

**Home Arcade System**

**Version 4.0**

**Instruction Manual ver. 0.3 DRAFT**

**By RGB, 2019**

# **CAUTION!**

**DO NOT ALLOW CHILDREN OR ANIMALS ANYWHERE NEAR YOUR ARCADE SETUP.**

**EXPOSED 110/220VAC TERMINAL BLOCK ON THE ARCADE POWER SUPPLY POSES REAL DANGER IF ACCIDENTALLY TOUCHED.**

**NEVER LEAVE YOUR ARCADE SETUP UNATTENDED WHEN IT IS POWERED ON.**

## CARE, USE, SAFEGUARDS

The HAS, just like every other device with exposed electronic components is ESD sensitive and prone to physical damage. Improper handling can permanently damage the device. Below is a list of the most basic rules that can help you prevent damage:

- Please read this manual BEFORE you start setting up and using the HAS.
- Do not use the HAS without its acrylic glass covers.
- When connecting the HAS to a PCB game make sure the JAMMA connector is properly aligned to avoid damage.
- Disconnect the HAS slowly and carefully, do not force it.
- Do not wear any clothing that conducts electrical charge when you hold or touch the HAS or your PCB game.
- Do not place the HAS on fabric, or any other fibrous surface, like carpets etc. Place it on a clean dry table, wooden floor, cardboard etc.
- It is a good practice to wear an antistatic wrist strap whenever you are handling the HAS or the PCB games in general. The end of the wrist strap should be attached to a good grounding point - the metal chassis of the PC, pipes, the radiator, etc.
- When not used, you should store your HAS in an antistatic bag.
- Do not keep the HAS in an antistatic bag when you are actually using it! The surface of the antistatic bag is conductive.
- Try to hold the acrylic case along its edges or at least near the bolts. Do not apply force directly to the center of the acrylic glass.
- Do not touch the contacts or surface mount components, especially the microcontroller.
- Never wipe the HAS PCB, wiping can induce ESD. Use clean canned compressed air and an ESD-safe soft bristle brush instead.
- Do not change jumper positions or use built-in switches while the HAS is powered ON.
- Never connect or disconnect cables, controllers or adapters while the HAS is powered ON. This may result in short circuit or inrush current and can damage or even destroy the HAS and your PCB game.
- Never leave your HAS setup unattended, especially when it is powered ON!
- Do not use JAMMA amplified audio for home equipment, unless you know it can handle it.
- Make sure you read the PCB game instruction manual BEFORE you connect it to the HAS.
- Make sure you read the Power Supply Unit instruction manual BEFORE you connect it to the HAS.
- **Keep the HAS away from children and animals.**
- **Any modification to the HAS is at your own risk and responsibility, you will be liable for any damage incurred.**
- **Do not use cheap hardware with the HAS. Using subpar quality hardware with the HAS (be it the power supply unit, controller adapters, audio/video cables, JAMMA harness extension and so on) will most likely result in equipment damage or more serious implications.**
- **The HAS is not a toy. You must never give it to your children or allow them to use it.**
- **Non-adherence to the instructions may result in equipment damage or even more catastrophic failure, like electrocution or fire!**



