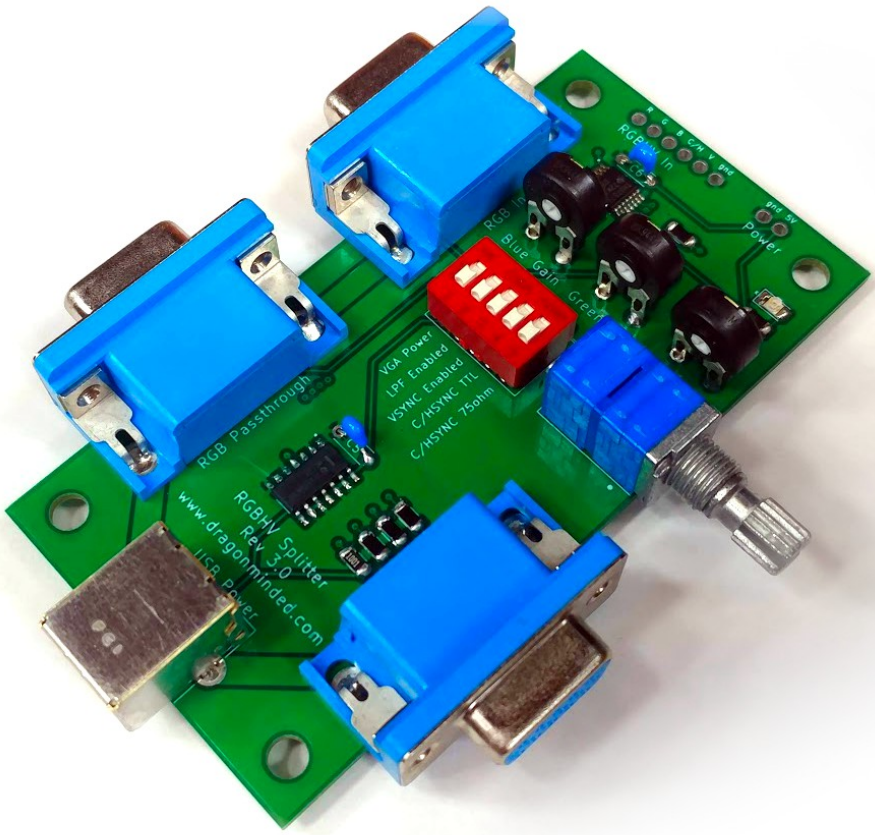
RGBHV Splitter Board



A board that can make a one-to-one buffered copy of a variety of RGB video signals. Optionally the copied video signal can be attenuated to bring overly bright JAMMA and console sources down to VGA-compatible levels. The copied signal is suitable for capturing and streaming home consoles and arcade cabinets while still retaining the use of the original monitor.

This board was developed by Jennifer Taylor (DragonMinded) and is available for purchase at https://www.dragonminded.com/.

The current revision of the board is 3.0.

