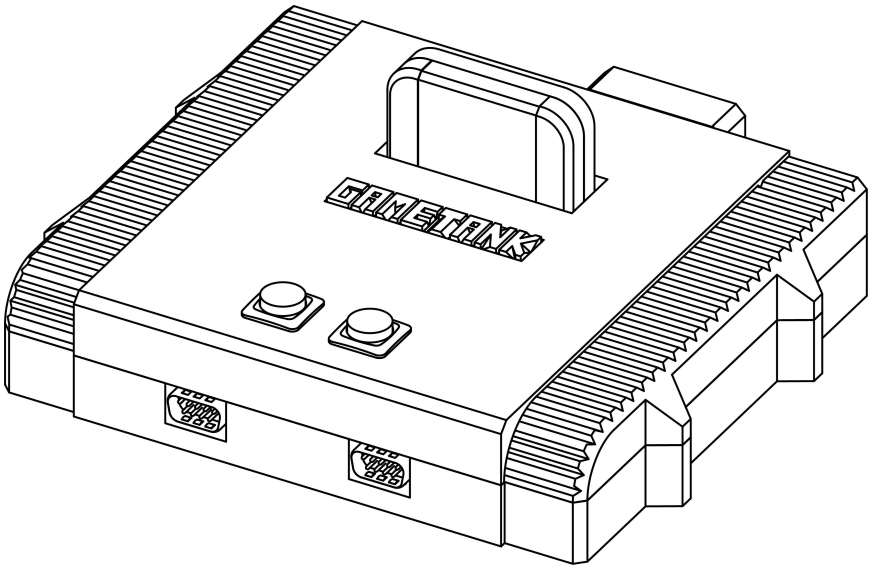
GameTank

8-bit console



User Manual

v1.06

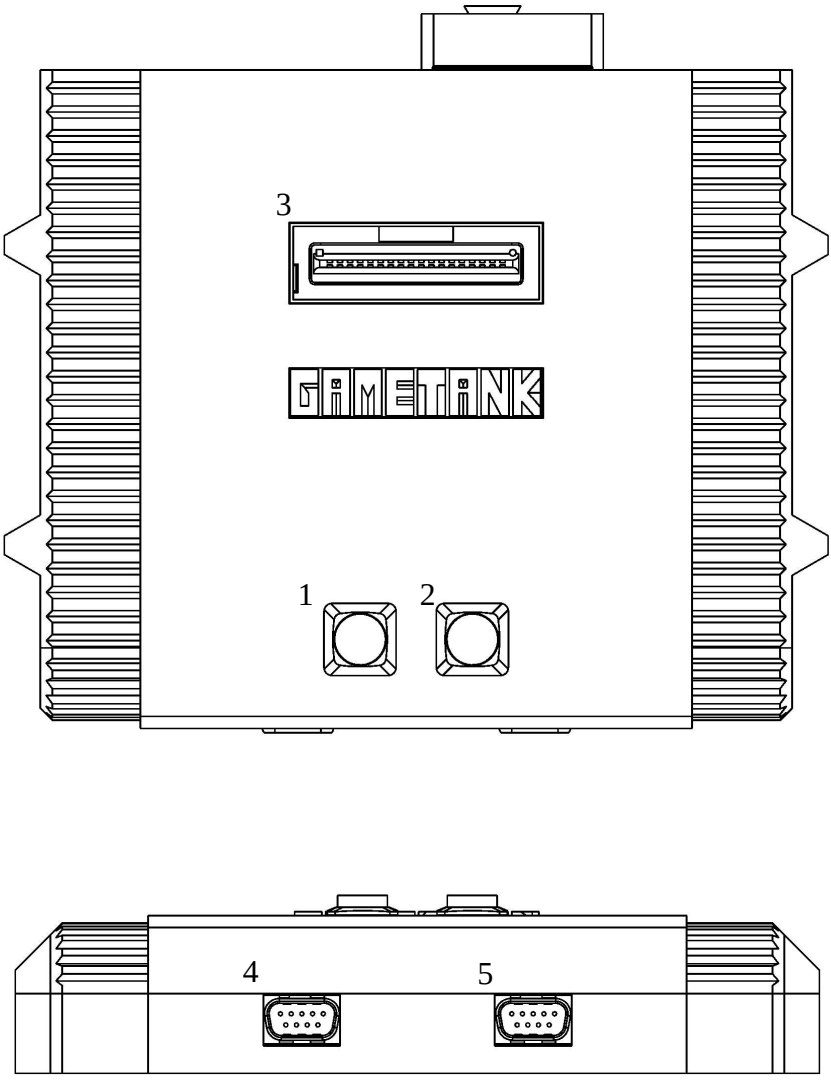
Contents

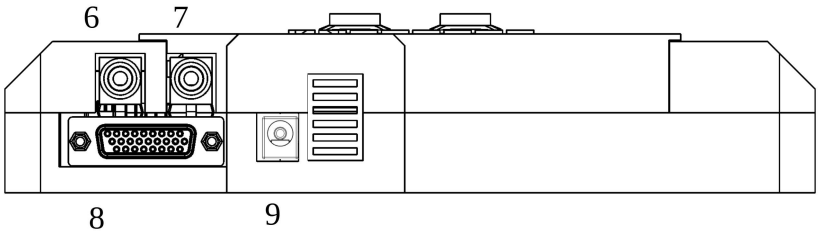
Safety

Thanks for purchasing a GameTank! Here are some tips to help keep it in working order for a long time:

- Only use a center-positive barrel jack 7-12v power supply.
- Install and remove program cartridges with gentle and even force.
- Only install or remove program cartridges while the system is powered off, unless specified by the game program.
- The GameTank is not waterproof, so please don’t take it into the bath, shower, or swimming pool.
- If you open the case, take care not to strip the plastic case threads when putting it back together.
- The rear expansion port gives direct access to critical internal circuits, so take care when experimenting with it.