## HAS V4 features

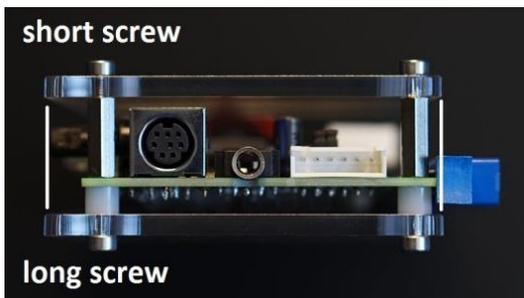
- JAMMA, JAMMA+ and CHAMMA compatible
- DB15 controller ports (NeoGeo compatible, extended to support buttons 5 and 6)
- Programmable button layout
- Programmable rapid-fire (VSync synchronized, 6 different fire rates)
- Buttons 1-6 on the JAMMA connector (buttons 4-5 can be disabled)
- Buttons 4-6 on the “kick harness” connector
- Internal memory to store the button layout and rapid-fire settings
- RGB+CSync video output (75 Ohm impedance)
- Selectable video Low Pass Filter
- Video brightness regulation via one knob
- CSync buffer
- CSync regeneration (fixes video issues in the Taito F3 connected via the XRGB Mini)
- Selectable CSync level and impedance (~0.35Vp-p, 75 Ohm impedance or ~5Vp-p, high impedance, TTL)
- HSync and VSync outputs (~5Vp-p, high impedance, TTL)
- 8pin mini DIN connector for audio and video output (XRGB Mini pinout)
- 3.5mm jack connector for audio output (it will override the 8pin mini DIN audio output)
- Audio attenuation
- JAMMA (mono audio) or MVS (stereo audio) compatible
- Test and Service buttons
- Voltmeter (selectable +5V/+12V measurement)
- 6pin power connector
- Acrylic glass case
- Modular build (the basic functionality can be expanded by using special modules)

## Installation

- 1 Remove the blue/white/transparent protective film from both sides of the acrylic glass covers.



- 1 Assemble the acrylic glass case - the acrylic glass should cover the controller ports and the brightness regulation knob.



- 2 Make sure that the power supply unit is disconnected from the electrical outlet. Attach the HAS power supply harness to the power supply unit.



- 3 Double check if the HAS power supply harness is correctly attached to the power supply unit. Mixing GND, +5V, -5V and +12V will permanently damage your HAS unit and your PCB game. Refer to your power supply instruction if in doubt.

- 4 Plug in the JAMMA PCB to the HAS.

- 5 Connect the HAS power supply harness, AV cable, controller and kick harness to the HAS.

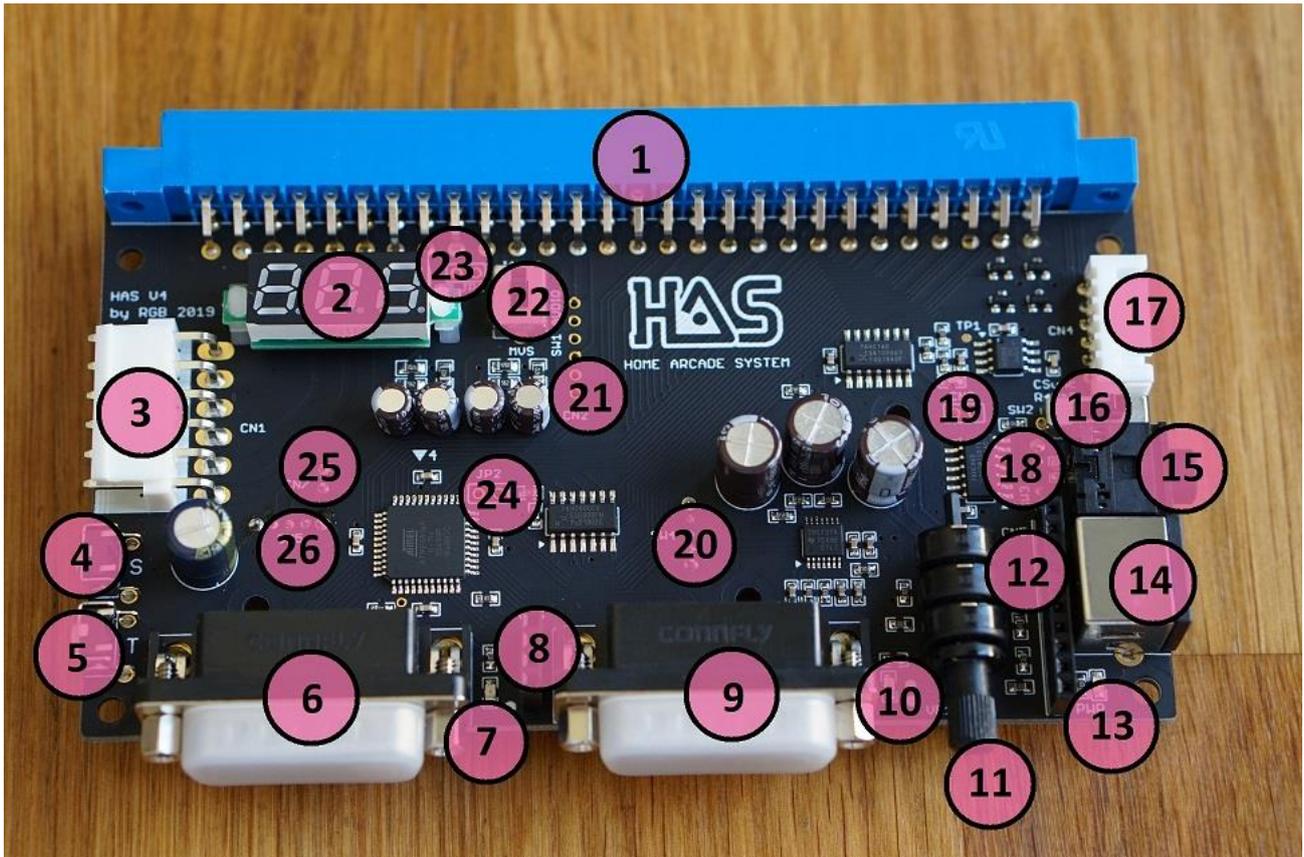
- 6 Power on the HAS by connecting the power supply cable to the electrical outlet. If everything works correctly, a red LED will light up and two status LEDs on the HAS will blink rapidly for a second.

