



# Analogue Mega Sg Reference Manual

# **Analogue**

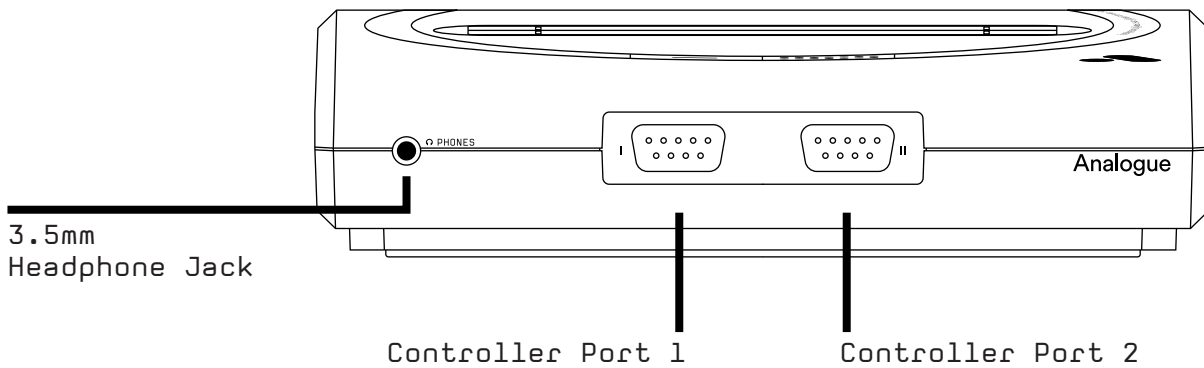
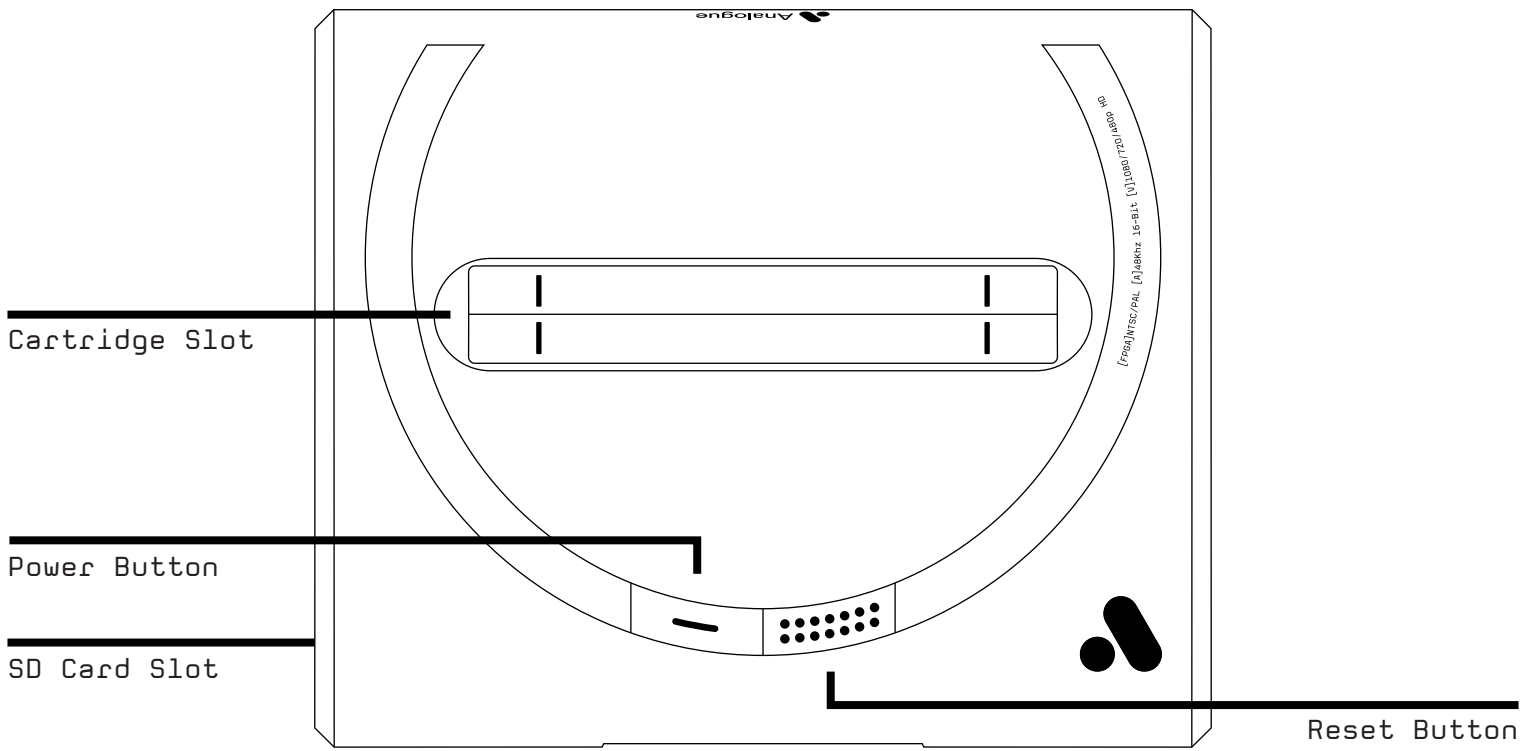
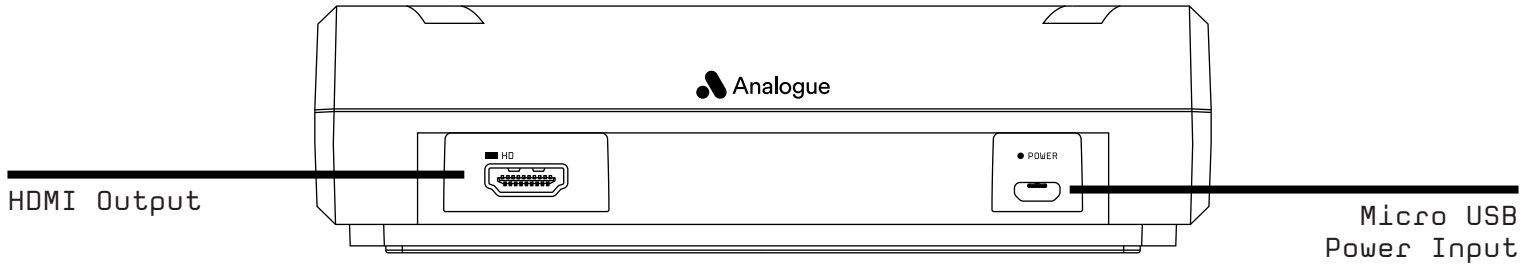
**Celebrate & explore the  
history of video games with  
the respect it deserves.**