- Most controllers for other systems with 9-pin controller ports will not work on the Gametank. Genesis gamepads however, are compatible.

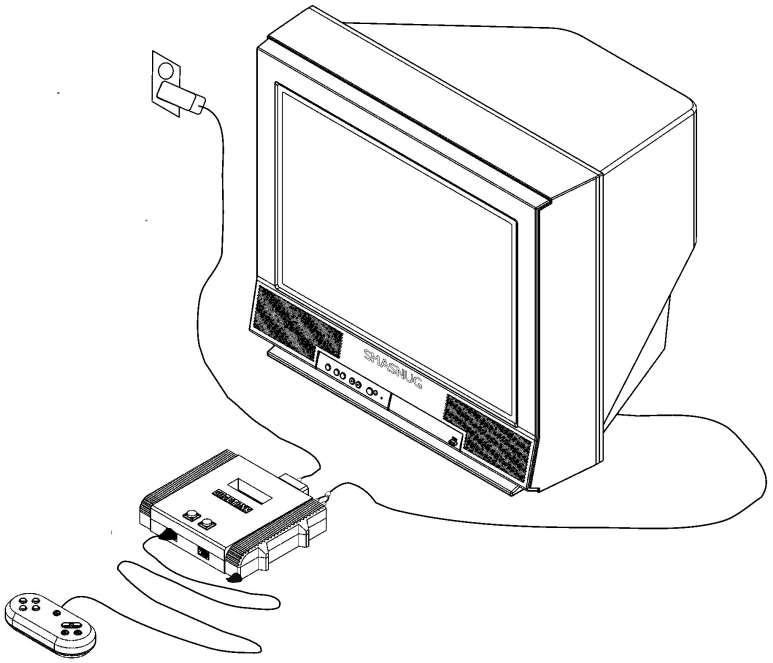
Hardware Overview





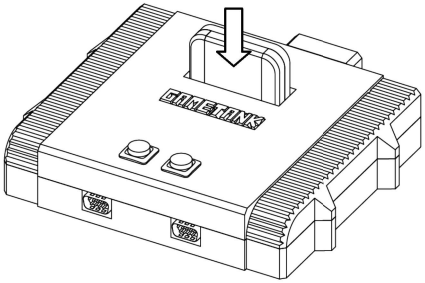
1. Power Button
2. Reset Button
3. Program Cartridge Port
4. Player 1’s Controller Port
5. Player 2’s Controller Port
6. Mono Audio Out
7. Composite Video Out
8. 26-pin Expansion Port
9. DC Power In (5v, 7-12v Center-Positive)

Getting Started

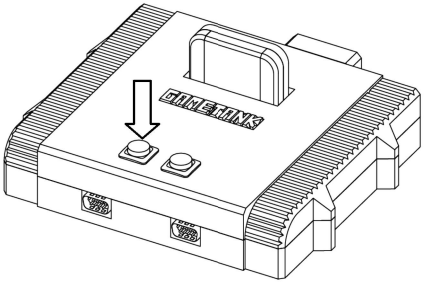


1. Connect GameTank AV outputs to television AV inputs with included cable
2. Plug included AC adapter into electrical outlet
3. Plug barrel jack end of AC adapter in to GameTank
4. If the red Power Button lights up at this time, press it to turn the system off
5. Plug a controller into the Player 1 controller port