### WARNING:

- NEVER CONNECT OR DISCONNECT THE JAMMA PCB GAME WHILE THE HAS UNIT IS POWERED ON!
- NEVER CONNECT OR DISCONNECT THE HAS POWER SUPPLY HARNESS TO THE HAS UNIT WHILE THE POWER SUPPLY UNIT IS POWERED ON!
- NEVER CONNECT OR DISCONNECT ACCESSORIES LIKE CABLES, CONTROLLERS, ADAPTERS OR OTHER, WHILE THE HAS UNIT IS POWERED ON
- DO NOT RAPIDLY TURN THE POWER SUPPLY ON AND OFF!

**NON-ADHERENCE TO THESE RULES WILL MOST LIKELY RESULT IN EQUIPMENT DAMAGE OR OTHER SERIOUS IMPLICATIONS!**

## HAS V4 PCB



1. JAMMA connector.
2. Digital voltmeter.
3. Power supply connector (CN1).
4. SERVICE button.
5. TEST button.
6. Player 1 controller port.
7. Player 1 status LED.
8. AUX 1 connector (CN6)
9. Player 2 controller port.
10. Player 2 status LED.
11. Video brightness potentiometer (VR1).
12. AUX 2 connector (CN5).
13. Power ON/OFF status LED.
14. 8pin mini DIN audio/video output.
15. 3.5mm audio jack audio output.
16. CSync mode switch (SW2).
17. Kick harness connector (CN4).
18. CSync level and impedance switch (SW3).
19. AUX 3 connector (for advanced users only) (CN3).
20. Video LPF switch (SW4).
21. AUX 4 connector (for advanced users only) (CN2).
22. JAMMA/MVS audio switch (SW1).
23. Audio jumper (for advanced users only) (JP1).
24. Button 4/5 jumper (for advanced users only) (JP2).
25. Voltmeter connector (CN7).
26. Voltmeter switch (SW5).

## Main features

### Video brightness

Potentiometer "VR1". Turn it clockwise to darken the displayed picture.



### CSync processing

There are three CSync output signals to choose from, and you can switch between them using the switch marked as "SW2":



- R - "Regenerated"
- U - "Unprocessed"
- B - "Buffered" - Default setting.