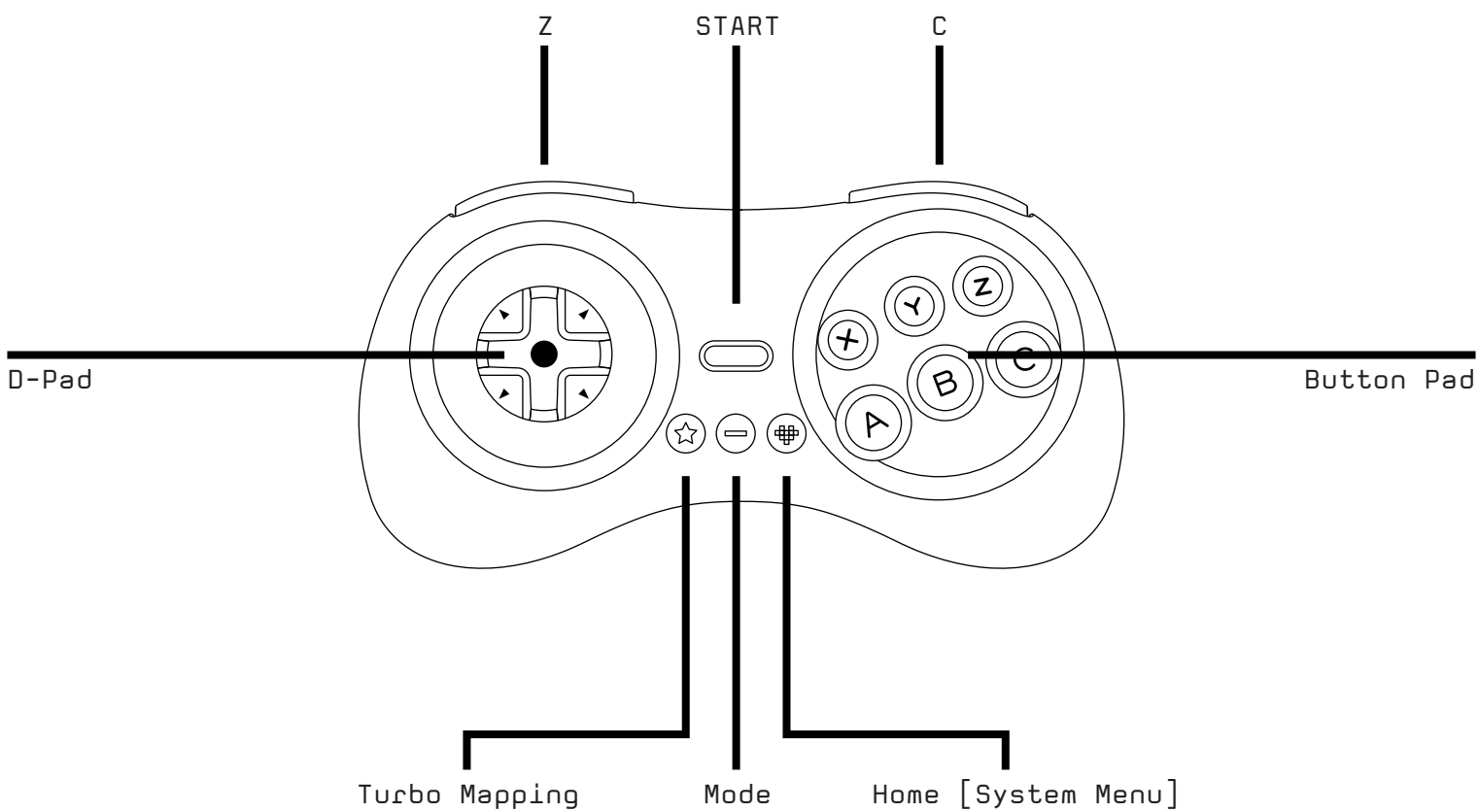
# Congratulations on becoming an Analogue Mega Sg owner.

A reimagining of the underdog that led a 16-bit revolution. Engineered with an FPGA. No emulation. 1080p. Zero lag. Total accuracy. Mega Sg is not a plug n' play toy. Compatible with the 2,180+ Sega Genesis, Mega Drive and Master System game cartridge library. Explore and re-live one of the greatest video game systems of all time with no compromises.

## What's in the box

- Analogue Mega Sg
- Analogue Sega Master System game cartridge adapter
- Sega CD / Mega CD spacer
- Ultracore (digital)
- HDMI cable
- USB cable
- Worldwide USB Power Supply [100-240v, 50/60hz, USA/JPN plug-type]





## Setting Up Mega Sg

- 1 Plug your micro-USB cable into your USB Charger
- 2 Plug your micro-USB cable into Mega Sg
- 3 Plug your USB power supply into a working AC Outlet
- 4 Plug one end of your HDMI cable into your Mega Sg
- 5 Plug the other end of your HDMI cable into your TV/Monitor/Capture Device
- 6 Plug in a Genesis/Mega Drive-compatible controller into Controller Port 1
- 7 Insert a cartridge into the cartridge slot (optional)
- 8 Push the Power Button

## Updating the Firmware

Before playing your Mega Sg, make sure to update to the latest firmware at [support.analogue.co](http://support.analogue.co). You will need a FAT16 or FAT32 formatted SD card to update the firmware.

In order to update the firmware, copy the latest firmware update file at [support.analogue.co](http://support.analogue.co) (with a .bin extension) to the root directory of your SD card. Make sure no other firmware files are in the root directory. Insert your SD card into the SD card slot on your Mega Sg and turn the power on. The firmware update process will start automatically and takes approximately three minutes to complete. During that time the power LED will flicker red at the screen will be blank. When the process is complete the LED will show a steady color and you will see the Animated Mega Sg Startup logo. Do not power off Mega Sg while the firmware is updating. If the power goes off for any reason, Don't Panic! The system may not display anything but it will look for a firmware file to flash to once the power is restored. You cannot brick your Mega Sg with a failed firmware update.

When you update firmware, all settings are reset to their defaults. Take notes of your settings prior to updating.

## Setting Up Mega Sg with Sega CD or Mega CD

To connect Mega Sg to a Sega CD or Mega CD, you must remove the Expansion Slot connector from the right side of the console. Put the Sega CD spacer underneath Mega Sg to raise its connector to a height which will match the Sega CD's connector.

## Notes on Power

While any charger that can supply 5v/2A will work with Mega Sg, including a car charger, it is recommended to use the included high quality USB-to-micro USB cable.

## Setting up your TV for perfect retro gaming

If your TV has a low-lag or Game Mode, enable it. Otherwise turn off all processing features on your TV or it may negatively effect gameplay and latency.

## Default Controller Key Assignments & Hotkeys

*Down + Start* — Enter/Leave Menu

Entering the Menu may not pause a game and blocks controller inputs to the game, Leaving the Menu returns to a game in progress and returns controller inputs to the game.

*Up + Start + A + B + C* — Reset

Same as pressing the physical reset button, initiates a soft reset.

*A* — Confirm/Select Menu Option Key

*B* — Cancel/Back Key

*C* — Exit Menu and Return to Game

## Main Menu Options

### *Run Cartridge*

Performs a Cold Reset (CPU registers and memory is reset) and runs the cartridge in the cartridge slot. This can be a Genesis/Mega Drive cartridge or, with the appropriate cartridge adapter, a Sega Master System cartridge, a Sega Card/MyCard, or a Sega Game Gear cartridge. The system will load the appropriate core automatically if the cartridge is not a Genesis cartridge. This option is also used to startup the Sega CD if one is attached to the Mega Sg.

