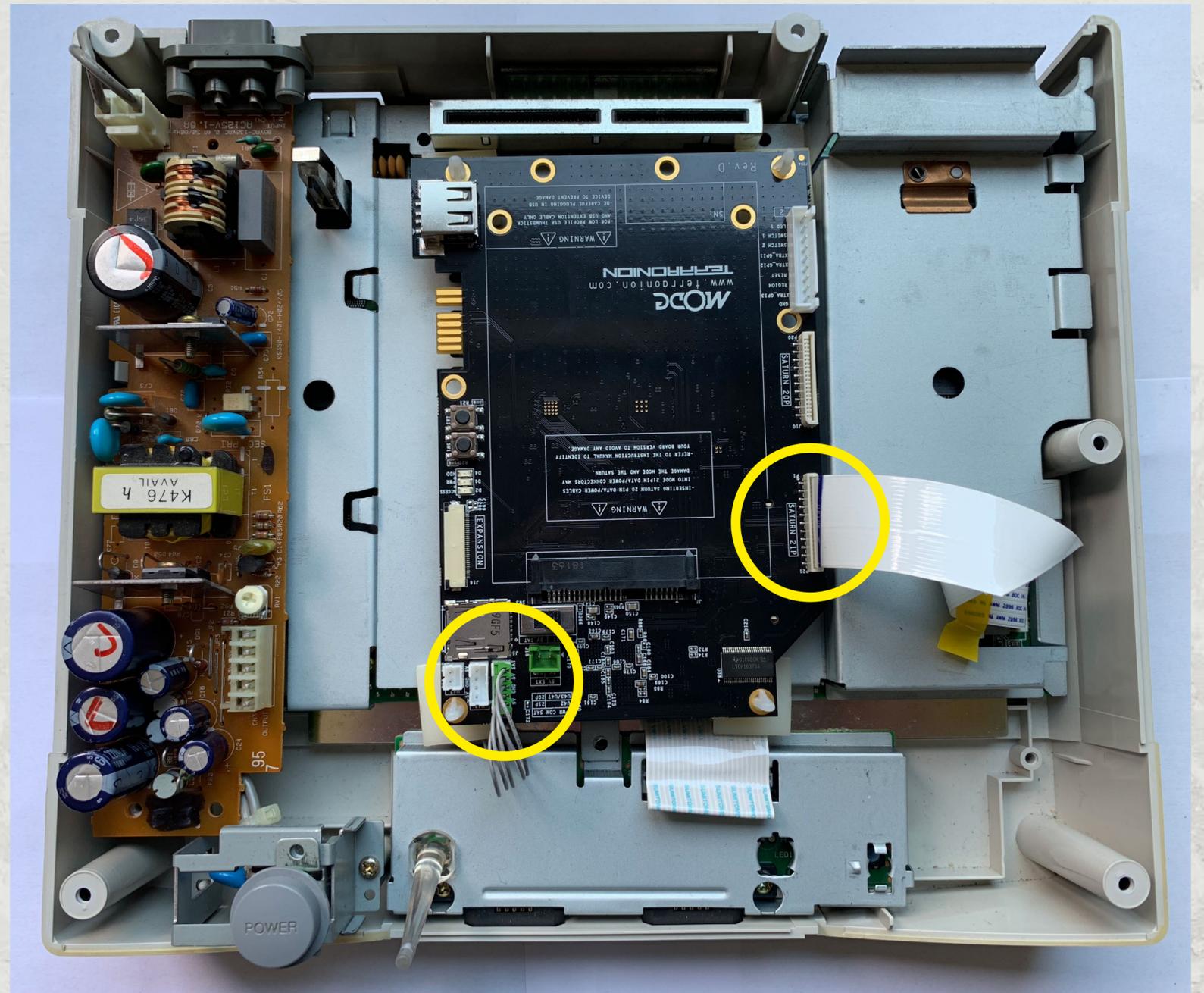
## General Saturn Install Instructions

- Remove the film from the bottom of the sticky feet and install MODE onto the metal plate.



### **Warning!** **Read this paragraph carefully**

- **Insert the CD-ROM power/tray cables.** Please only plug connectors with the same pin number into the corresponding MODE connection. **2-pin connectors must only go in the 2-pin connection and so-on.** If you have two connectors (2-pin and 4-pin) plug the ribbon cable into the 20-pin connection. If you have a single 5-pin power/tray connector plug the ribbon cable into the 21-pin connection (as shown to right).



## General Saturn Install Instructions

### Optional External Power Cable

We have included with your MODE a power cable that can be used on all Saturn models (with the exception of the earliest Saturn with the PSU in the lid) to provide additional power to the MODE. Depending on the HDD / SDD you are using your MODE may not power up without it.

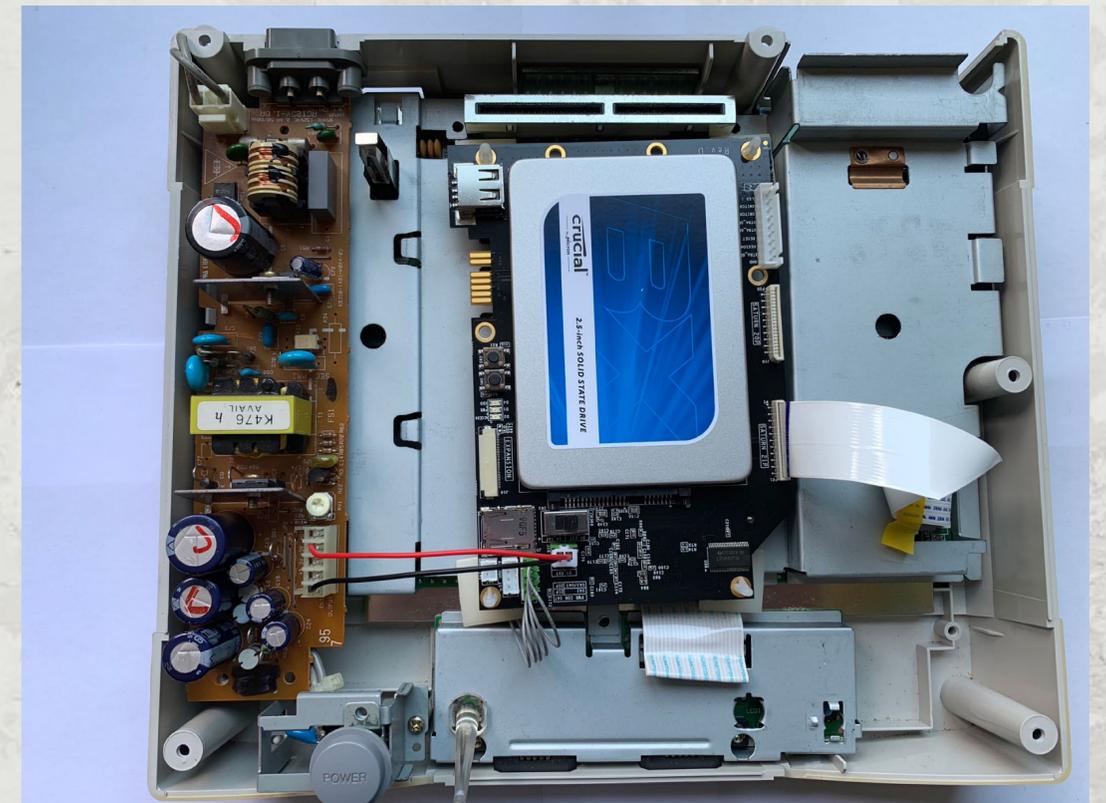
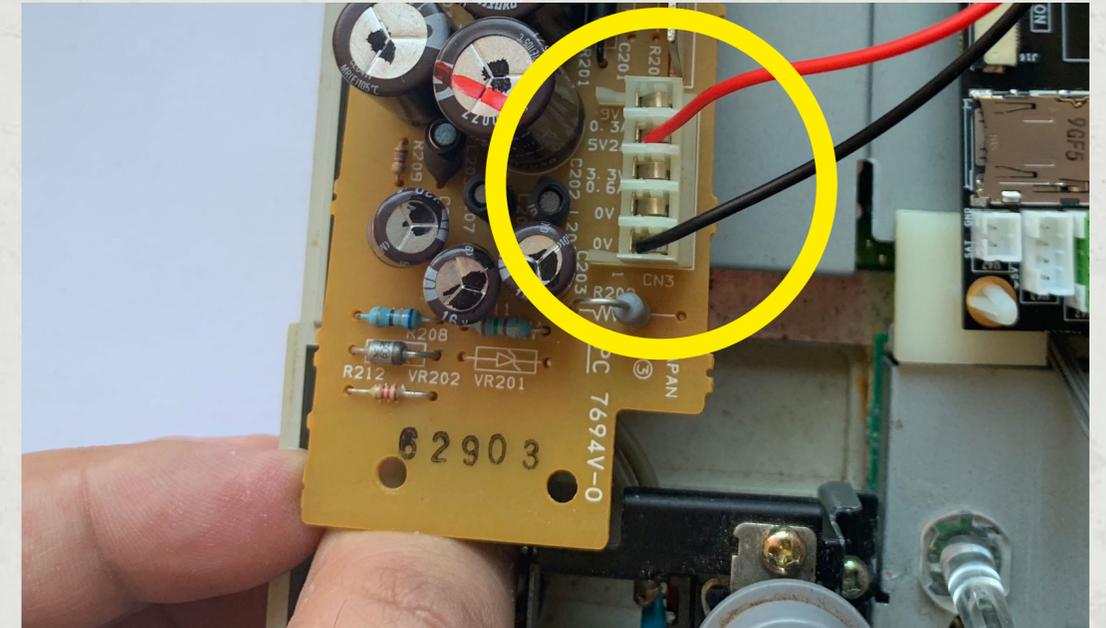