**Side note:** The default setting is "Buffered" CSync (SW2 switch position "B"). It should be used at all times unless your setup requires the following:

- Regenerated CSync (SW2 switch position "R"). Use it to stabilize the displayed picture of the Taito F2/F3 when used with the XRGB Mini.
- Unprocessed CSync (SW2 switch position "U"). CSync pulled directly from the PCB game. **Do not use it unless you know what you are doing!!!**

**WARNING:** Do not use the switch when the HAS is powered on to avoid damage!

### CSync level and impedance

Switch "SW3" allows you to change the CSync level and impedance. In general, the 75 Ohm CSync output should be used with consumer equipment (XRGB mini, OSSC, TVs etc.) and the TTL with equipment that expects TTL signal levels.



- 75R (~0.35Vp-p, 75 Ohm impedance) - Default setting.
- TTL (~5Vp-p, high impedance)

**WARNING:** Using TTL with Scart equipment could cause damage to the equipment!

## Video Low Pass Filter

Switch “SW1” allows you to enable or disable the video Low Pass Filter

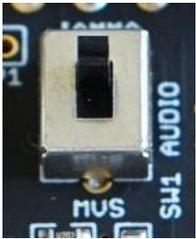


- ON
- OFF – Default setting.

**Side note:** The Low Pass Filter is especially helpful if your scaler does not apply any video filter. A good use case is the OSSC's HD15 input (AV3, RGBS).

## Mono and stereo audio

Switch “SW1” allows you to switch audio between JAMMA (mono) and MVS (stereo).



- JAMMA (mono audio) – Default setting.
- MVS (stereo audio) - Only stereo compatible NeoGeo MVS motherboards.

**Warning:** Do not use this switch when the HAS is powered on. Before you switch to “MVS” (stereo audio), make sure your NeoGeo is the stereo version (usually these are MV-2, MV-4, MV6 motherboard versions). Do not leave the switch in the “MVS” position when you play the JAMMA games (mono audio) to avoid damage to the JAMMA game amplifier!

## Voltage measurement

The voltmeter is used to monitor the +5V power rail (default setting) or +12V. You can change the measured voltage by changing the switch “SW5” position.



- +5V – Default setting.
- +12V

**WARNING:** Do not use the switch when the HAS is powered on to avoid damage!

## Disabling buttons 4 and 5 on the JAMMA connector

In order to disable button 4 and 5 output on the JAMMA connector, press and hold down the physical button 4 on the Player 1 controller (Player 1 DB15 pin #4) while powering on the HAS. Once the two status LEDs stop blinking, you can release the button 4. Button 4 and 5 outputs on the JAMMA connector will be disabled.

**Side note:** Another way to disable buttons 4 and 5 is to close the jumper “JP2”. You can do this by either running a jumper wire across the JP2 pads, or by installing a 2pin 2.54mm Gold Pin header (male) to the JP2 pads and attaching a jumper (the recommended method). This is method is only for advanced users, do not attempt it unless you have decent soldering skills.

## Controls - Operation

### Button configuration mode

❶ Press and hold down two arbitrary buttons and the START button for 3 or more seconds. After 3 seconds an appropriate status LED on the HAS board will light up and buttons will no longer register – this means the HAS has entered the buttons remapping mode and you can release the buttons.

❷ Right after you release the last of the buttons held down, you can set a new button layout by pressing buttons.

❸ Each press of a button corresponds to the JAMMA button number. If you press a button once, it will be JAMMA button 1, twice - button 2, thrice - button 3, it works up to button 6. The seventh press disables the button; the eighth press starts the countdown over. No button press means the button will not be set.

Additionally, each press of a button is indicated by the status LED blink.

❹ To exit the button configuration mode and save your new layout, press the START button.

**Side note:** Every time you access this mode, your previous layout will be erased, and you will need to set your layout anew. This is an easy and fast way to reset your settings.

### Rapid-fire configuration mode

❶ Press and hold down one arbitrary button and the START button for 3 or more seconds. After 3 seconds an appropriate status LED on the HAS board will light up and buttons will no longer register – this means the HAS has entered the rapid-fire configuration mode and you can release the buttons.