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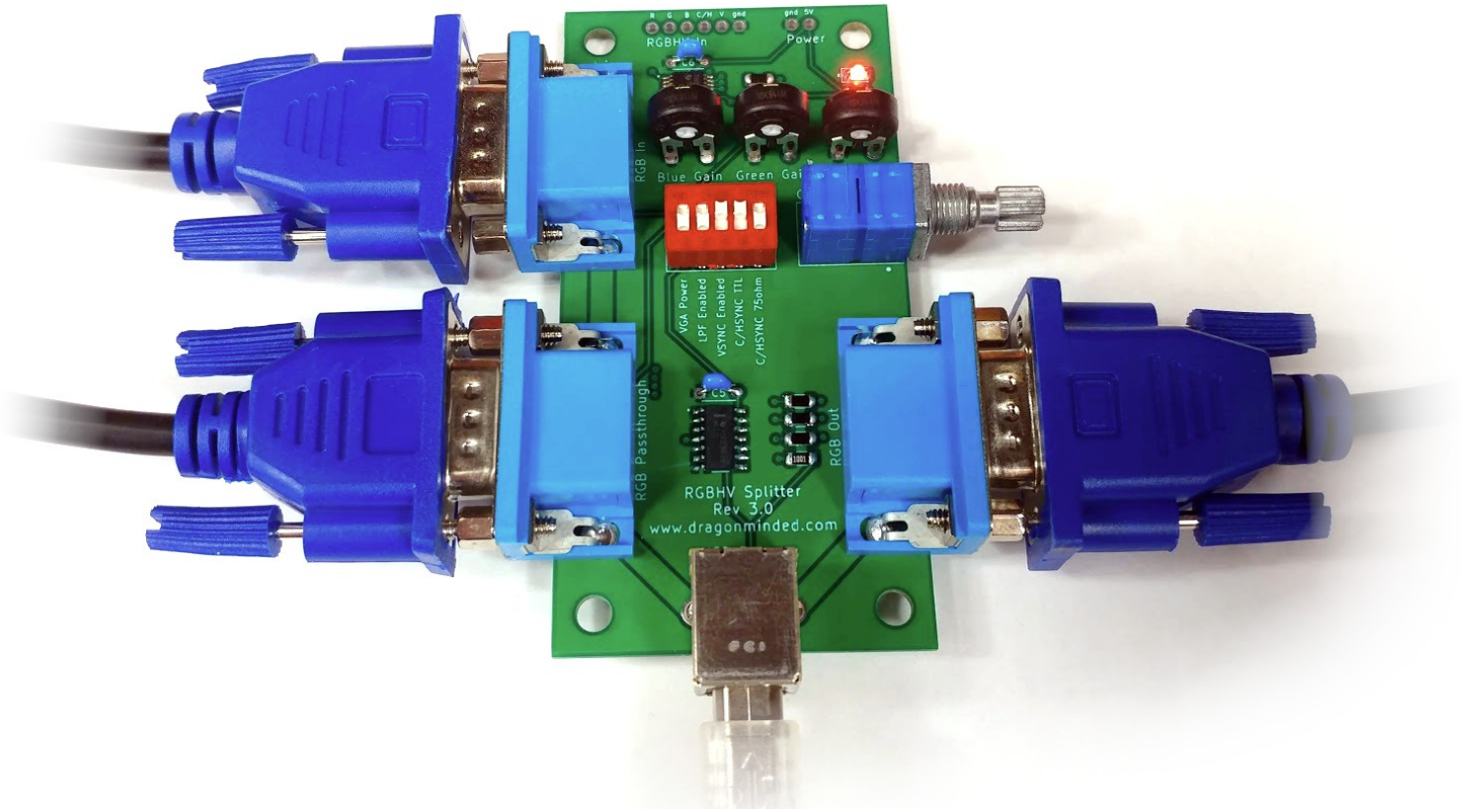
Features

- Zero lag splitter which does not affect the source signal in any way.
- VGA-compatible RGBHV splitting which can feed a secondary VGA monitor or a VGA-compatible capture device.
- OSSC-compatible RGBHV and RGBS splitting which can attenuate arcade video signals to safe levels for plugging into the AV3 input of an OSSC.
- SCART-compatible RGBS splitting which can be used with SCART-to-VGA cables for plugging into the AV1 input of an OSSC.
- Unity contrast knob for adjusting video attenuation in situations with non-standard voltage levels such as JAMMA.
- Individual gain pots for fine-tuning color adjustments to account for variations in source signals in the case of JAMMA capture.
- Can be powered from a USB cable, external 5V power such as a 5V JAMMA wire or even from pin 9 on VGA when it is present.
- User-selectable sync buffering which allows for TTL-level horizontal/vertical and composite sync, as well as 75Ohm terminated composite sync.
- User-selectable low-pass filter on RGB lines when interfacing with RGB-modded consoles.
- Passthrough VGA port which includes EDID pass-through for VGA signals.
- Solder points for attaching spliced RGBS or RGBHV signals and power for custom installations.

Basic Setup

For any successful installation you will need to connect the board to a 5V power source as well as the input video signals. The board will make a one-to-one copy of the video signal and place it on the “RGB Out” connector without affecting the input signal.