### *Play Ultracore*

Allows you to play the previously unreleased game Ultracore (formerly known as Hardcore) built into Mega Sg.

### *Settings*

Allows you to adjust the video, audio or system options, save settings and view the credits.

### *Tools*

Allows you to enter Game Genie-style cheat codes and test your controllers using the built-in Analogue controller test program.

## Compatible Cartridges

- Official Sega/Manufactured and approved Genesis/Mega Drive cartridges (all regions)
- Codemasters J-Cart Cartridges
- Sonic & Knuckles Lock-On Cartridge
- Virtua Racing
- Unlicensed/Homebrew/Reproduction/Pirate Genesis/Mega Drive cartridges
- Sega Genesis/Mega Drive Game Genie
- Krikzz Mega EverDrive v1, v2/X7, X5 & X3, EverDrive MD v1-v3
- Sega Master System Cartridges with included Master System Adapter, Master System Converter II, Power Base Mini or PowerBase Mini FM, Master EverDrive X7
- Sega Game Gear Cartridges with Game Gear adapter (sold separately)
- Sega Master System and SG-1000 Cards with Card adapter (sold separately)

## Compatible Controllers & Peripherals

- Official and aftermarket Genesis/Mega Drive controllers (all regions, all varieties including 3 button and 6 button controllers)
- Official Sega Mouse and Mega Mouse
- Sega Activator
- Sega Team Player & Electronic Arts 4 Way Play Multi-taps (never attach anything other than a wired regular Genesis/Mega Drive controller to a multi-tap)
- 8BitDo Retro Receiver
- Sega CD Models 1 & 2
- Zero Tolerance Link Cable
- Miracle Piano (with Sega Genesis/Mega Drive Adapter)

# Settings Menu Structure & Outline

Factory Default Settings for each option are highlighted. If the option is not highlighted, then it is not enabled with the Factory Default Settings. If there is a range given to a particular option, then the default value for that range is highlighted after the range limits are given.

<b>A Video</b>	d Green (1.00-1.99, <b>1.00</b> )	<b>C System</b>	f SD Card Speed
1 Resolution	e Blue (1.00-1.99, <b>1.00</b> )	1 Menu Options	i Normal Speed
a 480p60	9 Advanced Mode	a Skin	ii Fast
b 720p60	<b>B Audio</b>	i USA	iii <b>Faster</b>
c <b>1080p60</b> (assuming your display supports this resolution)	1 Headphone Settings	ii EUR	g Debug
d 480p50	a Headphone Volume (0-50, <b>32</b> )	iii JPN	i Disable YM2612 Channels
e. 720p50	b High Impedance Phones	b Highlight Style	1 0
f. 1080p50	2 Channel Levels	i Solid	2 1
2 Width & Height (when Advanced Mode is enabled, otherwise Screen Size)	a YM2612 L (28-100, <b>100</b> )	ii Swipe	3 2
a x320 width (depends on resolution, <b>1337</b> for 1080p)	b YM2612 R (28-100, <b>100</b> )	iii <b>Flash</b>	4 3
b Horizontal Position (depends on resolution, <b>38</b> for 1080p)	c Square 1 (28-100, <b>55</b> )	iv Rolling	5 4
c Height (depends on resolution, <b>1080</b> for 1080p)	d Square 2 (28-100, <b>55</b> )	v Throb	6 5
d Vertical Position (depends on resolution, <b>50</b> for 1080p)	e Square 3 (28-100, <b>55</b> )	c Highlight Color	ii Disable PCM Audio
f Link x320 and x256 sliders	f Noise (28-100, <b>55</b> )	i Chlorophyll	iii Show IRQs
3 Screen Size (when Advanced Mode is disabled)	3 Channel Panning	ii Quinoline	iv Show Display Enable
a 1:1	a YM2612 L (-100-100, <b>-84</b> )	iii Fast Green	v Highlight Scanline
b Square Pixels	b YM2612 R (-100-100, <b>84</b> )	iv Petent Blue V	1 Scanline Number (0-255, 0)
c 4:3 for 16:9	c Square 1 (-100-100, 0)	v Spirulina	vi Highlight Pixel
d 4:3 for 16:10	d Square 2 (-100-100, 0)	vi Brilliant Blue	1 Pixel Number (0-359,0)
e 4x Height (1080p only)	e Square 3 (-100-100, 0)	vii Anthocyanin	5 LED Options
f 4.5x Height (1080p only)	f Noise (-100-100, 0)	viii Indiotine	a Standby Color
g 5x Height (1080p only)	4 <b>-3db</b> Output Cut	ix Phloxine	b Center Pixel
4 Scalers	5 Enable Cartridge and CD Audio	x Carmine	c K-Pro Rainbow
a No Scaler	6 Swap Left & Right	xi Carotene	d Load Custom Pattern
b HQ2x	7 Cartridge & CD Audio Volume (0-255, <b>25</b> )	xii Tartrazine	i File Browser
c HQ3x	8 Use Lowpass Filter	xiii Titanium Dioxide	e Adjust Pattern
d HQ4x	9 Lowpass Filter (100-20000, <b>20000</b> )	xiv Aluminum Oxide	i Animate Pattern
e Scale 2x	10 Ladder Effect Depth (0-31, 0)	d Font	ii Animate Speed (0-31, <b>16</b> )
f Scale 3x	11 <b>YM2612</b> High Quality Mode	i Alternate Font	iii Pattern Position (0-255, 0)
g X-Ray	12 <b>YM2612</b> Waveform (0-31, 0)	ii Upper Case	f LED Brightness (0-31, <b>8</b> )
h Disable H Interpolation		iii Mixed Case	<b>D About</b>
i Disable V Interpolation		iv Lower Case	1 Special Thanks
5 Scanlines		v User Loaded Font	2 Licensing
a No Scanlines		vi Load Font from SD Card	<b>E Save/Clear Settings</b>
b Normal Scanlines		e Menu Bounce	1 Save Settings
c Hybrid Scanlines		f Dim Game in Menu	2 Restore Factory Defaults
d Scanline Depth (0-255, 120)		2 Hotkeys	
6 Extra Features		a Reset Hotkey	
a Mask Top and Bottom Borders		i Left	
b Mask Left and Right Borders		ii Right	
c Enable Dither Blending		iii Down	
b Dither Blending Depth (0-63, 0)		iv Up	
7 Buffer Mode (not shown unless Advanced Mode is enabled)		v Start	
a Fully Buffered		vi A	
b Zero Delay		vii B	
c Single Buffer		viii C	
8 Color (not shown unless Advanced Mode is enabled)		b Menu Hotkey	
a Limit RGB Range		i Left	
b Lock Gamma Sliders Together		ii Right	
c Red (1.00-1.99, <b>1.00</b> )		iii Down	
		iv Up	
		v Start	
		vi A	
		vii B	
		viii C	
		c Disable Hotkeys	
		d Passthrough Mode	
		3 Startup Options	
		a Boot Sequence Delay (1-10, 4)	
		b Title → Menu	
		c Title → Cartridges	
		d Menu Direct	
		e Cartridge Direct	
		4 Hardware	
		a USA (NTSC Export)	
		b Japan (NTSC Domestic)	
		c PAL Regions (PAL Export)	
		d PAL Extra (PAL Domestic)	
		e Force 3 Button Mode	



## Video Settings

### *Resolution*

480p modes set a resolution of 640×480  
(no widescreen borders are added to the signal)  
720p modes set a resolution of 1280×720  
1080p modes set a resolution of 1920×1080.