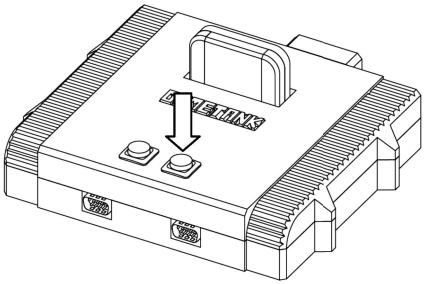
Playing Games



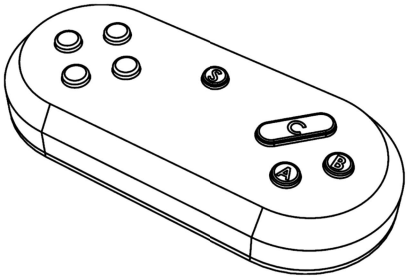
Insert program cartridge



Press power button (red) to turn system on



Press reset button (yellow) to begin cartridge program



Use controller to play game

Troubleshooting

The screen is blank	• Check that red power button is lit • Check connection between console and TV • Check that TV is on video input mode
The screen is filled with random pixels, not changing	• Press and release the reset button • Remove and reinsert the program cartridge • Check that the cartridge contacts are clean • Check that the cartridge port contacts are clean
Game accepts no input or input is erratic	• For single-player games, check that Controller Port 1 (on the left) is used • For two-player games, ensure that both controllers are plugged in
Horizontal bar pattern video and noisy sound	• Audio and video connections may be reversed

Developer Information

Memory Map:

0x0000 - 0x1FFF	General Purpose RAM
0x2000	Audio System Reset (Write 1)
0x2001	Audio System Interrupt (Write 1)
0x2005	Memory Bank Register
0x2006	Audio Sample Rate
0x2007	Video Control Register
0x2008	Player 1 Controller Port
0x2009	Player 2 Controller Port
0x2800 - 0x280F	Versatile Interface Adapter
0x3000 - 0x3FFF	Audio System RAM
0x4000 - 0x7FFF	Video/Graphics RAM
0x8000 - 0xFFFF	Cartridge Slot
0xFFFA	Non-Maskable Interrupt Vector
0xFFFC	Reset Vector
0xFFFE	Interrupt Request Vector

CPUs: WDC W65C02S
Clock Speed: 3.5MHz main, 14MHz audio system

CPU Datasheet is available from WDC at:
https://www.westerndesigncenter.com/wdc/documentation/w65c02s.pdf

Memory Bank Register:

Bitmask	Use
00000111	Select the active Sprite RAM page
00001000	Select which framebuffer to read/write/blit
00010000	Clip blits on the left/right screen edges
00100000	Clip blits on the top/bottom screen edges
11000000	Select general purpose RAM page

Video Control Register:

Bitmask	Name	Use
00000001	DMA_ENABLE	Enable/disable the Blitter
00000010	DMA_PAGE_OUT	Select framebuffer page sent to TV
00000100	DMA_NMI	Enable NMI signal generated by VBlank
00001000	DMA_COLORFILL_ENABLE	Use solid colors for blits instead of sprites
00010000	DMA_GCARRY	Set 0 to repeat 16×16 tiles on blit draws
00100000	DMA_CPU_TO_VRAM	0 means CPU accesses Sprite RAM1 means the CPU access the framebuffer
01000000	DMA_IRQ	Enable IRQ signal when blits finish
10000000	DMA_OPAQUE	Set 1 to disable transparency

Versatile Interface Adapter:

WDC W65C22S
See WDC's website for full data sheet:
https://www.westerndesigncenter.com/wdc/documentation/w65c22.pdf

Lower four bits of I/O port B are exposed in the cartridge port. All other I/O ports are on the rear expansion connector.

Video/Graphics RAM:

Different memory regions, as well as the Blitter Control Registers may be accessed at $4000 - $7FFF depending on the state of the Memory Bank Register and Video Control Register.

Blitter Control Registers:

Accessible when DMA_ENABLE is set.

Addr	Name	Use
$4000	VX	X coordinate in framebuffer of left column of drawing
$4001	VY	Y coordinate in framebuffer of top row of drawing
$4002	GX	X coordinate in Sprite RAM for first column of source data
$4003	GY	Y coordinate in Sprite RAM for first row of source data
$4004	WIDTH	Width of drawing operation. Bit 7 controls horizontal flipping.
$4005	HEIGHT	Height of drawing operation. Bit 7 controls vertical flipping.
$4006	START	Write 1 to clear IRQ and begin a blit operation. Write 0 to clear IRQ without starting a blit.
$4007	COLOR	Value to use for Color Fill Mode. Value is inverted. Only used when DMA_COLORFILL_ENABLE is set.