❷ Right after you release the last of the buttons held down, you can enable the rapid-fire feature by pressing buttons.

❸ Each press of a button corresponds to the rapid-fire rate.

- One press -> 1/2 of the game's VSYNC,
- Two presses -> 1/3 of the game's VSYNC,
- Three presses -> 1/4 of the game's VSYNC,
- Four presses -> 1/6 of the game's VSYNC,
- Five presses -> 1/8 of the game's VSYNC,
- Six presses -> 1/10 of the game's VSYNC,
- The seventh press disables rapid-fire; the eighth press starts the countdown over. No button press means the rapid-fire will not be set.

Additionally, each press of a button is indicated by the status LED blink.

❹ To exit the rapid-fire mode and save the settings, press the START button.

**Side note:** Just like in the button remapping mode, your previous rapid-fire settings are being erased the moment you access the rapid-fire mode. Consequently, if you want to reset all rapid-fire settings, just enter the rapid-fire mode and exit it without pressing any button.

### Button layout and rapid-fire settings reset

You can consider this a full device reset. It will erase the layouts for both Player 1 and 2. To do the reset, press and hold down both Player 1 and Player 2 START buttons while powering on the HAS.

**Side note:** Once you perform the full device reset, the button layout will be blank, and you will need to enter the button configuration mode and set your new button layout.

## Connectors and pinouts

### Power Supply connector

6pin JST VH series (CN1).

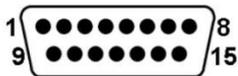


GND (black wire)
GND (black wire)
+5V (red wire)
+5V (red wire)
-5V (white wire)
+12V (yellow wire)

**WARNING:** If you mix HAS power supply harness colors, you will damage your equipment.

### Controller ports

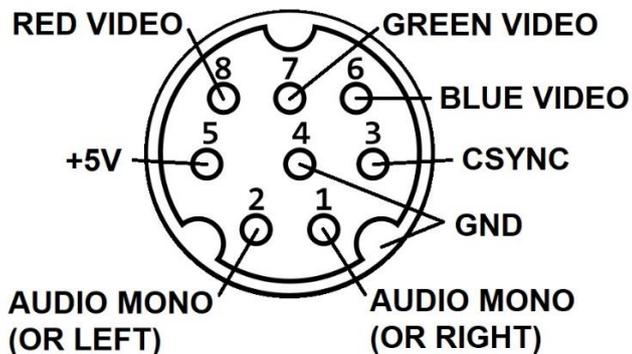
Player 1 and Player 2 controller ports, DB15. NeoGeo compatible, extended to support buttons 5 and 6. The diagram shows the connector looking at the HAS.



Pin	Description	Pin	Description
1	GND	9	N/C
2	Configurable button 6	10	Configurable button 5
3	Coin	11	Start
4	Configurable button 4	12	Configurable button 3
5	Configurable button 2	13	Configurable button 1
6	Right	14	Left
7	Down	15	Up
8	+5V	-	-

### Audio and Video output

8pin mini DIN connector.



**Side note:** The connector has the same pinout as the XRGB mini and you can connect the HAS to the XRGB mini using an 8pin mini DIN cable. Pins of the cable must connect straight through end to end (1:1). When you connect the cable to the 3.5mm audio jack connector, it will override the audio that goes through the 8pin mini DIN.

**WARNING:** Incorrectly wired 8pin mini DIN cable or adapter will damage your equipment.

## Kick harness connector

6pin JST XH series (CN5).



P1 button 4
P2 button 4
P1 button 5
P2 button 5
P1 button 6
P2 button 6

## Voltmeter connector

2pin 2.54mm Gold Pin header (male) (CN7).

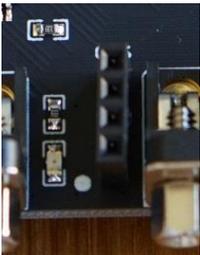


+ (+5V/+12V)
- (GND)

**Side note:** The voltmeter's black wire must be connected to "-", and red wire to "+".

## AUX 1 connector

4pin 2.54mm Gold Pin header (female) (CN6).



