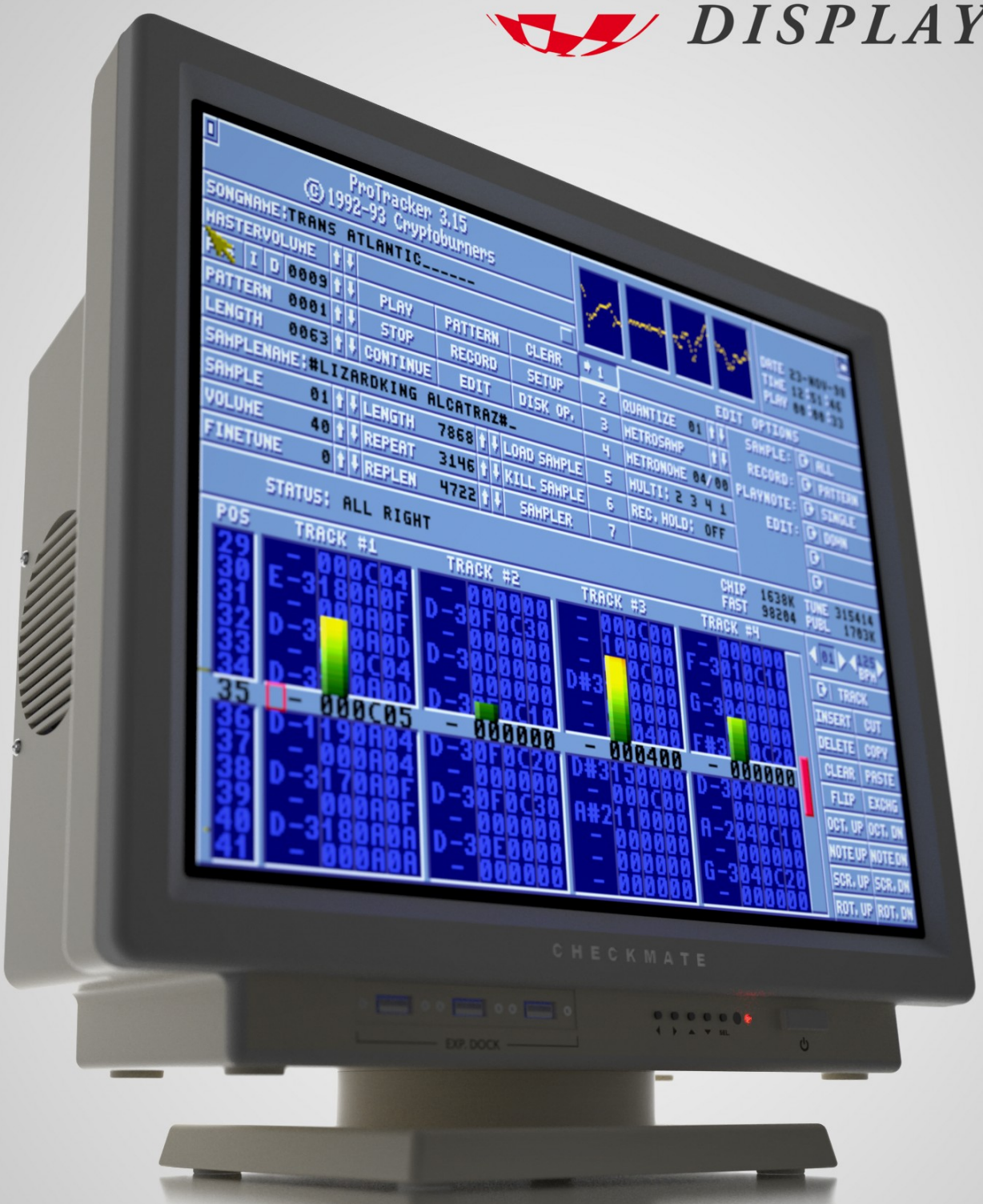
CHECKMATE DISPLAYS™

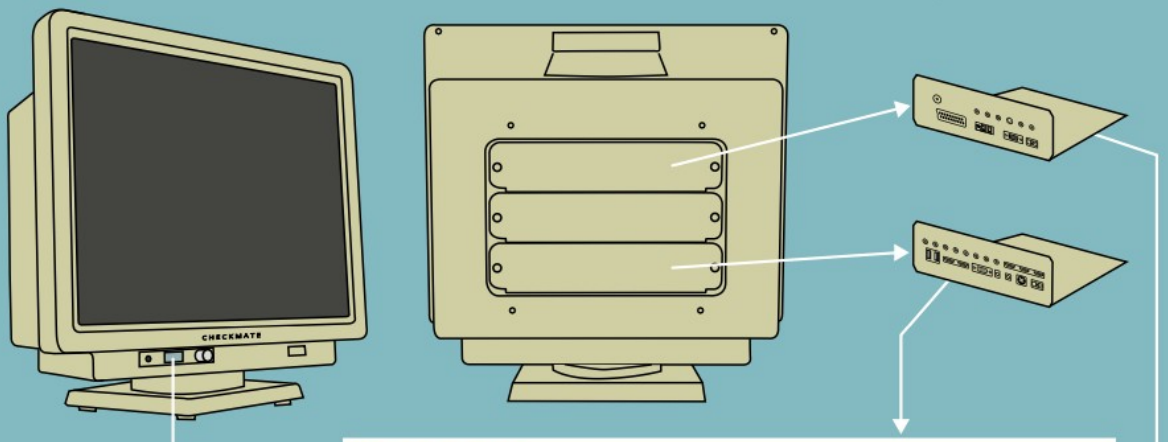


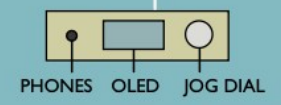
17” & 19” RETRO COMPUTER MONITOR

USER MANUAL

CHECKMATE AT A GLANCE

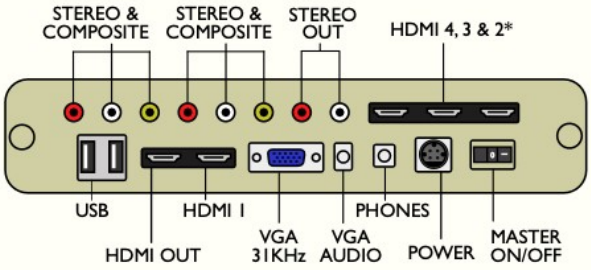
WHAT YOU SEE IS WHAT YOU GET





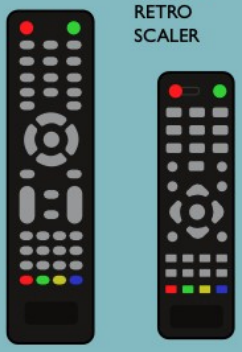
NOTE: Can be used to control pods, and more!

SLOT ZERO

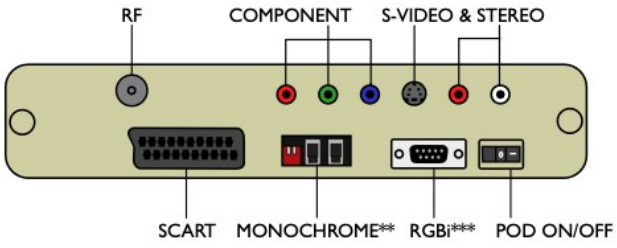


MAIN REMOTE

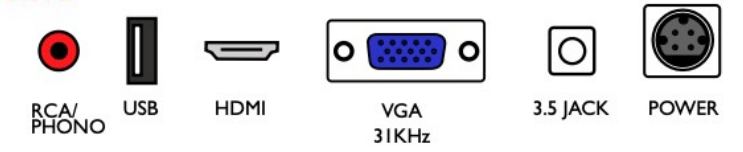
RF REMOTE for TV TUNER on APPY'S RETRO SCALER



APPY' S RETRO SCALER OPTIONAL POD



PORTS



NOTES

* Yes, we know it's an odd order but the engineering dictated the arrangement.

** Monochrome modes only work with RGBi input.

*** RGBi, also CGA, EGA, and Appy's Commodore C128.

NOTE: The Appy's Retro Scaler is an optional add-on pod and not included with the standard system.

HTTPS://CHECKMATEDISPLAYS.COM/

Contents

A Window to the Past

Foreword by Phil South
Former journalist and professional old guy

All those years ago in 2018 when Steve offered to press a little cash into my sweaty little hand for the honour of writing an introduction for the Checkmate A1500+ case user manual, I was more than delighted to oblige. Not only was I, and am I, a massive fan of Checkmate products, I'm all for anything which feeds The Community. So, here I am again.