All blit operations are **from** Sprite RAM **to** Video RAM at 1 pixel/cycle.

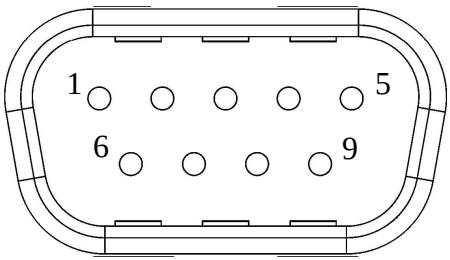
Audio System:

0x3000 – 0x3FFF is read by the concurrently-operating Audio System as the range 0x0000 – 0x0FFF. This should be loaded with a program by the main processor and then reset using the Audio System reset address. The Audio System receives IRQ signals at a rate set by the Audio System Sample Rate register. Any writes by the Audio System to 0x8000 or above will be sent to the digital-to-analog converter, representing a relative voltage for the audio output to the television.

Reading Controllers:

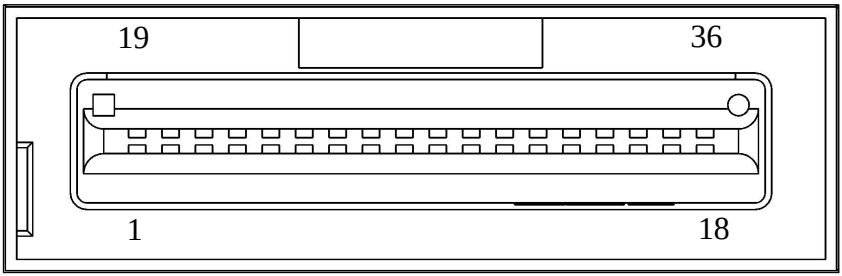
Consecutive reads of the same controller port will toggle the select line, switching between sets of buttons read from the controller.
Reading a controller port will reset the other controller's select line to the initial state.

Controller Port:



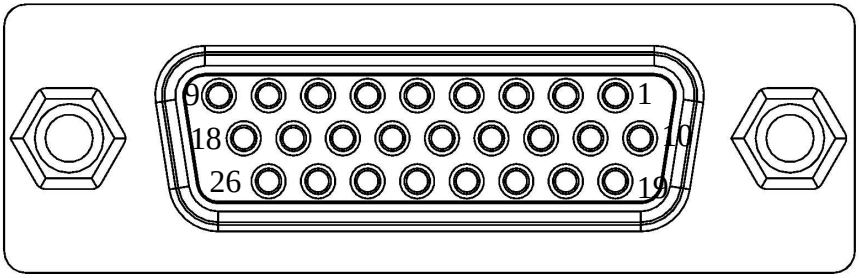
1. Up
2. Down
3. Left / Ground
4. Right / Ground
5. +5V
6. C Button / Start
7. Ground
8. Data Select
9. B Button / A Button

Cartridge Port:



1. +5V
2. VIA PA2
3. VIA PA7
4. VIA PA1
5. VIA PA0
6. A12
7. A7
8. A6
9. A5
10. A4
11. A3
12. A2
13. A1
14. A0
15. D0
16. D1
17. D2
18. Clock
19. A13
20. Write (Active Low)
21. IRQ (Active Low)
22. A8
23. A9
24. A11
25. Read (Active Low)
26. A10
27. Cartridge Select (Active Low)
28. D7
29. D6
30. D5
31. D4
32. D3
33. A14
34. Ready
35. Reset (Active Low)
36. Ground

Expansion Port:



1. Read/!Write	10. +5V	19. VIA PB0
2. Sync	11. VIA PA3	20. VIA PB1
3. 28MHz Clock	12. VIA PA4	21. VIA PB2
4. Vsync	13. VIA PA5	22. VIA PB3
5. !Reset	14. VIA PA6	23. VIA PB4
6. Bus Enable	15. VIA CA1	24. VIA PB5
7. Mem Lock	16. VIA CA2	25. VIA PB6
8. A15	17. VIA CB1	26. VIA PB7
9. Ground	18. VIA CB2	----------

Website and Community

Check out gametank.zone for more information on the GameTank, GameTank games, and development resources.

Visit discord.gametank.zone to connect with the GameTank Community on the Discord app

We hope you enjoy your GameTank and look forward to hearing from you!