50p is intended for European and Australian PAL games, all Japanese, American, South Korean and Brazilian games use the NTSC 60p frame rate. If you see visual artefacts like tearing (assuming the single buffer mode is off) or stuttering, check here to make sure your refresh rate matches the refresh rate of the game's region. This setting should be used in conjunction with the Hardware settings in the System Submenu.

Mega Sg supports EDID (Extended Display Identification Data) over HDMI. The display will send EDID information over the HDMI cable telling Mega Sg what display modes it supports. You may get an unsupported display mode to work, but if you do not, you may end up with no picture. Some NTSC displays may not report 50p support but will work with some or all 50p resolutions anyway. Almost all European displays support 60p. Mega Sg will start up with the highest resolution and frame rate your monitor supports unless you select a lower resolution setting and save the settings.

The Sega Genesis/Mega Drive could display four resolutions. The main resolutions are 320×224 and 256×224 pixels, with the former being more common. Games can and sometimes do switch resolutions from screen to screen. There are also interlaced versions of these resolutions supporting 320×448 and 256×448 at 60/50 fields per second. 320×448 is used for Sonic 2's 2-Player Vs. Mode and Combat Cars 2-Player mode. 256×448 is used for SeaQuest DSV's submarine navigation scenes. PAL games could also use 240-line/480-interlaced line modes.

If you select a resolution that does not work, you may see a black screen. You can still access the menu and may be able to walk back your steps to select a working resolution. If you cannot, then turn off the console and press the reset button as you press the power button. Release the reset button and your console should boot up in 480p mode, which is the most compatible mode supported by Mega Sg.

## Video Settings

### Width & Height

#### 1. 480p Options

Minimum/Maximum Width (Horizontal Pixels) :  
340/640

Horizontal Presets (at 288) :  
x320 Width – 340 (1x320); 408 (Square Pixels); 640  
x256 Width – 340; 408 (Square Pixels); 544 (2x256)

Horizontal Presets (at 1.5x) : x320 Width – 340  
(1x320); 344 (4:3 for 16:9); 360 (1:1); 382 (4:3 for  
16:10); 510 (Square Pixels); 640

x256 Width – 340; 344 (4:3 for 16:9); 360 (1:1); 382  
(4:3 for 16:10); 510 (Square Pixels); 544 (2x256)

Horizontal Presets (at 2x) : x320 Width – 340  
(1x320); 459 (4:3 for 16:9); 480 (1:1); 510 (4:3 for  
16:10); 640

x256 Width – 340; 459 (4:3 for 16:9); 510 (4:3 for  
16:10); 544 (2x256)

Minimum/Maximum Height (Vertical Pixels) :  
288/480

Vertical Presets : 288, 360 (1.5x), 480 (2x)  
Horizontal Position : 0-128  
Vertical Position : 0-64

#### 2. 720p Options

Minimum/Maximum Width (Horizontal Pixels) :  
680/1280

Horizontal Presets (at 2x Vertical) : x320 Width –  
680 (4:3 for 16:10) (2x320); 1020 (3x320); 1280

x256 Width – 680 (4:3 for 16:10); 816 (3x256); 1088  
(4x256)

Horizontal Presets (at 2.5x Vertical) : x320 Width –  
680 (2x320); 720 (1:1); 765 (4:3 for 16:9); 849 (4:3 for  
16:10); 850 (Square Pixels); 1280

x256 Width – 680; 765 (4:3 for 16:9); 816 (3x256);  
849 (4:3 for 16:10); 850 (Square Pixels); 1088  
(4x256)

Horizontal Presets (at 3x Vertical) : x320 Width –  
680 (2x320); 720 (1:1); 918 (4:3 for 16:9); 1019 (4:3  
for 16:10); 1020 (Square Pixels) (3x320); 1280

x256 Width – 680; 720 (1:1); 816 (3x256); 918 (4:3 for  
16:9); 1019 (4:3 for 16:10); 1088 (4x256)

Minimum/Maximum Height (Vertical Pixels) :  
480/720

Vertical Presets : 480 (2x), 600 (2.5x), 720 (3x)  
Horizontal Position : 0-128  
Vertical Position : 0-64

#### 3. 1080p Options

Minimum/Maximum Width (Horizontal Pixels) :  
1020/1920

Horizontal Presets (at 4x Vertical) : x320 Width –  
1020 (3x320); 1224 (4:3 for 16:9); 1360 (4:3 for 16:10)  
(4x320); 1700 (5x320); 1920

x256 Width – 1020; 1088 (4x256); 1224 (4:3 for  
16:9); 1360 (4:3 for 16:10) (5x256); 1632 (6x256);  
1904 (7x256)

Horizontal Presets (at 4.5x Vertical) : x320 Width –  
1020 (3x320); 1080 (1:1); 1360 (4x320); 1377 (4:3 for  
16:9); 1530 (4:3 for 16:10); 1700 (5x320); 1920

x256 Width – 1020; 1080 (1:1); 1088 (4x256); 1360  
(5x256); 1377 (4:3 for 16:9); 1530 (4:3 for 16:9); 1632  
(6x256); 1904 (7x256)

Horizontal Presets (at 5x Vertical) : x320 Width –  
1020 (3x320); 1200 (1:1); 1360 (4x320); 1530 (4:3  
for 16:9); 1699 (4:3 for 16:10); 1700 (Square Pixels)  
(5x320); 1920

x256 Width – 1020; 1088 (4x256); 1200 (1:1); 1360  
(5x256); 1530 (4:3 for 16:9); 1632 (6x256); 1699 (4:3  
for 16:10); 1904 (7x256)

Minimum/Maximum Height (Vertical Pixels) :  
960/1200

Vertical Presets : 960 (4x), 1080 (4.5x), 1200 (5x)  
Horizontal Position : 0-128  
Vertical Position : 0-64

## Video Settings

### *Recommended Scaling Settings*

If you are outputting your Mega Sg to a 1080p or 4K native display and you care about seeing the vertical borders, then you should use 4x vertical scale. If you do not care then you should use a 5x vertical scale. Ideally, the Genesis/Mega Drive displayed 320 pixels in a 32:35 or .91:1 ratio and 256 pixels in a 8:7 or 1.14:1 ratio.