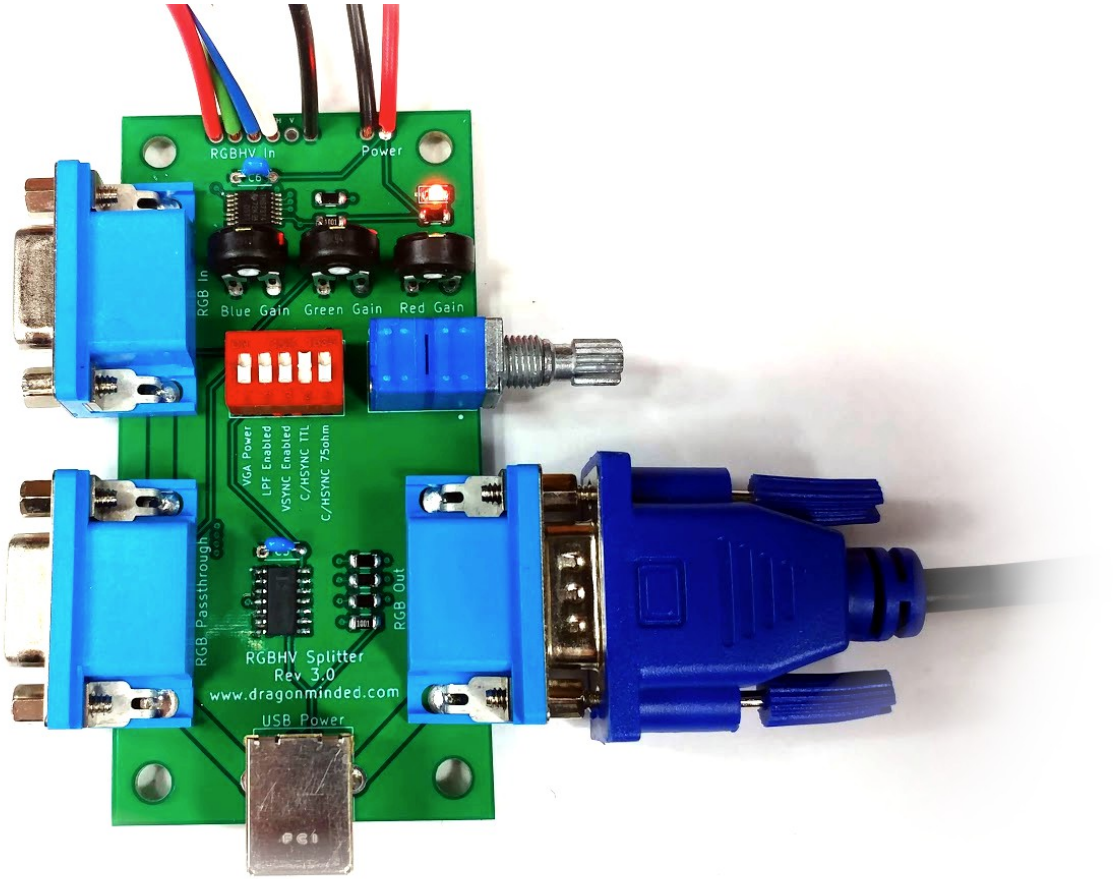
Standard VGA Sources



Unplug the VGA cable which is running from your computer or arcade board to your VGA monitor. Plug the cable into the source computer/board and plug the other end into the “RGB In” connector on the board. Plug a second VGA cable into the “RGB Passthrough” connector and plug the other end into the VGA monitor where you unplugged the original cable. Flip the “VGA Power”, “C/HSYNC TTL” and “VSYNC Enable” DIP switches on. Connect a second VGA monitor, an OSSC using AV3 or a capture device to the “RGB Out” connector.