**Please follow these instructions carefully as installing the cable wrong will damage MODE and your Saturn.**

- Remove the one screw near the white power connector on the PSU.
- Pull Gently up this side of the PCB.
- There are two different power supplies on the Saturn where this cable can be installed. One has 5 pins and one has 4 pins. The Saturn with the PSU in the lid does not require this wire so please ignore this section if this is your model.

#### • 5 Pin Power Supply:

Insert the black wire on the first pin from the bottom if the Saturn is facing you. The red pin goes on the second pin from the top **(as shown top right).**



## General Saturn Install Instructions

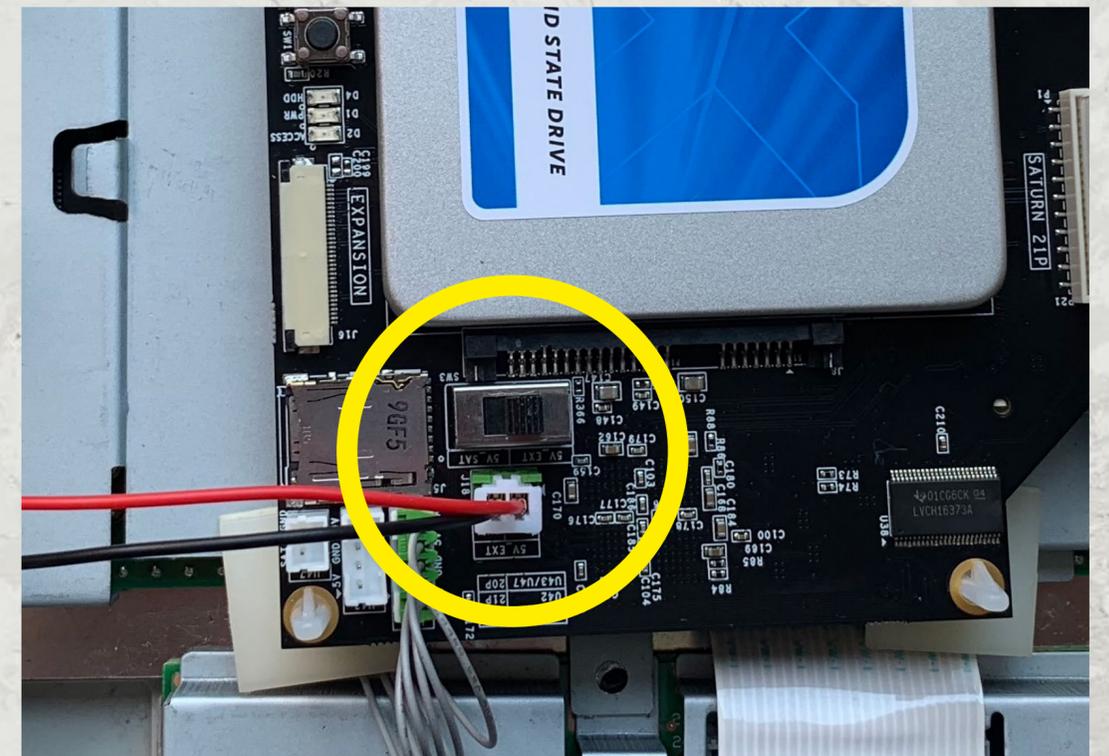
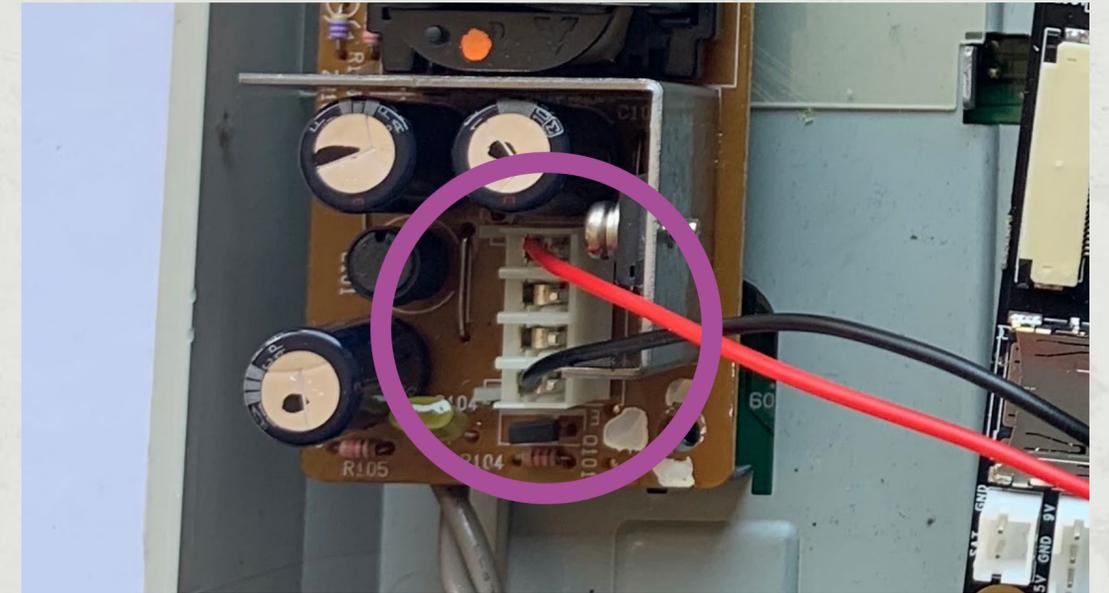
### 4 Pin Power Supply:

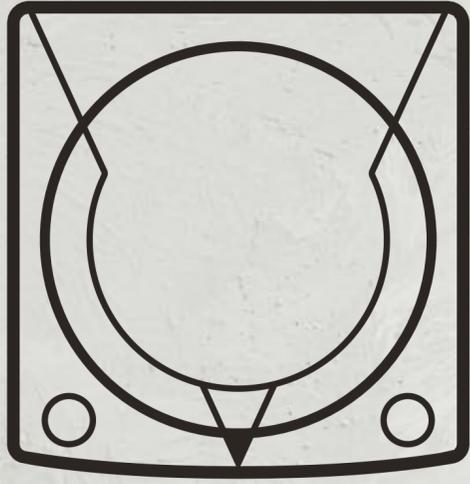
- Insert the black wire on the first pin from the bottom if the Saturn is facing you. The red pin goes on the first pin from the top **(as shown right)**.
- After installing the power cable, push the PSU PCB back down onto the pins and reinstall the screw.

• If you are using the optional power cable move the switch position to external power on the MODE PCB. By default it is set to internal power. All original connectors must still be plugged into MODE even when using external power.