GND
GND
+5V
+5V

## AUX 2 connector

10pin 2.54mm Gold Pin header (female) (CN5).



Mono audio (Left channel in the MVS mode)
Mono audio (Right channel in the MVS mode)
CSync
Blue
Green
Red
+5V
+5V
GND
GND

## AUX 3 connector

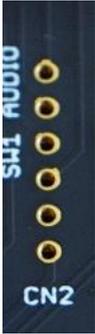
2pin, 2.54mm pitch (CN4).



VSync	HSync
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## AUX 4 connector

6pin, 2.54mm pitch (CN2).



JAMMA #P (CSync)
JAMMA #12 (Red)
JAMMA #N (Green)
JAMMA #13 (Blue)
GND
+5V

## Audio jumper (advanced users)

Audio jumper (JP1) (for advanced users only). Cut the trace between the JP1 pads (the trace is located on the bottom of the PCB) and set the SW1 to "JAMMA" to permanently disable audio on the HAS.



## Button 4&5 jumper (advanced users)

Button 4&5 jumper (JP2) (for advanced users only). Join the JP2 pads to permanently disable buttons 4 and 5 on the JAMMA connector.



### POWER

- “What power supply do you recommend?”**
  - Mean Well MWP-606
  - Prima Power 42PP0606 (can be bought directly from SUZO HAPP, at least in Europe)
  - Mean Well RT-65A (only 65W, so double check if it's enough for your games)
- How do I connect the PSU to the wall socket?**

The easiest way is to use a computer power cable. Strip one end of the cable, then crimp pre-insulated fork terminals and attach them to the PSU terminal block. Make sure you use a cable with 3 wires (Earth, Live, Neutral).

Usually the cable colors for America are as follows:  
Ground (Earth) wire: green, or green with a yellow stripe  
Neutral wire: white or gray  
Single phase live wire: black

Canada:  
Ground (Earth) wire: green, or green with a yellow stripe  
Neutral wire: white  
Single phase live wire: black

Europe:  
Ground (Earth) wire: green with a yellow stripe  
Neutral wire: blue  
Single phase live wire: brown

To be 100% sure check continuity of the wire end and plug end.
- “How should I secure the stripped power supply wires?”**

Crimp M3.5 pre-insulated fork terminals.
- Is it safe to keep the arcade power supply on my desk/floor/table?**

It is extremely dangerous to keep the PSU in places where you or anyone else can accidentally touch the 110/220VAC terminals. Touching the terminals will electrocute you and can lead to death. You should ALWAYS cover the power supply terminal block, by applying a thick layer of insulation tape or by using a terminal block cover.
- “How do I power on/power off the HAS?”**

You power on/off the HAS by plugging in/unplugging the power cable from the wall socket or use a switch on the power strip (the recommended method).
- “Does the HAS provide -5V?”**

Yes, you just need a power supply that outputs -5V.

### AUDIO AND VIDEO

- “What audio/video cable should I buy?”**

This depends on your setup. The most common solution is to use an 8pin mini DIN to male Scart cable, but there are other ways, too. Refer to the “Setups” page on the HAS website.
- “Can I use the 8pin mini DIN to female Scart that is dedicated to the XRGB Mini Framemeister and plug it in to the HAS?”**

No, it won't work. The Scart head in the cable that goes into the XRGB is wired for “input”. When you connect it to the HAS, you output the video signal, so the Scart should be wired for “output”.
- “My cable has a sync stripper, will it work?”**

It depends. The sync stripper isn't needed for the HAS, because the HAS already outputs perfectly clean and jitter-free Composite Sync. Additional sync stripper in the video chain may cause problems.
- “I have a Taito F3, but it does not sync with the XRGB mini.”**