Now I'm not talking about the community in general, like when people talk about "society". No, I'm talking specifically about the Retro Computing Community here, you steely eyed souls who've weathered decades of indifference to your hobby from software and hardware developers alike. Anything which puts new technology in your hands is fine by me, and the Checkmate IPS Retro Monitor is so much more than just a new widget which makes life a bit easier. No, it's a whole new platform which supports retro computer fans in everything they do, be it consoles or computers, be it gaming or personal productivity. That's not nothing.

And shall I tell you what else is not nothing? The way The Community got behind this project and supported it to the hilt, not just with your hearts and minds but with something more tangible and unequivocal: cold hard wads of cash. You backed it with your wallets, and that means a lot. Here in my remote bolthole in the mountains, I looked on in awe as the Kickstarter campaign not only survived but thrived. I've not seen anything like it, and I've seen some things, I can tell you.

Like a science fiction window, through the Checkmate IPS Retro Monitor you can look into the past and the future, it unlocks so many gorgeous old computing machines which were previously unusable. It's thrilling and it makes them look so darn good on screen. Plus it opens up new ways to recreate them too, via emulation of both hardware and software in modules that you can add to the case. With this tool in your possession you can revive and renovate old devices which had been effectively cut off from the mainstream. You can connect with your past in a new and refreshed way. You can join together again around machines which had all but lost their community spirit and bring them laughing their heads off into the 21st Century.

For my part I can’t wait to see what you do with this fabulous monitor, what you’ll configure it to do. I’m sure you will surprise both me and yourself. But what it gives us most of all as a community is a future. It makes the old, new, the lost, found and the obsolete relevant again. And as a professional old guy that’s a notion I can fully get behind.

Have fun.

Phil South, In the South of Welsh Wales, 2024

Chapter 1:

Introduction

Checkmate 19"/17” IPS Retro Monitor Overview

What we are building is a modular display platform to take us into the future of retro computing and gaming or as we say, “Yesterday’s Technology Tomorrow”. It’s the base on which to build your own future proof display solution based on what you need, and with great build quality and good looks. And it’s flexible and upgradable enough for it to last you a lifetime.

CRT displays of the kind we all grew up with are terrific displays, but they come with a price. They are not modern tech and as such they are expensive and difficult to maintain, like classic pinball machines or arcade games. We knew we had to come up with a better, more future proof solution going forwards and what we’ve designed is the Checkmate Retro Styled Modular IPS Display platform. Modular inputs and modular outputs.

Overview

Retro machines usually output RF, composite, SVideo or maybe RGB at 15khz, and so to get you started all models have the two composite inputs in the main controller and are able to accept composite in PAL/NTSC and 15khz compatible, interlaced or non interlaced.

Appy’s Retro Scalar

For RGB signals we needed to convert that 15khz signal to a 31khz one, compatible with the VGA input of the main board, which is the standard for high quality and stable displays, i.e. none of that annoying interlace flicker.

We do this by using a frame buffer and custom circuitry that stabilises and holds an individual video frame long enough to work at 31khz. That's pretty neat if we say so ourselves.

Good points

This means that the image quality is great, better in a lot of cases than the old CRT’s which had awful flicker between scan lines, the result of the old 15khz displays (may they rest in peace). Also up to 1280x1024 resolution is available natively, which looks really great. Other useful resolutions like 1024x768, 800x600, 720x576 and 640x480 are also available, either scaled or unscaled and with a user selectable 5:4 or 4:3 aspect ratio.

This improves the display for productivity apps that used interlace to get the most data on the screen, and I know for me personally this would have been a real game changer back in the day. What this means is, unless you are playing games or demos, you will have a better experience.

Downsides

Note: these are listed separately in this manual under the heading “Future features in the pipeline" (See chapter list).

Overall

Mostly we think you will notice the bright colours and great viewing angles of these monitors and being able to use Appy’s amazing Retro Scalar to give you access to a wealth of different inputs: RGB Scart, EGA, CGA, RGBi, Scart Composite, Component, RF* (TV aerial) and SVideo* inputs supporting PAL and NTSC. And all inputs are easy to use and fully configurable with the Node-Control unit, via a web browser.