**Close up your Saturn.  
You are done!**

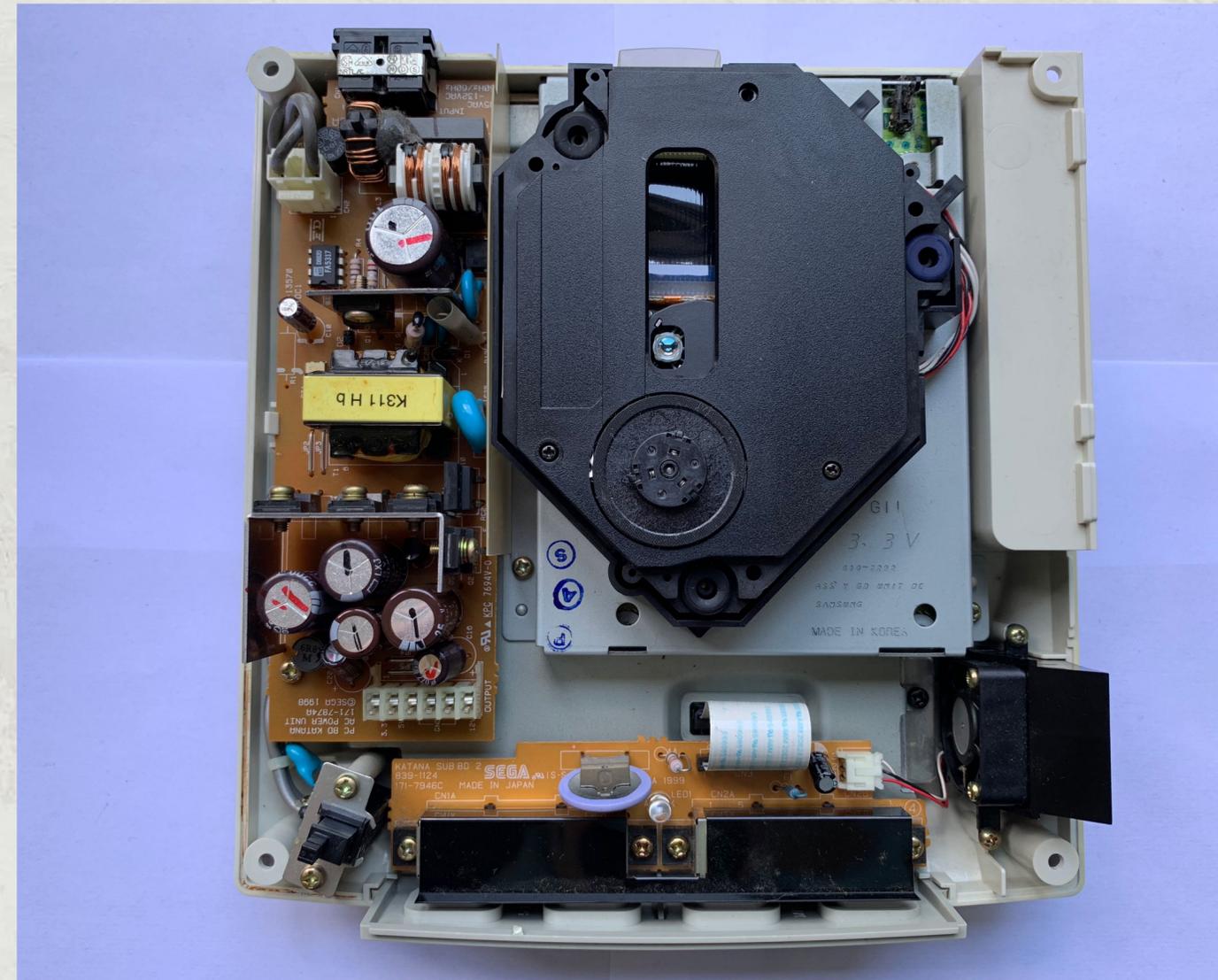
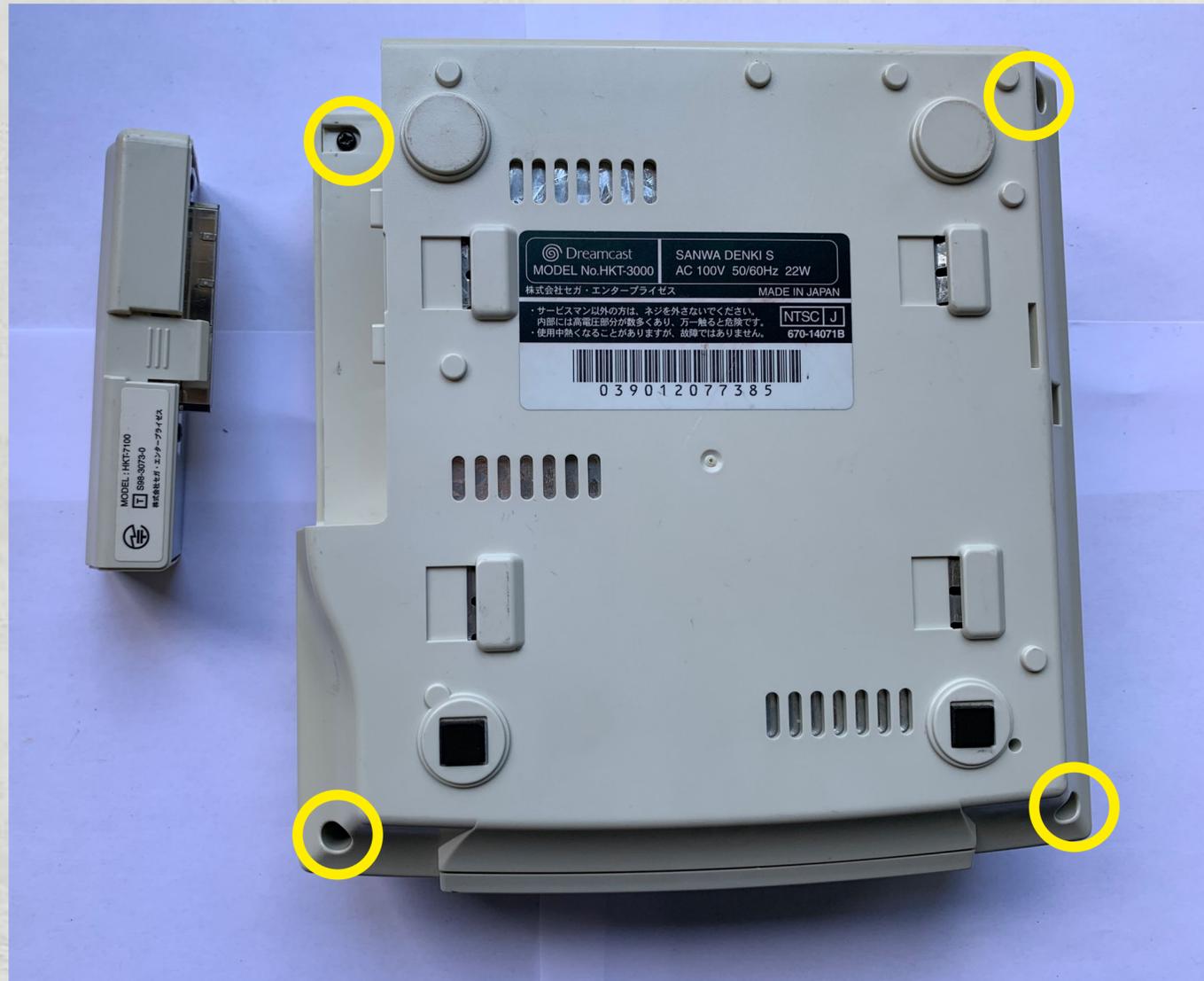