720p - x320 Width 1020 (Square Pixels)  
(3x320) / x256 1088 Width (4x256)  
Horizontal Position 21  
Height 720 (3x)  
Vertical Position 39

720p 320x224 3x/3x  
Width 1020 (Square Pixels) (3x)  
Horizontal Position 27  
Height 720  
Vertical Position 39

1080p 4x - x320 Width 1360 (4:3 for 16:10)  
(4x320) / x256 1360 Width (5x256)  
Horizontal Position 19  
Height 960  
Vertical Position 51

1080p 320x224 4x/4x  
Width 1360 (4:3 for 16:10) (4x) (5x 256p)  
Horizontal Position 23  
Height 960  
Vertical Position 51

1080p 256x224 6x/5x  
Width 1632 (6x 256p)  
Horizontal Position 10  
Height 1200  
Vertical Position 47

1080p 5x - x320 Width 1700 (Square Pixels)  
(5x320) / x256 1632 Width (6x256)  
Horizontal Position 16  
Height 1200  
Vertical Position 47

### *Screen Size*

In the simplified Screen Size setting, height settings are given only for 1080p modes. Horizontal and Vertical Interpolation are enabled and the Borders are disabled.

### *Scalers*

Several scalers are available if you wish to apply them. “No scaler” uses nearest-neighbor interpolation where the color of a pixel is repeated horizontally and vertically as often as is necessary to get to the desired scaled resolution. This results in the sharpest, “pixel purist” graphics but can leave uneven horizontal pixels if the scaled resolution is not an integer multiple of the original resolution.

The HQ2x, HQ3x and HQ4x scalers interpolate a pixel based on the surrounding pixels. The result is generally a smoother image. The 2x, 3x and 4x refer to blocks of pixels, and the larger the block, the fewer colors will be used. Scale 2x and Scale 3x use a somewhat different algorithm but produce a similar result. X-Ray uses a simple algorithm to give inverted black and white graphics.

Using scalers may shift the image slightly, alter the colors considerably and will cause a little extra lag due to the processing of the image required.

The Disable H and V Interpolation options are useful with 8:7 and 4:3 for 16:9 or 16:10 modes with no scaler. These modes subtly blend the edges of pixels to make uneven nearest-neighbor scaled pixels less noticeable. It can also eliminate shimmer in scrolling backgrounds on LCD displays. Genesis/Mega Drive games can freely switch between 320 and 256 pixel screens, so shimmering will be more apparent than a NES or a SNES as a result without integer scaling or interpolation. If you are using a true integer horizontal or vertical scale, you should not need to use these options.

When the Disable Horizontal or Vertical Interpolation box is checked, that means the interpolation is NOT being applied to the video. You can set each form of interpolation independently.

## Video Settings

### *Scanlines*

Mega Sg can generate simulated scanlines to reproduce the scanning beam structure of a CRT. Normal Scanlines dim pixels by the same amount regardless of the pixel's color. Hybrid Scanlines targets more realistic scanlines by adjusting for gamma when dimming a pixel's color. With hybrid scanlines, darker objects have thicker scanlines than brighter objects.

In the opinion of many people, the thickness of the scanlines produced in 720p modes is the ideal thickness. This dims every third line. Scanlines in 1080p modes dim every fourth (4x-4.5x) or fifth (5x) line. Some people view this as making the lines too thin. Scanlines in 480p mode dim every second line. Some view these scanlines as too thick. CRTs varied in their scanline thickness, with higher quality displays tending to produce more pronounced scanlines.

If you use scanlines, you may need adjust the Vertical Position in the Width and Height from the current setting to allow the scanlines to align themselves with the top or bottom edge of each line of scaled pixels. Having scanlines bisect a scaled pixel is not ideal.

### *Extra Features*

The Genesis/Mega Drive would show colored borders on all four sides of the active display area in many games. NTSC CRTs would typically mask off most of these borders behind the screen bezel, but PAL CRTs usually showed at least some of the top and bottom borders.

Mega Sg can simulate this effect if you wish by turning off the masking for the top and bottom or left and right borders. The Genesis/Mega Drive would also show colorful flickering dots in the vertical borders which represented entries into Color RAM, but the Mega Sg does not simulate this artifact.

Dithering was a commonly used technique on the Genesis/Mega Drive to blend colors of adjacent pixels. With an RGB display, the pixels would appear distinct and usually be in

a pattern of alternating vertical lines or a checkerboard pattern where the pixels shift by one every scanline. However, most people played Genesis/Mega Drive through composite or RF video. Composite video lacks the bandwidth to show all pixels distinctly and will tend to blend alternating patterns of two colored pixels. Sometimes this was used as for transparency, other times it would be used to show a mixed color using the color directly generated by the console. The slider will adjust the detection Mega Sg uses to determine whether to blend pixels or not.

### *Buffer Mode*

The buffering modes on Mega Sg address the issue that the Genesis/Mega Drive's native NTSC frame rate is 59.92275fps and the PAL rate is 49.70146fps. A CRT can display these frame rates with ease but modern displays and HDMI interfaces expect either 60fps. 59.94fps or 50fps and are generally not tolerant of refresh rates that vary from too far from the official frame rates. Mega Sg has three modes that deal with the frame rate differential in different ways.

Fully Buffered Mode buffers full frames to maintain the timing of a 59.92 frame rate using only 60fps. This mode avoids tearing at the cost of latency. Mega Sg must render at least 1 frame ahead of the game's internal rendering to stay ahead.

Zero Delay Mode speeds Mega Sg up to achieve a true 60fps frame rate, a speed difference of 0.13%. There is no latency penalty with this method but this method causes Mega Sg to jump ahead by about 1 second every 10 minutes compared to an original Genesis/Mega Drive.

Single Buffer Mode is something of a compromise between the two methods described above. Like the Full Buffer option, the original timing is being generated within Mega Sg. Unlike the Full Buffer, only a portion of the next frame is being pre-rendered, giving latency of no more than 1 frame depending on when the player activates an input. The drawback is a recurring retrace line that is visible once per every several seconds.

## Video Settings

### *Color*

Limiting RGB Range adjusts the color output range to accommodate those displays which do not handle 24-bit RGB natively. Many LCDs found on TVs do not show a full range of RGB for each of the three primaries, red, green and blue. Each primary color is represented by an 8-bit value, giving 256 levels of color for each primary. Full RGB displays accept values of 0-255 for each color primary.

Limited RGB displays only accept values of 16-235, with values below 16 being designated as black and values above 235 being designated as white.

The identical RGB value will not produce the same color in limited RGB versus full RGB because limited RGB tries to cover the same color space as full RGB but has fewer values to cover the range.

You should use Full RGB if your display supports it. If you turn on the Limited RGB Option and see black turn to dark gray, then you should not use this option. If the black stays black, then keep this option on.

The Lock Gamma Sliders Together option disables your ability to set the gamma for Red, Green and Blue independently.

Red, Green & Blue sliders can be set from 1.00 to 1.99 in .01 increments. You may come close to the gamma of a CRT with the sliders at 1.20 without scanlines and 1.40 with scanlines.

### *Advanced Mode*

Enabling this option adds the Buffer Mode, Extra Features and Color options to the Video Submenu and turns the simplified Screen Size options into the Width & Height options.