**We should note here that the RF and SVideo only supports 60hz regardless of input due to chips we use rather than going high priced custom chips. The other inputs all support 50hz and 60hz. The RF goes through Appy's Retro Scalar, but the SVideo is diverted to one of the internal HDMI inputs. Over time we will improve this as new chips become available. Or we could just design our own FPGA input boards like the great RetroTink systems, but to be honest this is more than the price of the monitor for high end versions. We'll ponder that one and get back to you.*

Chapter 2:

Important information for getting started

1. The pods each have independent power switches so they can be isolated, although the Slot 0 switch turns them all off regardless of the position of Slot 1 and 2 switches. *Essentially when Slot 0 is switched on then power will go through to any pod with the power left in the ON position.*

2. Pressing the front power button puts ONLY the Slot 0 main controller into standby mode, just so you are aware.

3. The front small round buttons are useful if you don't have the remote control. From left to right they switch input sources, modify monitor menu and volume up and down. However, best to use the remote control.

4. If you have *Appy's Retro Scalar*, then you can press the VGA button to toggle round active signals plugged in and working. It is best to have only one connected at a time, but feel free to experiment. Pressing the Channel Up/Down button toggles around the VGA signals regardless of if they are connected and powered.

5. If you have the RF input, you will notice you have a second remote control for it. Please be aware that at present when using the normal remote, it can trigger options in the RF menu. It's our intention in future to have a combined remote, of course, but we added the RF as a free bonus late in the project, so it still has some teething troubles. We hope you appreciate the free RF input with the Svideo upgrade though.

6. The HDMI out is a fantastic feature that was added to all monitors to facilitate external capture. Be aware however because it intercepts the final output to the panel it is exactly the same resolution as the IPS panel and not the input being sent to the monitor, so 1280x1024 at 50/60hz, and as such not all capture cards will understand that old mode. Also if you have our own HDMI → USB capture device you can select that as the input for your capture software. Set it to 1280x1024 and 50/60hz (or whatever is appropriate for your input).

7. If at any point you need to update the panel controller software, download the firmware file (MST_56.bin) and put into the root folder of a Fat32 formatted memory card or USB stick. It only works in one USB port on the monitor, looking from the rear, the right USB port. Power down the monitor and restart it and the upgrade process will happen automatically. DO NOT turn off the power during this process! The front light will flash on and off, and when