# ***Dreamcast Install Instructions***

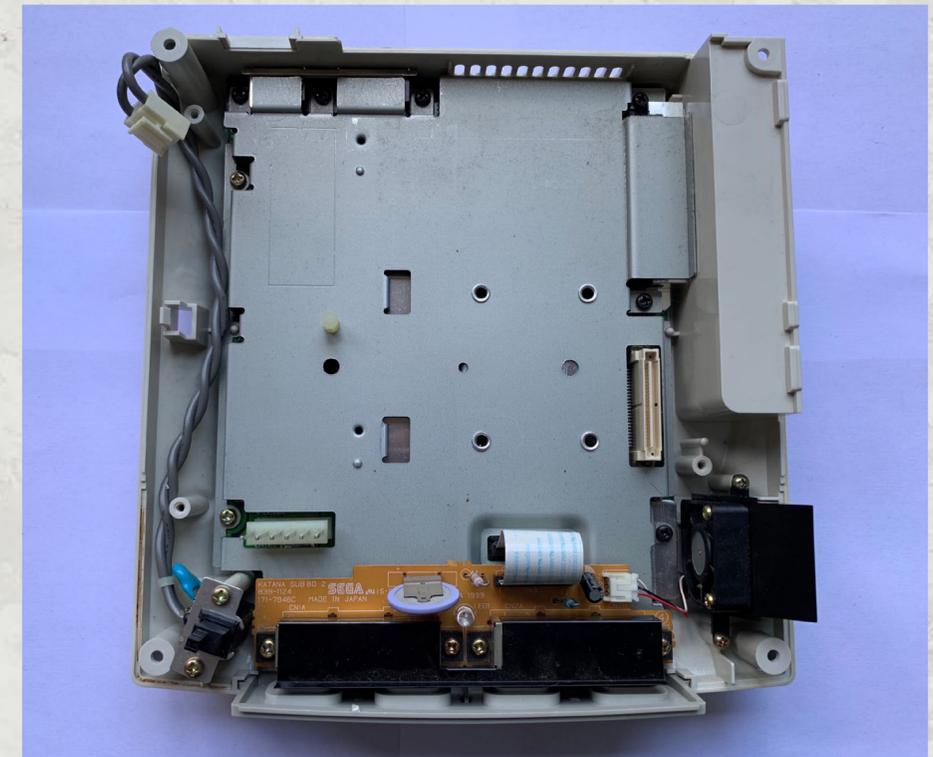
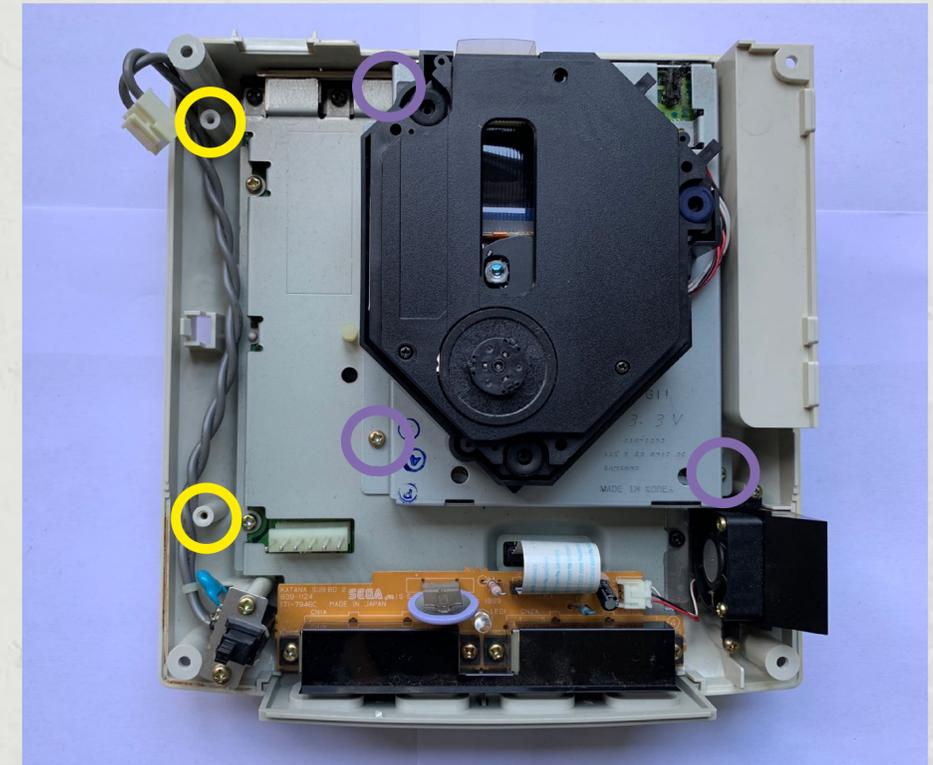
## General Dreamcast Install Instructions

- Remove Modem or BBA adapter.
- **Remove four screws from each corner** of the underside of the Dreamcast. Flip the Dreamcast over and remove the lid.



## General Dreamcast Install Instructions

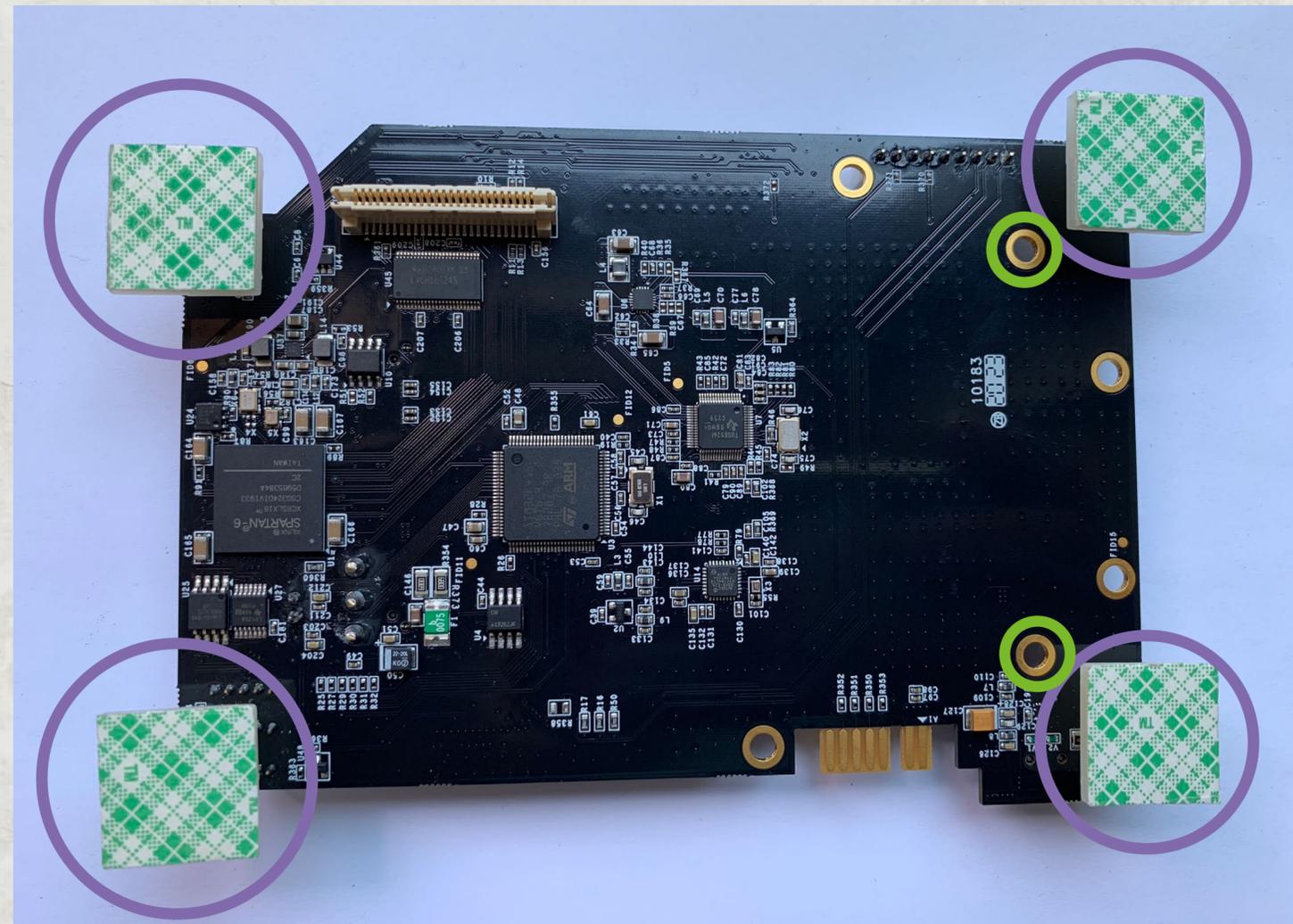
- On certain revisions you may need to remove the PSU to access the GD-ROM assembly screws. If needed, unplug the 2 pin power cable going into the PSU from the motherboard.
- Remove the 2 screws holding it in place and gently lift the PSU out.
- Remove screws (3) holding down GD-ROM assembly.
- Remove GD-ROM assembly.



**Please note that if your Dreamcast has a ribbon cable coming off of the GD-ROM assembly you likely have a VA2 Dreamcast and MODE is not compatible.**

## General Dreamcast Install Instructions

- You should now see a beige connector underneath where your GD-Rom assembly was located. **MODE attaches to this point.**
  - Insert the four sticky feet into the MODE PCB screw holes. Then remove the film from the bottom of the sticky feet and install MODE onto the metal plate.
- When using a hard disk or SSD, use the 2 included screws to mount the SATA drive to the MODE PCB to keep them from moving.



## General Dreamcast Install Instructions

- Remove the film from the bottom of the sticky feet and install MODE onto the metal plate.