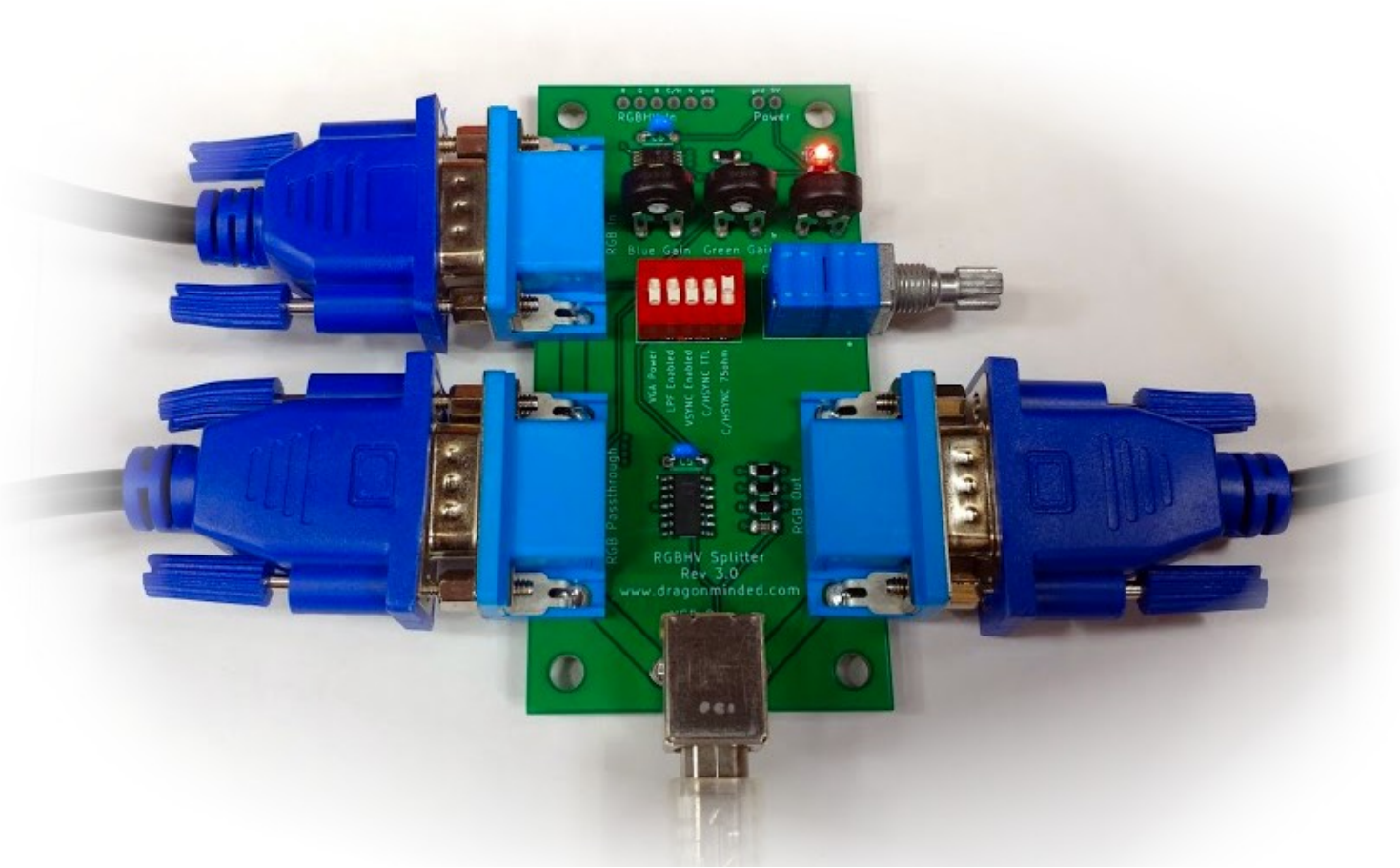
If your video looks wavy, has jail bars or waterfall-style distortion then your video card is not capable of powering the board directly. Flip the “VGA Power” DIP switch back off and connect the board to a spare USB slot or USB charger using a USB cable, or wire the 5V and gnd solder points to an external 5V switching power supply.

JAMMA Video Sources



Connect the Video Red, Video Green, Video Blue, Video Sync and Video Ground signals from your JAMMA edge connector to the R, G, B, C/H and gnd “RGBHV In” solder points on the board. Leave the V solder point disconnected, it is not used for JAMMA splitting. Connect a +5V and ground wire from your JAMMA edge connector to the the 5V and gnd “Power” solder points on the board. Flip the “C/HSYNC TTL” DIP switch on. Connect an OSSC using AV3 or capture device to the “RGB Out” connector.

SCART Video Sources



Any SCART to VGA cable which runs composite sync from SCART pin 20 directly to VGA pin 13 should be compatible with the “RGB In” and “RGB Out” connectors. Alternatively you can build your own SCART cable and solder it to the “RGBHV In” connections. Do not attempt to use the SCART cable enable line to power the board. Power the board either through a nearby USB port/USB charger or by connecting a 5V switching power supply to the 5V and gnd solder points on the board. Flip the “C/HSYNC 75Ohm” Dip switch on. Optionally, depending on what you are splitting, you can turn on the “LPF Enabled” DIP switch to see if it does not improve video quality. Connect an OSSC using a VGA to SCART cable going to AV1 or to a SCART-compatible monitor from the “RGB Out” connector.