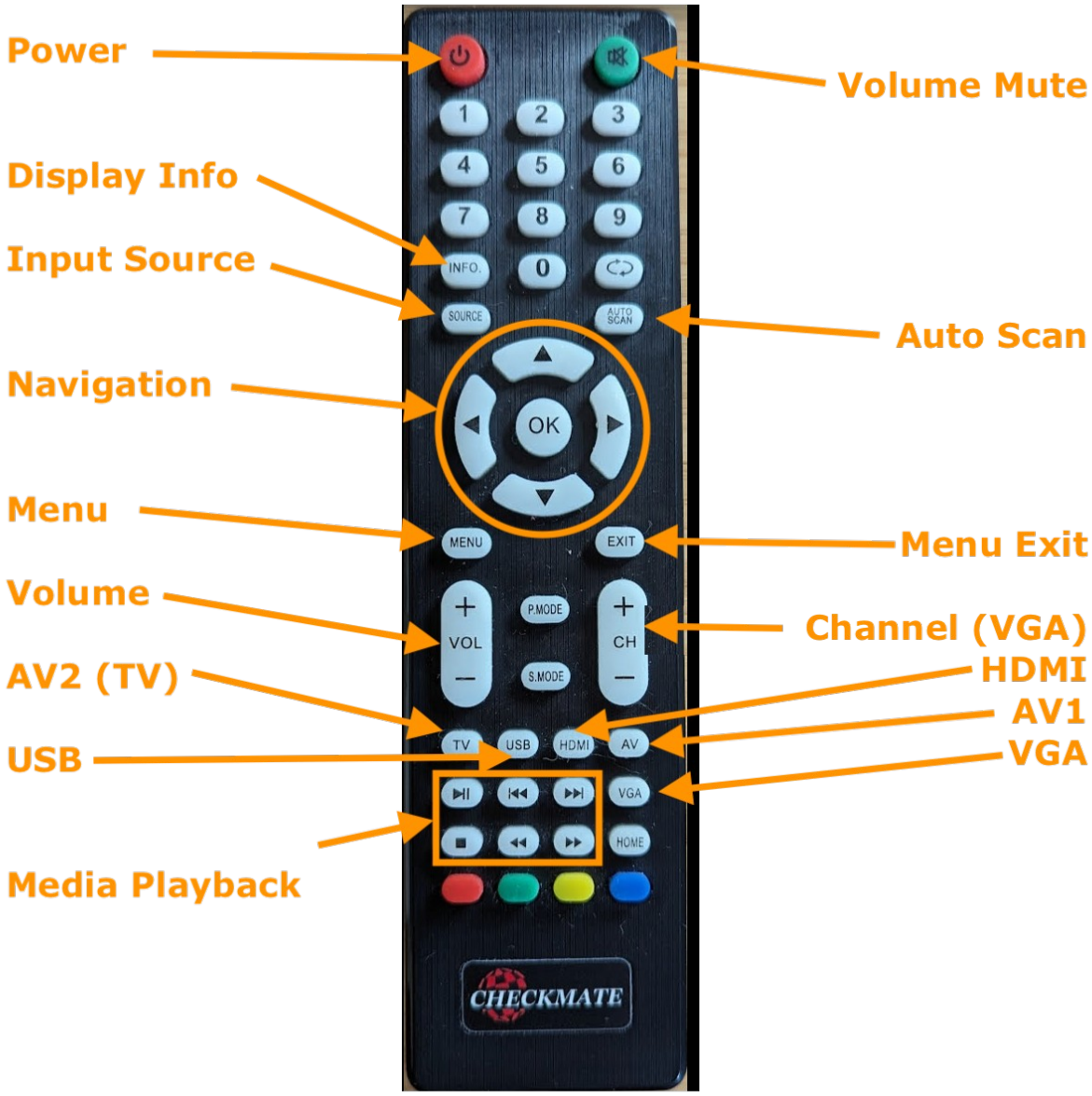
complete it will reboot. Once it's installed, delete the firmware file from the USB stick to prevent re-using it accidentally.

Chapter 3:

Day to Day usage

Remote Control

All users will have the main remote, but if you also have the SVideo/RF input option then you will have a separate RF remote. I'll explain why shortly. For now let's focus on the main remote.



This is mostly self explanatory, if you ever owned a TV, but here are some key

points:

Power, this puts the main Slot 0 controller into sleep mode, any other pods will still be running and consuming power. This is a good thing if you are working on something and just want the display turned off. Otherwise use the power switches at the rear accordingly. Remember the bottom switch turns off everything.

Display Info, This displays the current input source and resolution and indicates if it is either 50hz or 60hz.

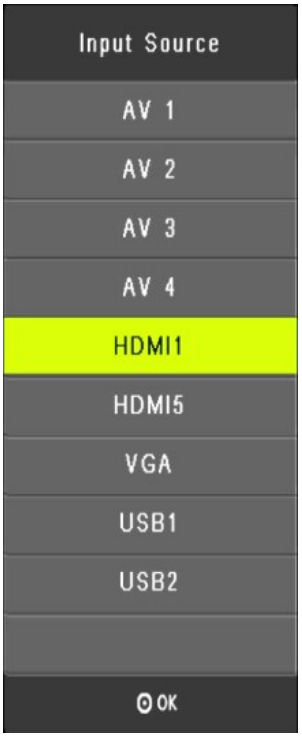
Input Source

This lists all main inputs in the menu.

Please view the Inputs section for more details.

By default HDMI1 is always the main HDMI input next to the HDMI Output, but HDMI5 could be displayed as anything between HDMI2-6

VGA as standard is the rear 15 pin external VGA input. Please read the VGA and *Appy's Retro Scalar* sections for more information about VGA input switching.



Auto Scan, this is not what you might think. This is to help you with the HDMI switcher if you have the 5 way input. (If you don't then it will merely switch between HDMI1 external and HDMI2 internal.) You must select an HDMI source to use this menu!

By default the HDMI switcher is set to manual, so each time you press the HDMI button it toggles through HDMI1-6.

If you press the right arrow this will change it to Auto Scan. This senses when something is plugged in or activated and switches automatically. Try this to see if it suits you.