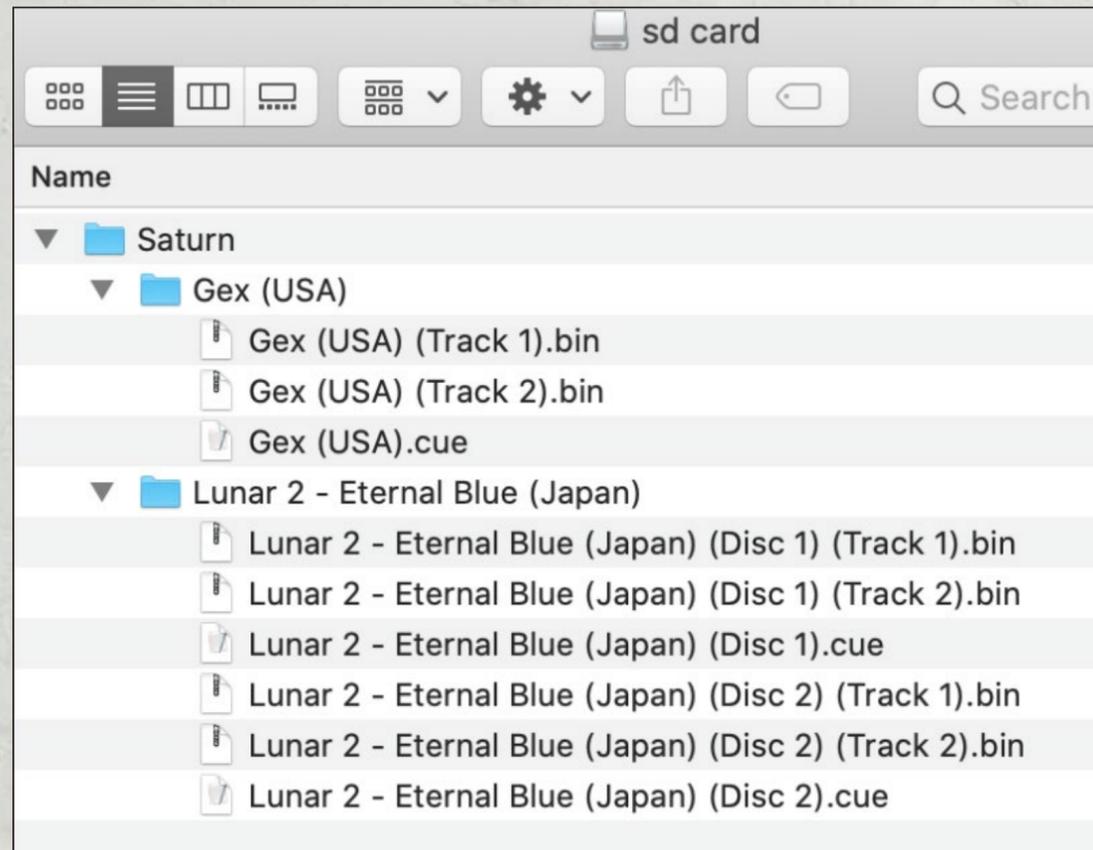
- Reinstall the PSU.

- Close up the Dreamcast if you are not planning to perform advanced installations (noted further down in this guide).



**Close up your Dreamcast.  
You are done!**





**Format your MicroSD card, SATA drive or USB thumbstick to either FAT32 or exFAT.**

MODE supports using a single storage option or 2 of the 3 storage options at the same time. You can use microSD with SATA or microSD with USB. However you can not use all three at the same time nor can you use SATA and USB together. See the Limitations section for more details.

Create a folder named "Saturn", "Dreamcast", or both, on the root of your storage device and copy the CD or GD-ROM image folders into it. **Each CD game image set should be in their own folder.** Multi disc game image sets can be combined into the same folder, however that is not a requirement. More on multi disc games in a later section.

**MODE supports nested sub folders.** This allows for additional sorting capabilities such as folders for regions or by alphabet if you choose.

Since the games are located in the Saturn or Dreamcast folders, **you can use one storage device for both consoles** if you plan to move MODE between consoles. Example: You can have a 2 terabyte hard disk with both Saturn and Dreamcast folders full of their respective console's games and they will work independently of each other. MODE will only display the contents of the folder that matches up with the console that it's installed in. Saturn games will not show up on the Dreamcast and vice versa.

**Plug the storage device into MODE in your Saturn or Dreamcast and power the console on.**

## MODE Menu and Interface

MODE has a menu system with **2 different view layouts**.

We will detail those shortly when going into the options menu.

**By default MODE ships in the list view interface** which is a simple list of your games with no additional artwork. This is a minimalist view with no frills.

**Up or Down** on the controller moves the cursor one game at a time.

**Right or Left** moves the cursor a page up or down.

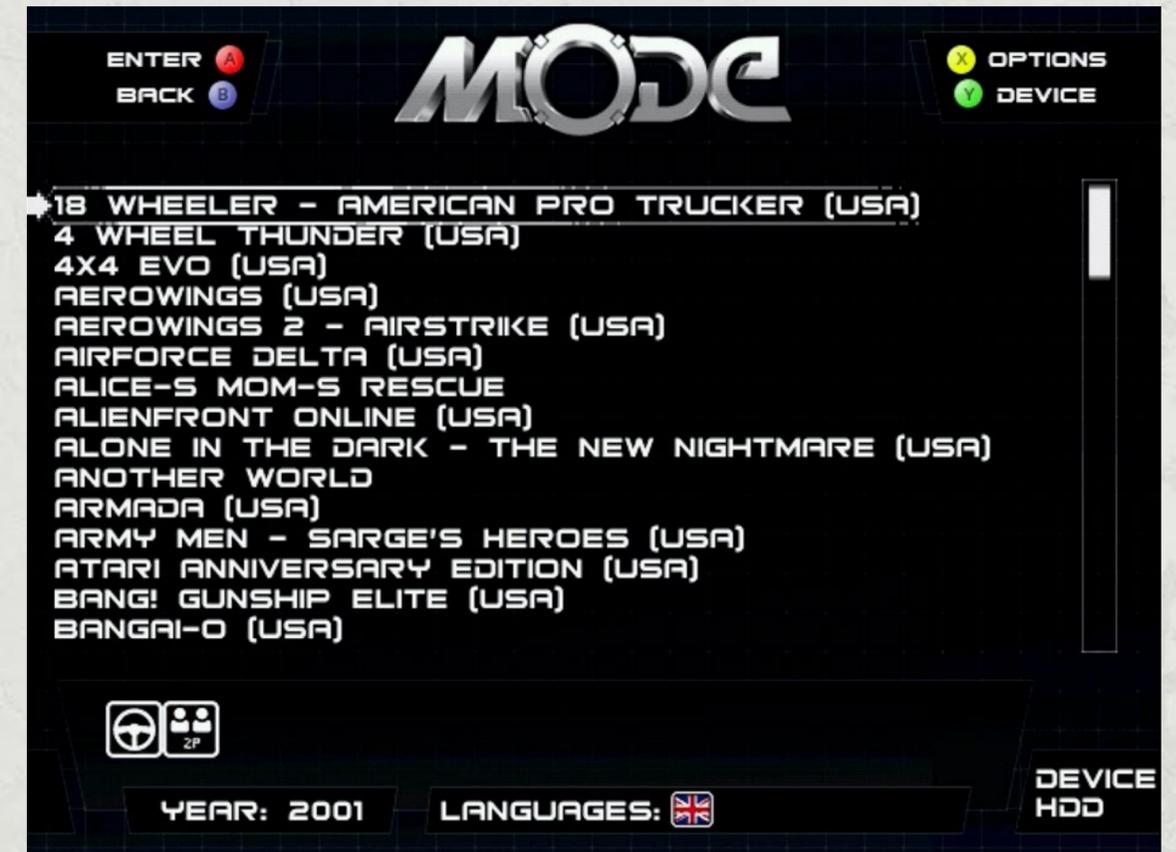
**A button** to launch a game, activate menu option or navigate into a folder.

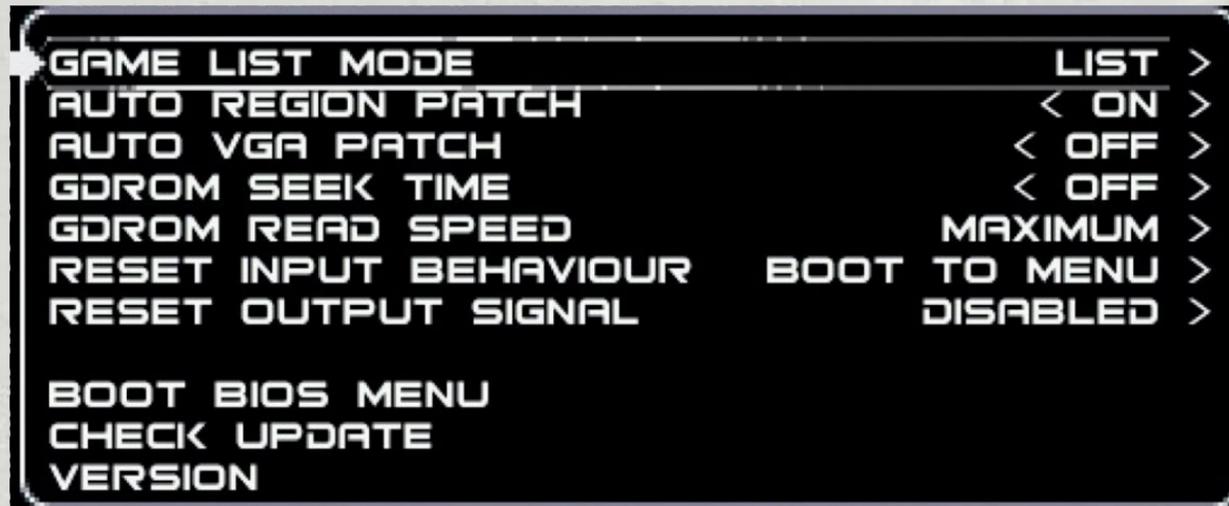
**B button** to go back in the interface (when navigating folders or exiting sub menus).