Caveats and Warnings

Sync Handling

This board does not perform any sync stripping, combining or processing. If you connect a composite sync signal to the board only a composite sync signal will be available on the “RGB Out” port. Similarly if you connect horizontal and vertical sync to the board separately they will only be available as separate horizontal and vertical sync on the “RGB Out” port. If you are feeding the board 75Ohm terminated sync such as from a modded console or a SCART-compatible signal you should only enable the “C/HSYNC 75Ohm” option. Enabling the “C/HSYNC TTL” option will not convert your signal to TTL-level and has not been tested. Similarly, if you are feeding the board TTL-level sync such as VGA or JAMMA video you should enable the “C/HSYNC TTL” option and in the case of VGA the “VSYNC Enabled” option as well. Enabling the “C/HSYNC 75Ohm” option will not combine sync or convert to SCART levels and has not been tested.

Incompatible Options

If you are powering the board via USB or via the Power solder points you should not enable the “VGA Power” option. This will inject 5V back onto pin 9 of the input cable and could damage the board, your VGA card or your monitor. Pin 9 of the “RGB Out” connector is always disconnected regardless of this setting. You should never enable both the “C/HSYNC TTL” and “C/HSYNC 75Ohm” options at the same time. Doing so will cause the two onboard circuits which handle the different sync to fight with each other and could damage the board.