## Audio Settings

All Sega Genesis/Mega Drive consoles include two internal sources of sound. The first is the six channel, Yamaha YM2612 OPN2 Four Operator Frequency Modulation Sound Generator. Later Genesis/Mega Drive consoles integrate a slightly different sounding YM3438 OPN2C. The second is an integrated recreation of the four channel Texas Instruments SN76489 Programmable Sound Generator. Mega Sg also includes a DAC to allow analog audio output via its headphone jack.

Headphone Output – Sets the volume level from the headphone jack.

High Impedance Phones – If you are using studio-grade headphones, select this option and Mega Sg will try to provide the power necessary to drive those phones. If you are using earbuds or typically low impedance computer/gaming headsets, leave this option unchecked. If your headphone's impedance is above 50 Ohms, then select this option. If below 30 Ohms, leave it unchecked. Between 30 and 50 Ohms, see which setting works best for you. You will notice an increase in the loudness of the audio with this item checked.

Channel Levels – Allows you to set the relative volume levels of the FM and PSG sound sources. The FM is inherently stereo, panning its output left and right, so these outputs are affected. The PSG is dual mono, so each channel is given its own volume level. The default level should match a Genesis/Mega Drive Model 1 with a discrete YM2612.

Channel Panning – Allows you to pan channels left and right relative to center. The original YM2612 has stereo output, so these panning sliders can influence the inherent separation. The original chip does have a certain amount of audio bleed. The original PSG does not have stereo capabilities, so this is an added feature. Set the sliders to 0 to make the sound source mono.

-3db Output Cut – Some monitor embedded speakers and soundbars clip or cannot recognize a full-volume signal. This option reduces the volume to reduce the peaks below their maximum amount (0db). Try enabling this option if you are not hearing any sound or hearing clipping sound from Mega Sg.

Enable Cartridge & CD Audio – This option must be turned on to hear audio from the Sega CD via Mega Sg. Use this option to enable expansion audio from a device like the Power Base Mini FM or the Mega EverDrive v2/X7. Otherwise you should disable this option if you are not using one of the above because the audio inputs can pick up bus noise.

Swap Left & Right – This option reverses stereo.

Cartridge Audio Volume – Sets the volume of the expansion audio.

Lowpass Filter – This allows you to apply a lowpass filter to the audio output. You may wish to use this to attenuate the higher frequency components of FM audio. The slider allows you to specify a cutoff frequency from 100-20000Hz in 100Hz steps. If you go too low the sound will start to sound muffled. The low pass filter is a 256-order low pass, so the cutoff frequency will sharply attenuate audio above the set frequency. The filter will not affect PSG audio or audio from any external source.

Ladder Effect Depth – This effect is sometimes called DAC Noise, because the YM2612 sends its six FM channels to its internal DAC sequentially, there can be unnecessary noise or crossover distortion produced when the audio is output. Some games had their audio designed with this in mind and sound less punchy when played in a system with a YM3438, which almost totally eliminates the effect. After Burner II is the classic example, set the level to 4 or 5 to get a more analog sound when playing that game.

## Audio Settings

YM2612 High Quality Mode – The YM2612's waveforms are expressed digitally using 14 bits, but they are truncated to 9 bits when sent to the internal DAC. When this Mode is turned on, the 14 bit waveforms are not truncated, producing a higher quality sound. This option is likely to be appreciated with high amplitude audio where 9 bits are insufficient to express the full dynamic range of which the audio is capable.

YM2612 Waveform – FM Synthesis works by one or more waveforms modulating one or more other waveforms. The YM2612 can only use a regular sine wave, but other FM synthesizers like the YMF-262 could use other waveforms. By setting the value of this parameter to something other than 0, you can use many other waveforms for modulation:

0	Sine Wave
1	Half Sine
2	Rectified Sine
3	Quarter Sine
4	2x Sine
5	2x Rectified Sine
6	Square Wave
7	Exponential Wave
8	Clipped Sine
9	Half-Period Clipped Sine
10	Rectified Clipped Sine
11	Clipped Quarter Sine
12	2x Clipped Sine
13	2x Rectified Clipped Sine
14	Clipped Half Square
15	Half Exponent
16	Triangle Wave
17	Half Triangle
18	Rectified Triangle
19	Quarter Triangle
20	2x Triangle
21	2x Rectified Triangle
22	2x Rectified Square
23	2x Rectified Exponent
24	Sawtooth Wave
25	Half Sawtooth
26	Rectified Sawtooth
27	Quarter Sawtooth
28	2x Sawtooth
29	2x Half Sawtooth
30	2x Half Square
31	Half Exponent

The resulting sound may vary considerably from what was intended, so the setting won't be saved when you Save Settings.

## System Settings

### *Menu Options*

**Skin** – Use the Cartridge graphic and Highlight color appropriate for the region selected.

**Highlight Style** – Used to indicate the current menu option.

**Highlight Color** – Used to determine the color of the current menu option.

**Font** – Changes the menu font, Alternate Font uses a thicker, standard 8x8 font instead of the default font.

The user loaded font allows you to select your own font in place of those which come with the Mega Sg. The load font option will bring you to the file browser. If you have a directory called FONT at the root of your SD card, it will default to that directory to load a font file. The font must use an 8x8 text box and must be represented in binary in a 1-bit per pixel format. Each character will take eight bytes to represent in this format. The file must be 768 bytes in size and use the extension .fnt. The characters in the file will have to start at ASCII 20 (space) and end at ASCII 7F (delete).

**Menu Bounce** – The menus will drop down instead of instantly appearing.

**Dim Game in Menu** – The game will be dimmed when the menu is active, making it easier to see the menu options but more difficult to see the effects of changing video parameters.

### *Controls & Hotkeys*

**Reset Hotkey** - You can use almost any combination of controller buttons and directionals for this option. You cannot use the Up and Down or Left and Right directionals at the same time. X,Y,Z and Mode buttons are not supported.

**Menu Hotkey** – You can use almost any combination of controller buttons and directionals for this option. You cannot use the Up and Down or Left and Right directionals at the same time. X,Y,Z and Mode buttons are not supported.

**Disable Hotkeys** – If you wish to eliminate any accidental triggering of the hotkeys, you can use this option but you will not be able to return to the menu without power cycling the console. The state of this option will not be saved when you Save Settings.

**Passthrough Mode** – If you are having trouble with an unusual peripheral or wish to disable all Mega Sg controller compatibility processing and eliminate a tiny amount of latency required by that processing, enable this mode. You can disable the Passthrough Mode by pressing the reset button down for two seconds. The state of this option will not be saved when you Save Settings. This is more likely to be useful for the Sega Master System Core, see the Master System section

### *Startup Options*

**Boot Sequence Delay** – This slider determines how much of a delay will be used before the screen will be activated. Some LCDs cannot handle information immediately available from the HDMI interface, so if you are not getting a picture you may want to add a little delay to give the display time to set up the picture parameters.