**X button** (Dreamcast) **or C button** (Saturn) opens up the Options menu.

**Y button** (Dreamcast) **or Z button** (Saturn) switches storage devices. Press it to switch between SD card, SATA or USB if you have a card or drive plugged into them.

**Left Shoulder and Right Shoulder buttons** sorts the games by genre. See Genre Filtering section for more details.





Pressing the X button on the Dreamcast or Z button on the Saturn controller will bring up the Options menu. The options menu will vary between the Saturn and Dreamcast.

**Game List Mode** – List and Covers. This allows you to switch between the simple list view and advanced cover art interface.

**Auto Region Patch** – On or Off. Allows you play games from regions other than the one your console is from. Example: Play Japanese games on a USA console.

**Auto VGA Patch (Dreamcast Only)** – On or Off. Forces games to run in 480P mode. Not all games support this.

**Disable Lid Switch (Saturn Only)** – Yes or No. The Saturn lid switch typically is used to send signals to the Saturn that the drive bay is open (which is used for disc switching). If you intend to run MODE with the Saturn top cover removed this option will bypass the lid switch for this behavior.

**GDROM Seek Time (Dreamcast Only)** – On or Off. This option approximates the behavior of the dreamcast laser as it searches for data on the disc. Turning it "On" may improve compatibility with games in exchange for slower loading.

**Starting Video Mode (Saturn Only)** – NTSC or PAL. Sets the video output to either PAL or NTSC at boot. (Requires the optional Region wire to be connected to MODE as per the Advanced Installation details.)

**GDROM Read Speed (Dreamcast Only)** – Normal, Medium or Maximum. This option allows for the simulated GD-ROM drive to load data at different rates. Some titles may prefer slow speeds in order to remain in sync.

**Video System Outpin Pin (Saturn Only)** – Auto NTSC, Auto PAL, Force NTSC, Force PAL – If your Saturn is 50/60hz modified with the optional connection to MODE; (Explained in advanced installations below), MODE will read the header of the Saturn images and will run the games in their native NTSC or PAL automatically or force a title from a different video signal into a non-native one. Forcing a PAL or NTSC title into a non-native signal may produce audio/video issues.

**Reset Input Behaviour** – Boot to Menu or Normal Reset. In Dreamcast, MODE can monitor the RESET signal in the system, so if you have a way to do a reset, by having a push button wired to the reset points or using the DCDigital reset option (if applicable), this option dictates what happens. On Saturn, this option similarly does not change the regular reset button functionality (Normal reset of game) unless an optional reset wire is connected (see advance install below)

**Reset Output Signal** – Disabled or Pulse on BTM. When enabled, the reset output signal makes the SYS\_RESET signal pulse low when trying to go to the menu by holding the SW2 button for a few seconds. So if wired you can make MODE reset the console and go to the menu. At the same time, this wire can be used to monitor the reset button in Saturn for the previous option.

**Boot Bios Menu** – Selecting this will boot back to the Saturn or Dreamcast bios menu for managing saves, setting system time and etc.

**Check Update** – This will check the currently selected device for a firmware update. During boot, MODE will automatically check for updates in the SD card only, so in order to apply an update from your hard disk, ensure the game list is showing HDD games, then use this option to check for updates in the current device.

**Version** – Displays information about MCU and FPGA versions and serial number for MODE.

## MODE Menu and Interface - Advanced Cover Art Menu

**MODE has an advanced cover art interface** that shows off the game box artwork and some details about the game. This cover menu utilizes redump's checksum database for disc images so alternate formatted dumps will not display covers currently.

To enable this, **you first need to download the game database** file which has the images and game information prepopulated in it.

**Go to <https://gamedb.terraonion.com/> and sign up for an account.** This login is separate from your Terraonion web shop or downloads account. After signing in, click on one of the large green buttons that says Download Saturn MODE Database or Download Dreamcast MODE Database.

**This will download a file called either db\_sat.bin.zip for the Sega Saturn or db\_dc.bin.zip for the Sega Dreamcast.** Uncompress the file with a decompressor such as WinZip, WinRAR or the built in macOS Archive Utility. The resulting file will be called db\_sat.bin or db\_dc.bin.

**Place this file on the root of one of your storage devices.** Power your console back up and enter the options menu and change the Game List Mode option from List to Covers. Once back to the menu, press and hold down the A button until a contextual menu pops up and select "Scan Current Folder".



## MODE Menu and Interface - Advanced Cover Art Menu

At this point MODE will scan for the database and populate all of the artwork and game information into the Covers menu. This only needs to happen once unless you add more games to your storage devices and/or download an updated database file. **Database scan can take several minutes, depending on the amount of games in your device, so be patient.**

Navigate the Advanced Cover Art interface with the A button. Selecting a game with the A button will bring up more information and artwork for the game. Press the Start or A button again to launch the game or the B button to go back to the menu. Pressing Start button while in the covers list will automatically launch the game without showing the extra information window.

## MODE Menu and Interface - Genre Filtering

**You can sort games in the MODE menu,** both the simple list and advanced cover art menus, by genre. This requires having the game database installed. Once this file is placed on the root of your storage device and you have scanned it, you can activate the filter by pressing the Left or Right shoulder button to change the filter. Above the games list you will see what filter is currently set. When no filter is listed, all games are displayed. **To exit out of genre filtering simply hit L+R together.**

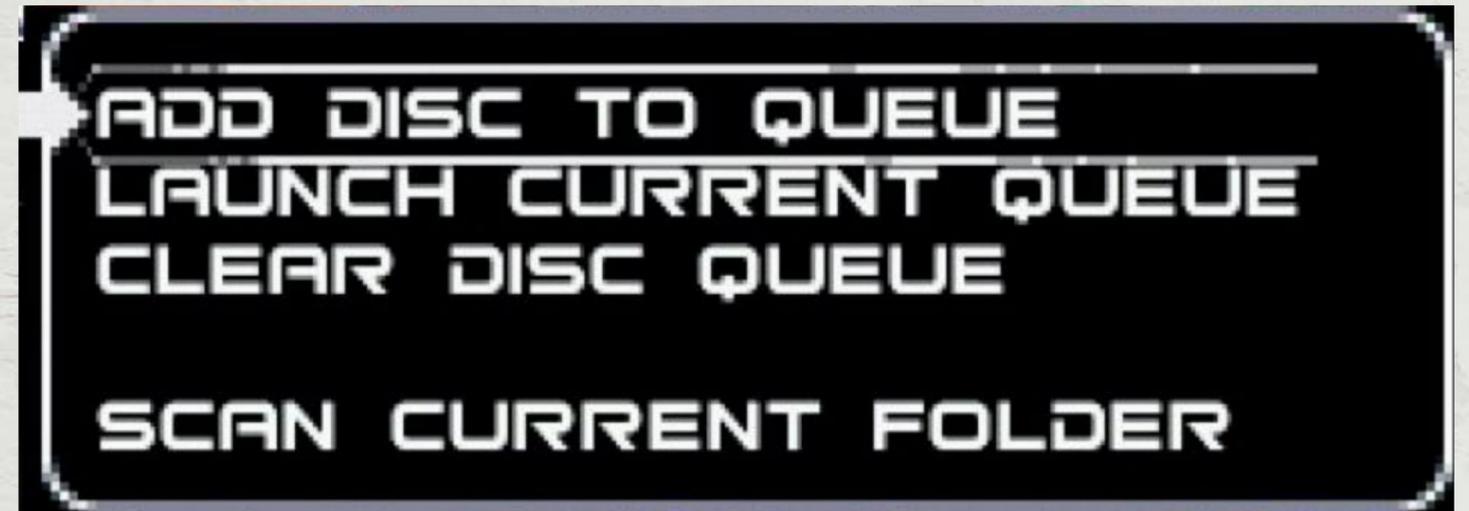


## Multi Disc Games

MODE supports multi disc games two different ways:

1. You can place all games image files in one folder and MODE will intelligently queue them up together during game play.
2. Or you can leave multi disc games in separate folders and on the MODE menu, press and hold the A button to bring up the contextual menu.