Set the CSync to “Regenerated” on the HAS.
- “I connected the Taito F3 to the OSSC via Scart, but it doesn't sync, and the red led on the OSSC lights up”**

Taito F3 won't work via Scart, use the HD15 connector on the OSSC, set the CSync to “buffered” and CSync level to “TTL” on the HAS; set the OSSC to AV3 (RGSB) and set the H-PLL pre and post coast settings to 4.
- “I use the OSSC, and I can see that it syncs with the game/HAS, but I get no signal on my TV/monitor”**

Your TV/monitor may be incompatible with the output produced by the OSSC. The OSSC does not use a frame buffer, which means that it cannot correct the frame timing. XRGB mini may provide better compatibility, but it also adds some lag because of the frame buffer.
- “I use the OSSC's HD15 port, but it doesn't sync with the HAS”**

Make sure the OSSC is set to AV3 (RGSB), the CSync on the HAS is set to buffered and the CSync level is set to TTL. It may also require tinkering with the OSSC's H-PLL pre and post coast settings.
- “I use the CXA2075 based Composite Video/S-Video adapter, but I get a black screen.”**

Make sure the CSync on the HAS is set to buffered and the CSync level is set to TTL.
- “How do I wire a Scart cable for the HAS?”**

8pin mini DIN (XRGB mini pinout):  
pin #1 - Audio - Right Channel (or leave unconnected if you use a 3.5mm jack for audio)  
pin #2 - Audio - Left Channel (or leave unconnected if you use a 3.5mm jack for audio)  
pin #3 - Csync  
pin #4 - Ground  
pin #5 - +5V  
pin #6 - Blue  
pin #7 - Green  
pin #8 - Red

Male Scart connector:  
pins #4, 5, 9, 13, 17, 18, 19, 21 - Ground  
pin #2 - Audio - Right Channel  
pin #6 - Audio - Left Channel  
pin #7 - Blue  
pin #8 - +5V  
pin #11 - Green  
pin #15 - Red  
pin #16 - +5V through a 180 Ohm resistor  
pin #20 - CSync
- “I bought a Scart cable from “XYZ”, but it doesn't work”**

Open the Scart hood and see if the CSync is wired to Scart pin #20. Some manufacturers wire it to pin #19, which is incorrect. If you are based in Europe and your TV accepts Scart, then additionally check if pins #8 and #16 are populated – these pins are responsible for putting the TV in the RGB input mode.
- “My BVM doesn't sync with the HAS, the screen is rolling or is shaky.”**

The BVM has a function called “VCR Mode” or “AFC Mode”, enable or disable it to see if it helps. Some BVM monitors can be picky with the signal they receive.
- “The picture is overly bright on my PVM/BVM and isn't very stable.”**

This means that you are missing 75R signal termination on the RGSB signals on the PVM/BVM end. Enable

termination to fix the issue. Some monitors may require external 75R caps to terminate the signals.

19. **“I bought an 8pin mini DIN to 8pin mini DIN cable and connected the HAS with the XRGB mini, but it doesn't sync.”**

Make sure that in your cable pins connect straight through end to end. A cable with crossed wiring is incompatible and can cause damage to your equipment.

20. **“I see noise/diagonal lines/interference on the screen.”**

This is most likely some grounding issue. Make sure your PSU is properly grounded.

21. **“I see noise/diagonal lines/interference on the screen, but it disappears as soon as I disconnect the audio cable.”**

This is a grounding problem in your setup, you can fix this by using a 3.5mm audio jack Ground Loop Isolator between the HAS and the 3.5mm audio jack cable.

## GENERAL

22. **“I connected the kick harness, but buttons 5 and 6 don't work”**

It means that buttons 5 and 6 aren't set. Go into the HAS button reconfiguration mode and set a new button layout.

23. **“Buttons on my HAS no longer register, what should I do?”**

This means that the button layout isn't set. Go into the HAS button reconfiguration mode and set a new button layout.

24. **“How do I change the audio volume?”**

You have a volume potentiometer on your PCB game (or volume control in the game's test menu). For convenience, I suggest keeping the volume potentiometer somewhere in the middle and use your TV/speakers volume control instead.