Channel (VGA)

This up and down toggle is programmed to allow you to manually switch through the VGA modes on *Appy's Retro Scalar*. When you navigate with the VGA button, the Scalar will try and sense a signal and lock to it. You will see the OLED display reset. With the channel up and down, you are manually switching through, and be aware it take two presses to switch each channel.

VGA Switching pattern in order

RF Mezze Board
Slot 2 Channel 2
Slot 1 Channel 2
Slot 2 Channel 1
Slot 1 Channel 1

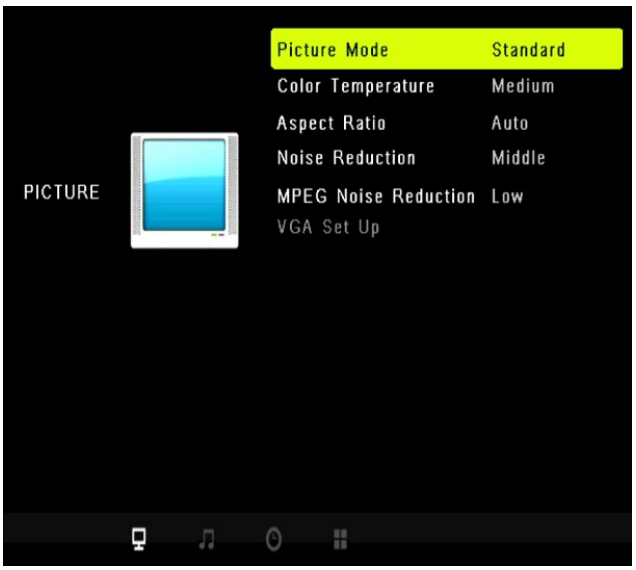
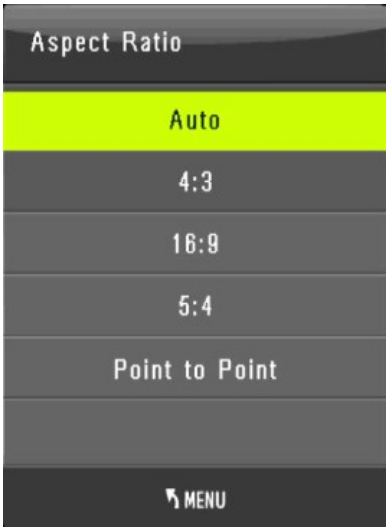
(With Slot 1 and 2 switching between what is plugged into the referenced Slot.)

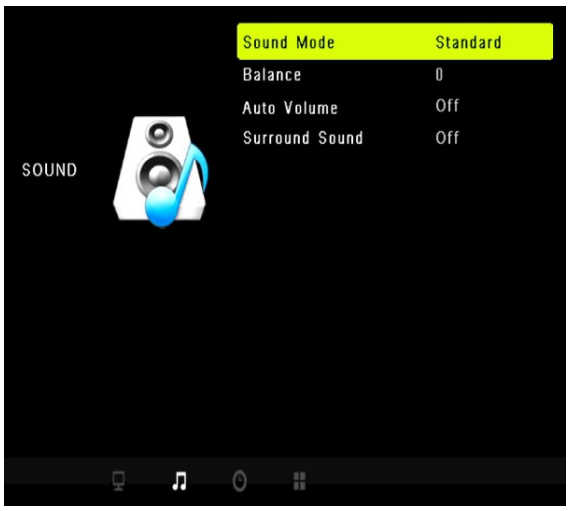
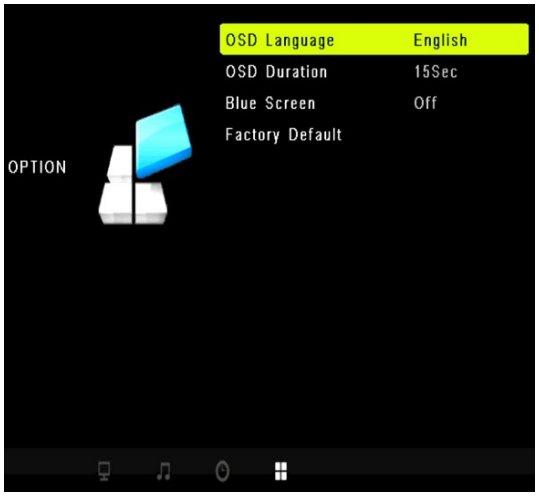
"Channel" is if the board plugged into the Slot has 2 VGA channels (as does "Appy's Retro Scaler") with Channel 1 being RGB, and channel 2 is SCART.