**Title → Menu** – Starts up directly with the Root Menu after showing the startup sequence.

**Title → Cartridges** – Starts any cartridge inserted in Mega Sg after showing the startup sequence

**Menu Direct** – Starts up directly with the Root Menu without showing the startup sequence.

**Cartridge Direct** – Starts any cartridge inserted in Mega Sg without showing the startup sequence.



## System Settings

### Hardware

USA (NTSC Export) – Use for Games released in North and South America  
Japan (NTSC Domestic) – Use for Games released in Japan and South Korea  
PAL Regions (PAL Export) – Use for Games released in Europe and Australasia  
PAL Extra (PAL Domestic) – Extra option which is not used by licensed games

The Genesis/Mega Drive uses region locking where the cartridge reads the state of a pair of bits. In some consoles, the state of these bits can be changed by installing jumpers or a switch, and these options replicate this. However, the PAL options also set the speed and video timing to PAL-compatible settings, so changing these bits in mid-game may cause a game, which is currently running, to crash. These settings should be set in conjunction with 60p modes for NTSC and 50p modes for PAL in the Video Submenu.

By 1992, most games would display some kind of message when a console played a game from the wrong region and would refuse to progress. Some games just give a single color screen or, for companies such as Konami, just a generic logo. In that case, change the region to the correct region and reset.

Auto Region Detection will allow you to play a game even if the game is not correct for the region set by Mega Sg. When this option is active, it will show the Region the console is being forced to use below the option's text. The change in the region is only temporary and nothing will appear if the region matches the console's settings. Some games are multi-region, so Mega Sg prioritizes USA over Japan, then Japan over PAL Regions with this option.

### Force 3 Button Mode

Some games will not function correctly with a 6 button controller, so use this option if you are experiencing controller difficulties. Most games which have difficulties with 6 button controllers on original hardware will work fine on Mega Sg. American Gladiators, John Madden Football, Ms. Pac-Man, Olympic Gold: Barcelona '92 and Second Samurai are examples of games which require this option to be enabled on Mega Sg.

### YM3438 Busy Behavior

The YM3438 has slightly different behavior when telling the system that it is ready to receive data compared to the YM2612. A few games do not account for the varying behaviors and as a result the speed of their music may not be ideal. If this option is checked, then the music in Hellfire will run slower than intended. Earthworm Jim should have it checked, the music is slower than it should be with the YM2612's behavior.

### SD Card Speed

This option allows for SD card access in the File Browser via three speed settings for loading files : Normal Speed, Fast and Faster.

Unless your SD card is really slow, you should be OK with Faster. Lower the speed down if you are having trouble loading Files.

### Debug

Disable YM2612 Channels – Allows you to individually disable each of the YM2612's channels.

Disable PCM Audio – Turns off the sampled sound processing mode feature of Channel 5, FM audio, which is synthesized sound, will still be heard through Channel 5.

Show IRQs – Shows IRQs active on any scanline or portion thereof in red. The Genesis/Mega Drive can generate an IRQ on any scanline and can generate an IRQ on each scanline. IRQs are often used for advanced graphical techniques.

## System Settings

### *Debug Options Cont.*

Display Enable – Will show a blue screen or blue area of the screen whenever the display is inactive. The Display can be enabled on any scanline. Disabling the display gives the programmer more resources to accomplish other tasks.

Highlight Scanline – Shows a green horizontal line on the line on the accompanying slider.

Highlight Pixel – Shows a green vertical line on the pixel column selected on the accompanying slider.

### *LED Options*

These options control the colors displayed by Mega Sg's RGB LED.

Standby Color – LED Color is solid White.

Center Pixel – LED Color will be whatever the pixel in the center of the screen's color is. If you choose this option, you may not see the LED show color when the system turns on if you boot to the menu because the center pixel is black.

K-Pro Rainbow – LED Color cycles through the rainbow.

Load Custom Pattern – Allows you to load a custom pattern contained on the SD card. Will send you to a File Browser. Pattern files are 768 bytes in size.

[Here](#) is a link to a few custom patterns.

Adjust Pattern – These options allow you to adjust the animation speed and position of the pattern selected in the previous menu.

Animate Pattern – Will disable animation and leave the LED set to the last displayed color if disabled. Equivalent to setting the Animate Speed to 0.

Animate Speed – Determines the speed at which the LED changes colors, higher numbers give faster transitions.

Pattern Position – Determines the currently displayed color within the pattern. Each pattern consists of 256 RGB values.

LED Brightness – Determines the brightness of the LED in a slider, 0 turns the LED off.

## Save/Clear Settings

Save Settings – Saves menu settings to Mega Sg's internal flash memory.

Restore Factory Defaults – Restores Factory Defaults, so take notes of your settings prior to updating.

## Tools

### *Cheat Codes*

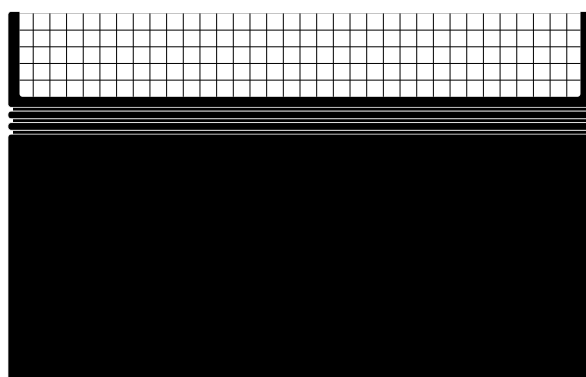
Enable Checked Codes – Activates and Deactivates Codes individually. Up to six standard Game Genie codes can be entered, Codes #1-#6. A code is entered by moving the D-pad to the box and pressing A to advance the numbers and letters. You can only go forward from A-Z & 0-9, not backward. Genesis/Mega Drive Game Genie codes do not use the letters I, O, Q or U.

### *Controller Settings*

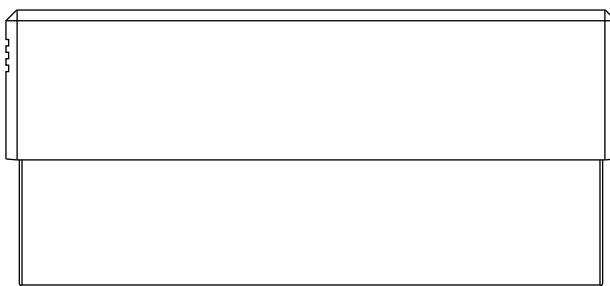
Runs a small program that lets you test the controller directionals and buttons.

# Playing Sega Master System Games

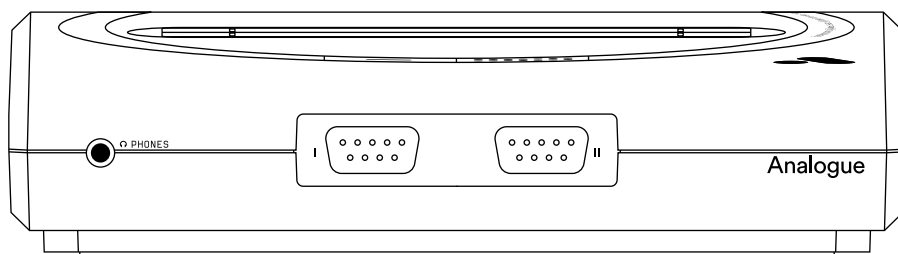
Included with your Mega Sg purchase is an adapter for Sega Master System cartridges. With the Adapter you can use Sega Master System Cartridges.