From here you can select "Add disc to queue". You will see at the top of the menu "Discs in queue: X". Do this for each game disc and afterwards press and hold the A button one more time and select Launch Current Queue to play the multi disc game. **You can clear all discs in the queue by selecting Clear Disc Queue from the contextual menu.**



## Changing Discs on a Multi Disc Game

Dreamcast disc changing is accomplished by **using three possible options:**

1. When prompted to change a disc hit SW2 button on the MODE board itself.
2. Use DCDigital's on screen display option to change disc (see advanced install below).
3. Wire a button to the Switch 1 pin on the JST9 connector to be used externally or in a tray mount.

Saturn disc changing is accomplished by opening and closing the disc lid upon prompt.

## Returning to MODE menu

Return to menu can be done in several ways:

- **Hold SW2 for a few seconds** (till the center led turns on again), this will “insert” the MODE menu as if a new cd/gd was inserted. Normally games return to the bios when the tray is open, so launching the game again from bios will load the menu.
- **Hold SW2, then press SW1, and release SW2.**
- **Using the Reset to menu option** in the options menu. In Dreamcast, no extra wires are needed, if the reset input is set to reset to menu, resetting the console (via a push button wired to the motherboard reset test point, or using DCDigital) will also make MODE boot to menu.

## Additional push button functions

Apart from game switch, there are **additional functions available for the SW1 and SW2 buttons:**

- **Hold SW2 while powering up the console** will allow booting to the bios screen as if you had the console lid open. Also in Saturn, booting this way disables the lid open detector. You can hold SW2, turn the console on, then release SW2, and the lid open detector will be disabled till you turn the console off again.
- **Hold SW1 and SW2 while powering up the console** will reset MODE to the factory default options.



**MODE uses a single binary firmware for both Sega Saturn and Dreamcast. There is no need to flash it separately for each console. The firmware is designed to function on both consoles and either one can update the firmware.**

**To update the Firmware on MODE, you must first register your device.** After registering it head to the Downloads section and download the most recent firmware. It will be a file that ends in UPD. Depending on what storage devices you use, the firmware update is slightly different.

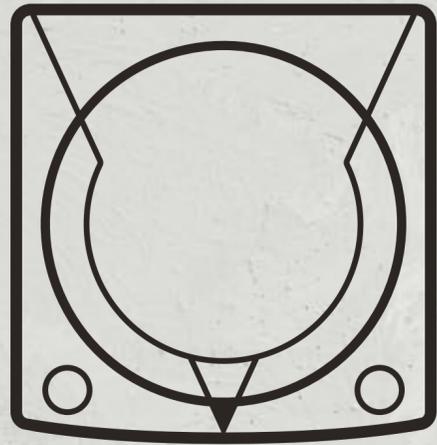
### **MicroSD:**

Power off your console and **copy this firmware file to the root of your MicroSD card.** Power the console back on and you will be greeted with a message prompting you to update the firmware. This message also provides some other information such as current firmware and FPGA details.

Press the A button on the game controller to flash the new firmware or press B to cancel and not update

### **SATA or USB:**

You can also update the firmware if the **file is copied to the root of the USB or SATA disk.** MODE will not prompt at boot up to update the firmware if a firmware file is on those storage formats. Instead, go into the options menu and select Check Update to initiate a firmware scan and then update.



# ***Advanced Install Information***

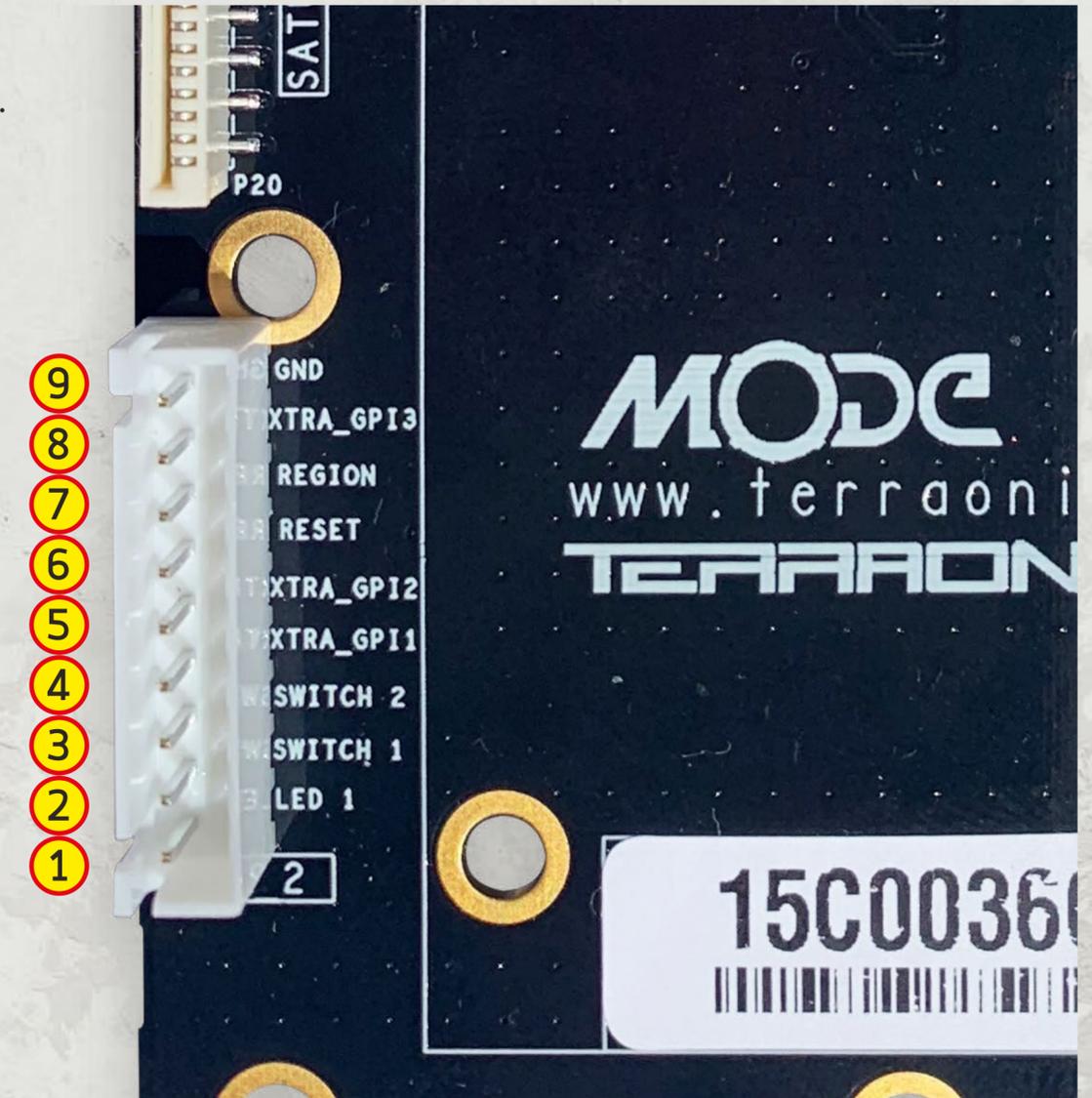
## Advanced Install Information

**MODE has some advanced install options that are NOT required for normal usage.** These are provided via a JST9 connector for modders and enthusiasts who want to take their install to the next level and leverage options such as interfacing with the DCDigital on their Dreamcast and toggling 50/60Hz output from the MODE options.

JST Connector is type "JST XH 9 position 2.5mm". Note that 2.5mm is not the same as 2.54mm.