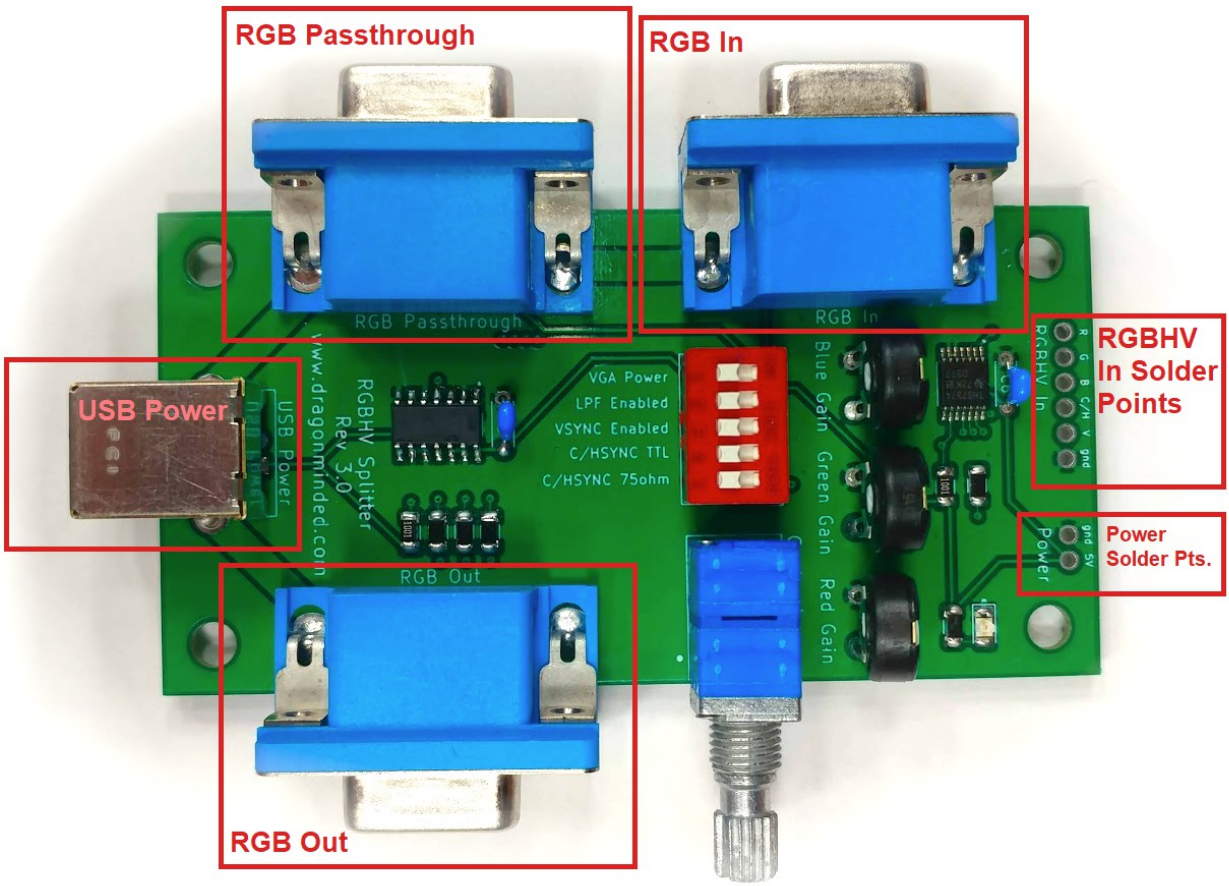
Parasitic Power

If you are splitting VGA-compatible sources you will notice that sometimes the board will appear to be powered and will split the video signal as expected even when you do not power the board at all. This is due to the onboard chips “stealing” power from the input VGA signals. While it is tempting to use the board as-is in this mode you should instead properly power the board. Doing so will often remove artifacts on the copied video signal and puts less strain on the VGA-compatible source.

OSSC Compatibility

If you are connecting the “RGB Out” connector to an OSSC you should be aware of the sync requirements for AV1 and AV3. Specifically, you should only enable the “C/HSYNC TTL” and “VSYNC Enabled” options when you are connecting to AV3. Using TTL-level sync when connecting to AV1 can potentially damage the OSSC. If you are splitting SCART-compatible signals you should only enable the “C/HSYNC 75Ohm” option and use a VGA-to-SCART connector to connect to the OSSC's AV1 port. If you are splitting JAMMA or VGA-compatible signals you should only enable the “C/HSYNC TTL” option and in the case of VGA the “VSYNC Enabled” option and connect to the OSSC's AV3 port. Similar restrictions apply to secondary monitors that speak either SCART or VGA.

Board Specifications



RGB In

A VGA (and SCART over VGA cable) compatible input.

- Pin 1 – Red video signal. Attenuated by both the Red Gain pot and the unity Contrast knob.
- Pin 2 – Green video signal. Attenuated by both the Green Gain pot and the unity Contrast knob.
- Pin 3 – Blue video signal. Attenuated by both the Blue Gain pot and the unity Contrast knob.
- Pin 4 – Not used by this board. This is connected directly to pin 4 of the RGB Passthrough connector. If you are making a custom cable this does not need to be connected.
- Pins 5, 6, 7, 8, 10 – Various grounds, connected to each other and digital ground on the board. As long as your cable connects ground to one of these pins it will work.
- Pin 9 – VGA DDC +5V. On compatible VGA cards this will be 5V power. If present, you can flip the “VGA Power” DIP switch to power the board from VGA. If you are making a custom cable

this should not be connected unless you can provide 5V safely to the board.

- Pin 11 – Not used by this board. This is connected directly to pin 11 of the RGB Passthrough connector. If you are making a custom cable this does not need to be connected.
- Pin 12 – Not used by this board. This is connected directly to pin 12 of the RGB Passthrough connector. If you are making a custom cable this does not need to be connected.
- Pin 13 – Horizontal sync (HSYNC) or composite sync (CSYNC). On VGA-compatible sources this will be a TTL-level horizontal sync signal. For SCART sources this will be a 75Ohm terminated composite sync signal. If you are making your own custom cable and only have composite sync it should be fed to this pin.
- Pin 14 – Vertical sync (VSYNC). On VGA-compatible sources this will be a TTL-level vertical sync signal. If you are making your own custom cable and only have composite sync then this does not need to be connected.
- Pin 15 – Not used by this board. This is connected directly to pin 15 of the RGB Passthrough connector. If you are making a custom cable this does not need to be connected.

RGB Passthrough

A one-to-one clone of the above “RGB In” connector. This is provided in case the video signal you want to split is already traversing a VGA cable. In this case you can plug the VGA cable into the “RGB In” connector and then plug a second cable into the “RGB Passthrough” connector going to the original destination. There is no termination or attenuation applied to any of the pins here or in the “RGB In” connector. From the perspective of the VGA source and the VGA monitor this will appear as if you used a VGA female-female adapter to connect two VGA cables together.

RGB Out

A VGA (and SCART over VGA cable) connector that the board feeds with buffered and attenuated video.