Master System  
Cartridge



Master System  
Adapter



Mega Sg



Sega CD Spacer

## Master System Video Settings

The NTSC Master System only supports one video mode, 256×192. Many games will show solid-color borders above and below the active screen image for 48 lines. In addition, some games may mask the first left eight pixel columns and show the border color, giving an effective 248×192 resolution. Horizontal borders outside the 256-pixel active display area are not shown, so when you calculate horizontal scaling you must use 256-pixel increments. The PAL Master System adds a 256×224 resolution, but that resolution is only used in Codemasters' games.

Cropping is added to the Video menu to allow you to crop all four sides of the screen if you wish. If you wish to remove the top horizontal border, use 23, the bottom border, use 25, and the left side border, use 8.

### 1. 480p Options

Minimum/Maximum Width (Horizontal Pixels) :  
384/640

Horizontal Presets (at 2x Vertical) : 384, 438 (4:3 for 16:9), 480 (1:1), 487 (4:3 for 16:9), 512 (2x), 548 (Square Pixels), 640

Minimum/Maximum Height (Vertical Pixels) :  
480/480  
Vertical Presets : 480 (2x)  
Horizontal Position : 0-128  
Vertical Position : 0-64

### 2. 720p Options

Minimum/Maximum Width (Horizontal Pixels) :  
512/1280

Horizontal Presets (at 2x Vertical) :  
512 (2x), 548 (Square Pixels), 585 (4:3 for 16:9), 650 (4:3 for 16:10), 768 (3x), 1024 (4x), 1280 (5x)

Horizontal Presets (at 2.5x Vertical) :  
512 (2x), 600 (1:1), 685 (Square Pixels), 731 (4:3 for 16:9), 768 (3x), 812 (4:3 for 16:10), 1024 (4x), 1280 (5x)

Horizontal Presets (at 3x Vertical) :  
512 (2x), 720 (1:1), 768 (3x), 822 (Square Pixels), 877 (4:3 for 16:9), 975 (4:3 for 16:10), 1024 (4x), 1280 (5x)

Minimum/Maximum Height (Vertical Pixels) :  
480/720  
Vertical Presets : 480 (2x), 600 (2.5x), 720 (3x)  
Horizontal Position : 0-128  
Vertical Position : 0-64

### 3. 1080p Options

Minimum/Maximum Width (Horizontal Pixels) :  
768/1920 (1080 visible maximum)

Horizontal Presets (at 4x Vertical) :  
768 (3x), 960 (1:1), 1024 (4x), 1097 (Square Pixels), 1170 (4:3 for 16:9), 1280 (5x), 1300 (4:3 for 16:10), 1536 (6x), 1792 (7x), 1920

Horizontal Presets (at 4.5x Vertical) :  
768 (3x), 1024 (4x), 1080 (1:1), 1234 (Square Pixels), 1280 (5x), 1316 (4:3 for 16:9), 1462 (4:3 for 16:10), 1536 (6x), 1792 (7x), 1920

Horizontal Presets (at 5x Vertical) :  
768 (3x), 1024 (4x), 1200 (1:1), 1280 (5x), 1371 (Square Pixels), 1462 (4:3 for 16:9), 1536 (6x), 1625 (4:3 for 16:10), 1792 (7x), 1920

Minimum/Maximum Height (Vertical Pixels) :  
960/1200  
Vertical Presets : 960 (4x), 1080 (4.5x), 1200 (5x)  
Horizontal Position : 0-128  
Vertical Position : 0-64

## Master System Audio Settings

All Sega 8-bit home consoles, from the SG-1000 to the Master System II, come with an original or built-in recreation of the 4 channel TI SN76489 PSG.

The Japanese Mark III supported an add-on FM Unit which included a Yamaha YM2413 9/6+5 channel 2-Operator FM Synthesis sound chip. The Japanese Sega Master System came with the YM2413 added to the console. The YM2413 upgrade was never officially released outside Japan. Many games support FM audio, even some games which were released only outside of Japan.

All audio on the original 8-bit systems was mixed and output in mono. The Channel Levels allow each channel of the PSG to have its volume adjusted independently and divides the YM2413 channels in half. The Channel Panning allows you to give stereo separation to the audio.

The default Channel Level is 60 for all sliders and the default Channel Panning is 0 for all sliders. Default Cartridge Audio is 90.

## Master System: Controls

The Master System and SG-1000 used controllers with a D-pad and two fire buttons, mapped as follows to a Genesis/Mega Drive controller :

A or C = Button 1 (Left Button)

B = Button 2 (Right Button)

Start = Pause (found on the console on the original Master Systems)

If you wish to use Master System controllers, they are supported in Passthrough Mode (except as noted below) but you cannot access the menu with them due to the lack of buttons.

Light Phaser games are not supported over HDMI due to incompatibility with HD TVs. The Analogue DAC (sold separately in 2019) will provide solutions for analog and CRT only accessories. Three of the thirteen Light Phaser games have control pad options.

Assault City (Required for Light Gun Version, use Control Pad Version)

Gangster Town (Required)

Laser Ghost (Optional)

Marksman Shooting (Required)

Missile Defense 3-D (Required)

Operation: Wolf (Optional)

Rambo III (Required)

Rescue Mission (Required)

Safari Hunt (Required)

Shooting Gallery (Required)

Space Gun (Required)

Trap Shooting (Required)

Wanted! (Required)

The 3-D Glasses are not supported over HDMI. In any game with a 3-D mode most graphics will flicker at approximately ~30Hz. Only three of the eight 3-D games do not support 2-D mode but an HD TV may not sync its frames to the shutter glasses, ruining the 3-D effect. The Analogue DAC (sold separately in 2019) will provide solutions for analog and CRT only accessories.

Blade Eagle 3-D (Required)

Line of Fire (Optional)

Maze Hunter 3-D (Required)

Missile Defense 3-D (Required)

Out Run 3-D (Optional)

Poseidon Wars 3-D (Optional)

Space Harrier 3-D (Optional)

Zaxxon 3-D (Optional)

## Master System Core Options

Use FM (YM2413)

Enables YM2413 FM audio for the 67 games which support it. A few games like Wanted and Walter Payton's Football may refuse to load if a YM2413 is present. Some games like Wonder Boy III: The Dragon's Trap and Time Soldiers must have their Hardware set to Japan to hear the FM sound. Ironically, neither game was actually released in Japan, so the FM audio for these games and many others were never heard during the Master System's original lifespan.

## Modding your Master System Adapter

The Master System adapter included in your Mega Sg can be modified to add a pause button. This can be useful if using original Master System control pads.

There are four plated through holes to the lower left of the female cartridge connector. These holes will take a TL1105 switch. Soldering is required.

The actuator should be at least 13.00mm in length. You will need to open the enclosure of the Master System adapter with a T-10 bit. Finally, you will need to drill a hole and shave a little plastic inside the enclosure for the button to be accessible.



**To be this good takes  
Analogue.**