**WARNING!** Pin Order for the JST9 Expansion connector read from top to bottom.

- **Pin 9** Ground
- **Pin 8** Extra\_GPI3. For future use
- **Pin 7** Region (Saturn)
- **Pin 6** Reset (Dreamcast and Saturn)
- **Pin 5** Extra\_GPI2. For future use
- **Pin 4** Extra\_GPI1. For future use
- **Pin 3** Switch 2. This pin is wired in parallel to SW1 pushbutton
- **Pin 2** Switch 1 (Next Disc). This pin is wired in parallel to SW2 pushbutton
- **Pin 1** LED 1 This pin is wired in parallel with the Access LED



## Saturn Reset Switch for Reset to Menu

**Connect Pin 6 of the JST connector to the reset button output pin.**

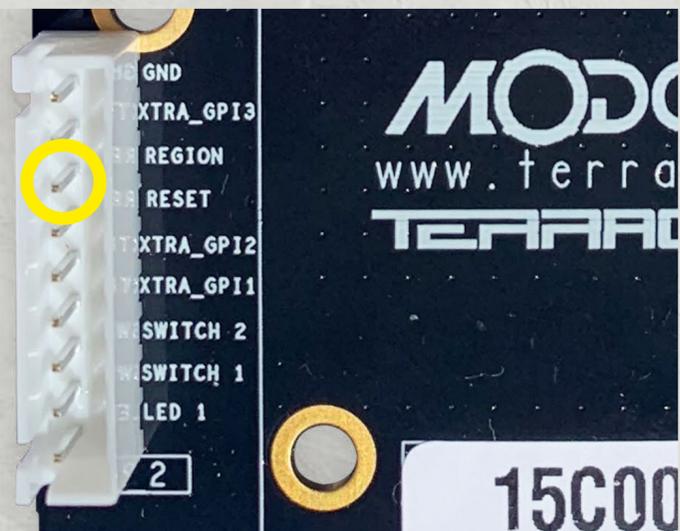
Once connected, make certain "Boot to Menu" is selected in the MODE options screen. Now a pressed reset will boot your Saturn to MODE's menu instead of simply resetting your game.



## Saturn 50/60hz refresh rate modification

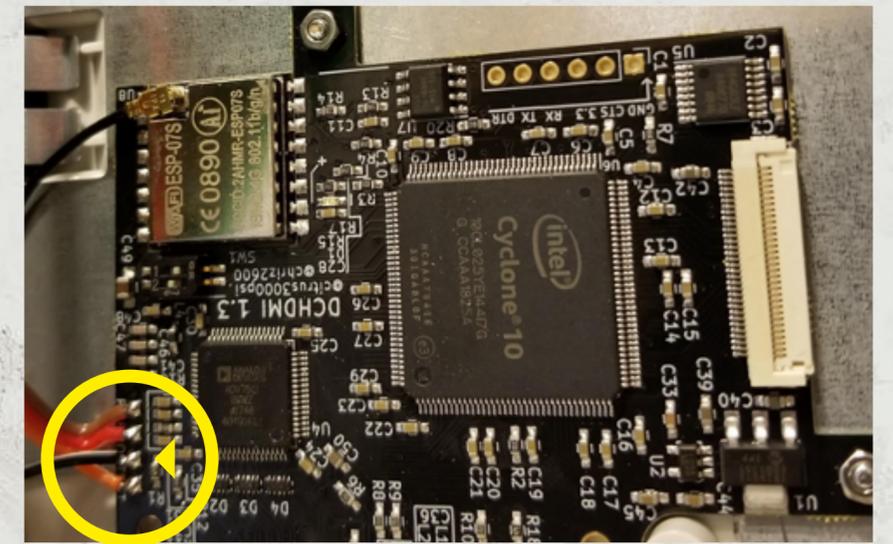
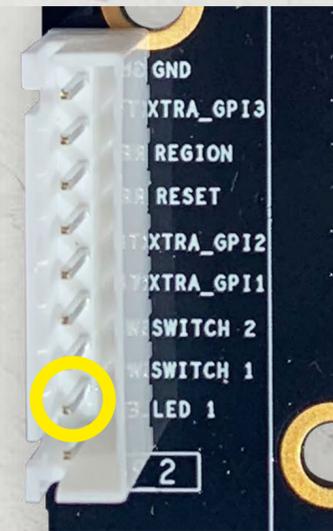
In order to change your Sega Saturn to either 50hz or 60hz from its native frequency (to run PAL or NTSC games at their native speeds)

**Pin 79 of the VDP2 chip must be lifted and a wire run to Pin 7** of the JST connector. Please note that the Saturn will still auto patch game region, allowing out of region play. Without this connection, MODE is unable to force PAL or NTSC refresh rates. Some games may not run properly when not at their native speed.

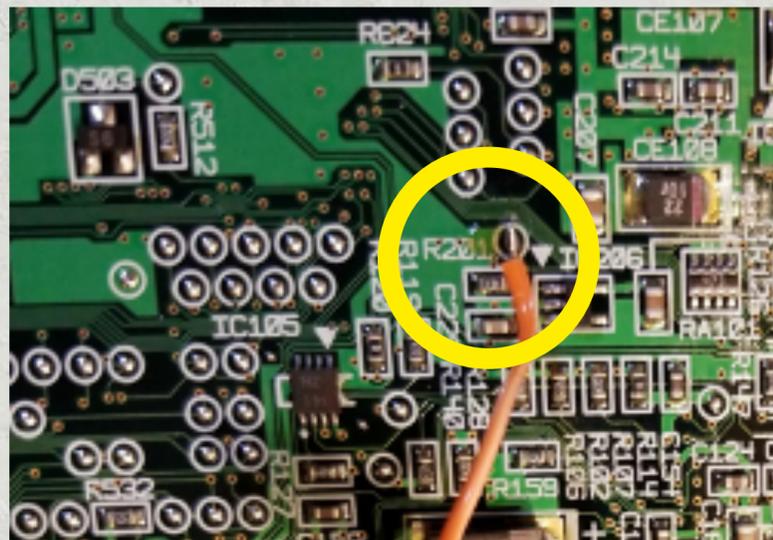
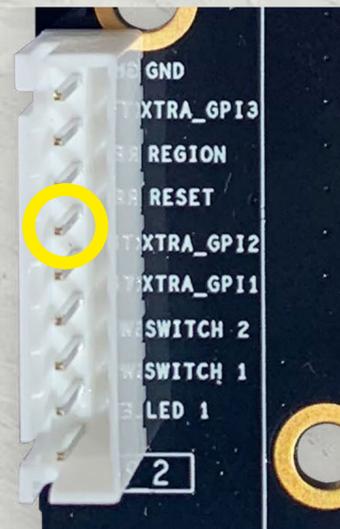


## Dreamcast to DC Digital for Disc Swap

Connect Pin 2 (Switch 1) of the JST connector to the solder point on the DC Digital intended for the “GDEMU/USB-GDROM/MODE reset function” (instructions for DC Digital here: ([http://www.dansprojects.com/dchdmi\\_install.html](http://www.dansprojects.com/dchdmi_install.html))). Use the DC Digital web interface to change its reset function to MODE. Now using the on screen display of the DC Digital you can activate a disc swap using the on screen interface.



## Dreamcast Reset Switch For Reset to Menu (Without DC Digital)



Connect Pin 6 of the JST connector to the reset test pad on the underside of the Dreamcast mainboard. Test pad is found next to R201 as seen in the picture below. Once connected, make certain “Boot to Menu” is selected in the MODE options screen. To soft reset the Dreamcast hold A+X+B+Y and press Start. This will then return you to the MODE menu.

## **Dreamcast Reset Switch For Reset to Menu (With DCDigital)**

**With DCDigital, no additional connections are necessary for reset to MODE menu.** Ensure "Boot to Menu" in MODE options menu is set. To perform a reset to MODE menu, open DCDigital On Screen Display. Select Reset option from DCDigital OSD.



# **ATTENTION!**

***Advanced Install Information guide is a work in progress,  
an advanced revision with more mods is forthcoming.***

## Limitations and Frequently Asked Questions

**Question:** Can I use MicroSD, SATA and USB all at the same time?

**Answer:** MODE does not support the usage of both SATA drives and USB drives at the same time due to microcontroller limitations. It was purposely designed in such a way that the USB port is physically blocked when a SATA drive is installed.

**Question:** Can I copy games from the microSD card to the USB or SATA while inside MODE?

**Answer:** MODE currently does not have a way to transfer data from SD Card to USB or SATA and vice versa.

**Question:** The advanced cover art menu system on the Sega Saturn is slow. Why is that?

**Answer:** This is due to limitations with the Sega Saturn CD bus. While the Dreamcasts is quite fast, the Saturn is limited and will cause artwork to take several seconds to be read and displayed.

**Question:** Can I use the storage devices on MODE for game saves?

**Answer:** As of right now, no. However, we are looking into seeing if this is feasible.

## Limitations and Frequently Asked Questions

**Question:** I want to use the largest size hard disk/SSD/USB thumb drive or microSD card. How large of a volume does MODE support?

**Answer:** We have tested MODE with 2TB spinning hard disks. It should support larger volumes, however, we haven't personally tested beyond 2TB.

**Question:** My Sega Saturn has the pc trap board in it. Is MODE compatible?

**Answer:** Yes it is. However, you will need to remove the trap board and purchase a longer Saturn ribbon cable due to the short cables used in this specific hardware revision.

**Question:** Does MODE need to have the 12v regulator removed for Dreamcast?

**Answer:** No. MODE was designed to load the 12v rail properly. If your 12v regulator is removed, it will cause no issues. If your 12v regulator is still installed it will similarly not cause issues.

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