- Pin 1 – Red video signal. Attenuated by both the Red Gain pot and the unity Contrast knob. 75Ohm impedance for compatibility with VGA monitors, SCART monitors and OSSC.
- Pin 2 – Green video signal. Attenuated by both the Green Gain pot and the unity Contrast knob. 75Ohm impedance for compatibility with VGA monitors, SCART monitors and OSSC.
- Pin 3 – Blue video signal. Attenuated by both the Blue Gain pot and the unity Contrast knob. 75Ohm impedance for compatibility with VGA monitors, SCART monitors and OSSC.
- Pin 4 – Not connected.
- Pins 5, 6, 7, 8, 10 – Various grounds, connected to each other and digital ground on the board. As long as your cable connects ground to one of these pins it will work.
- Pin 9 – Not connected.
- Pin 11 – Not connected.

- Pin 12 – Not connected.
- Pin 13 – Horizontal sync (HSYNC) or composite sync (CSYNC). If you turn on the “C/HSYNC TTL” DIP switch this will be a TTL-level signal suitable for feeding a VGA monitor or OSSC AV3. If you turn on the “C/HSYNC 75Ohm” DIP switch this will be a 75Ohm terminated composite sync signal suitable for feeding a SCART monitor or OSSC AV1.
- Pin 14 – Vertical sync (VSYNC). If you turn on the “VSYNC Enabled” DIP switch this will be a TTL-level VSYNC signal suitable for feeding a VGA monitor or OSSC AV3. If you are splitting RGBS video sources such as JAMMA or SCART you do not need to connect this pin to anything.
- Pin 15 – Not connected.

RGBHV In Solder Points

A secondary input which allows you to solder your own custom cable or wires to the board. Just as in the “RGB In” and “RGB Passthrough” connectors above, none of these inputs are terminated.

- R solder point – Red video signal. Attenuated by both the Red Gain pot and the unity Contrast knob.
- G solder point – Green video signal. Attenuated by both the Green Gain pot and the unity Contrast knob.
- B solder point – Blue video signal. Attenuated by both the Blue Gain pot and the unity Contrast knob.
- C/H solder point – Composite sync (CSYNC) or horizontal sync (HSYNC) signal.
- V solder point – Vertical sync (VSYNC) signal.
- gnd solder point – Video ground.

Power Solder Points

If you are powering this by tapping power from a JAMMA cable or an external 5V power supply, connect the 5V and gnd connections here. This should only be fed DC power from a switching mode power supply at 5V. The board requires 30mA of power when plugged in but not active, and 45mA of power when actively splitting a video source. There is no power regulator on the board so connecting higher voltages, low-quality power supplies or AC will damage your board! If you are using VGA power or USB power do not connect to these solder points!

USB Power

If you are powering this by connecting a USB cable to an available USB port or USB charger you can use this plug. The board requires 30mA of power when plugged in but not active, and 45mA of power when actively splitting a video source. If you power the board via VGA power or through the solder points do not connect a cable to this plug!

Video Terminology

Various web sites refer to RGB setups with different terminology. It can be confusing to determine whether your particular setup is compatible with various display and upscaling technologies. The below definitions will lay out how this guide refers to different signals.

- VGA – An analog video standard that carries RGB color information as well as separate horizontal and vertical (HV) sync. The VGA standard specifies TTL level sync signals which means that both the horizontal and vertical signals are expected to oscillate between 0V and 5V. RGB signal levels are expected in the range of 0V to 0.7V. In general, a signal that is labeled VGA compatible will just work with a VGA input on a monitor or capture card.
- RGBHV – An analog video non-standard similar to VGA. Usually the horizontal and vertical (HV) sync signals are TTL level. There is no standard for voltage ranges on the RGB lines themselves but in general RGBHV mirrors VGA and keeps to the range of 0V to 0.7V. Often if you plug an RGBHV source into a VGA-compatible input things will just work. Sometimes the colors are blown out because the voltages exceed the 0.7V required by VGA for full brightness.
- RGBS – An analog video non-standard where the sync signals are combined into one composite sync (S) signal. This is the type of video found on JAMMA arcade boards and in many consoles which have been modified to output RGB as well as consoles that work natively with SCART. Depending on the source the sync signal might be TTL level (JAMMA) or it might be 75Ohm terminated composite sync (SCART, modified consoles). RGB signal levels usually stay within the range of 0V to 0.7V in the case of SCART and modified consoles. However, many arcade boards output RGB voltages between 0V and 2V and expect a monitor with termination in the 1KOhm range. Many upscalers and capture cards which support RGBS expect the signals to be 75Ohm terminated and the RGB lines to never exceed 0.7V and will not work out of the box with JAMMA.