25. **“I installed the plexiglass case, but I cannot fully plug in the HAS to my CPS2, what is wrong?”**

You must have put the plexiglass case on backwards, turn it the other way around.

26. **“What connectors are installed on the HAS?”**

PSU connector – 6pin JST VH

Kick harness – 6pin JST XH

Controller ports – 15pin male DSUB

AV – 8pin mini DIN (XRGB mini pinout)

Audio – 3.5mm stereo jack.

27. **“What type and size of screw posts do I need to secure the Saturn adapters to the HAS?”**

You need a couple of DSUB screw locks with a 10~11mm long thread.

28. **“I'm attempting to play Carnevil on a PVM, and it requires a CSync wire to be ran back to the gun I/O. I tried the ext sync out from the PVM, but it doesn't seem to like it. I'm guessing I'd be better off running CSync directly from the HAS somewhere. Any suggestions on where I could tap in?”**

You can tap it from CN2.

29. **“I'm using a JAMMA harness extension and the HAS doesn't seem to work properly.”**

Try connecting the HAS directly to the PCB game. It's hard to find a JAMMA harness extension that is properly wired. It's not uncommon to see too thin power lines,

miswired audio/video lines and even power lines wired to button inputs by mistake. An improperly wired JAMMA extension harness or subpar quality JAMMA extension harness will damage your equipment and can lead to fire.

30. **“I'm using a 6-in-1 JAMMA selector and some buttons don't seem to work in this setup, but they work when I connect the PCB game directly to the HAS.”**

A good quality JAMMA selector board should not exhibit such issues.

31. **“What's your Sega Saturn controller adapter compatibility?”**

The adapter is programmed for lagless operation and it's compatible with official Sega Saturn joypads and arcade sticks (HSS-0104, HSS-0136, HSS-0130). 3rd party controllers/adapters work with limited luck, meaning there are models that work, and some that don't work at all. Analog controllers (including the Sega one; HSS-0137) are not compatible.

32. **“What is “CHAMMA”?”**

It's the “Chinese JAMMA” that breaks the real JAMMA standard. It accepts 6 buttons via the JAMMA edge. It's used in the multi game PCBs, like the Pandora's Box and similar.

33. **“My HAS works fine with everything I've thrown at it \*except\* the NeoGeo MV1C, PGM, Sega JVS I/O. Does it mean that the HAS is incompatible with those boards?”**

No, the HAS is perfectly compatible with those PCBs. Your problem is with the PSU. Power supplies operate in certain conditions (specified in your PSU datasheet), for example, the PSU may require a certain minimum load on the power rails (+5V being the most important), and if the PSU isn't sufficiently loaded, it may not work at all or give other problems (high pitch hissing sound coming from the PSU being one of the problems, and is a bad sign). The games listed (along with many other modern PCB games, like the Cave games) put very little load on the +5V line, sometimes even less than 1A. If you have a beefy PSU, the recommended minimum load may be even around 2A! A workaround for this is using a different PSU or putting additional load on the +5V line. The latter is advised only for advanced users with some electronics knowledge and who are confident in what they are doing. For example, you could install a cement resistor between GND and +5V, just calculate the load you need and choose a resistor that can dissipate a lot of heat, so that it doesn't become too hot (a 5R resistor, at least 5W if you want a 1A load, however a 5W resistor will get \*extremely\* hot, so a 25W or more will do a \*much\* better job).

34. **Does the HD15 adapter PCB (or other HAS modules) fit underneath the plexiglass case of the HAS, or does this need to be removed to use it?**

All modules/adapters fit underneath the plexiglass case of the HAS, they are supplied with extra spacers and bolts.

35. **I get no audio with Power Instinct and Asura Blade.**

Both Power Instinct and Asura Blade have the audio signals mixed up from the factory. To make them work with the HAS you'd need to use an adapter that fixes the speaker +/- wiring.