Some boards may just have the one VGA signal out, and this will be outputted on selection of that slot no matter which channel. So it may seem to be repeated through switching but only because it is outputting on both channels.

Slot 0 Menu options

Press the menu button on any source and you will have access to these menus. Please note that they remember different settings for groups of inputs, so AV has settings, then HDMI etc.

Picture Menu This is the one you will use the most. Picture mode has 4 options, Standard, Soft, Vivid and User. The User option can be modified to taste. Colour temperatures are Medium, Warm, Cool and User. Noise and MPEG Noise reduction are not really used except for media playback.	
Aspect Ratio Note: This monitor has square pixels We talk a lot more about this later in the manual. Suffice it to say this panel is 1280x1024 pixels which makes it 5:4 for fullscreen. All the other modes have black bars above, below or on the sides as required. Point to point literally means say a 720x576 pixel display would be placed in the middle with 1:1 pixels and not scaled to fit.	
VGA Set Up This allows you to tweak the settings on a VGA input. Obviously the monitor does a lot with VGA so this is the last tweak in the system. Read up on BGS-Control later in the manual if you have *Appy's Retro Scalar.*	

Sound setup This section is obviously for setting sound modes to Standard, Movie, Music, sports and user. User is configurable as usual. You can also turn on surround sound to make the most of the angle of the speakers.	
Time details Fairly self explanatory.	
Other Menu Options Be careful changing language unless you can read it. Quite hard to get back if not. Blue Screen changes the back ground colour, black tends to work best hence this is default.	

Chapter 4:

Power Supply Input

We use a custom power connector cable so as not to accidentally connect our power to any other devices.

It supplies 12v at 2amps and 5v at 5amps, therefore you must only ever use the monitor's proprietary power supply with a Checkmate Display.

Internally on the backplane are 5v and 12v power feeds that can be used to power your projects internally.

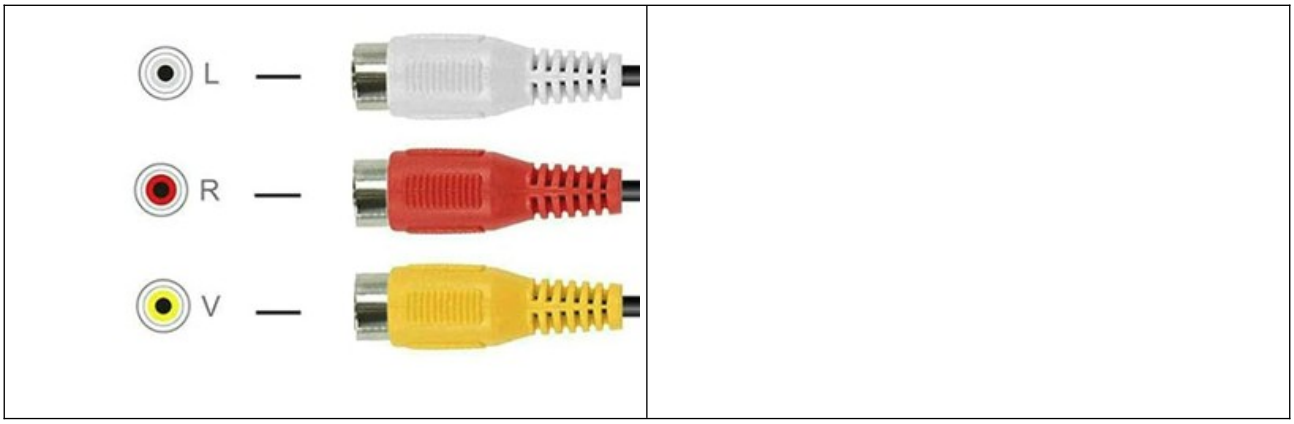
IMPORTANT: Due to the large number of mains plug connectors around the world and to save confusion with this, the initial Kickstarter batch, we are not including the mains lead that connects the Power pack to the mains socket.

Inputs/Outputs selection and explanation

You have obviously purchased this monitor with the promise of all the inputs you could ever need, so here is a list of the input ports, what they can accept and the kind of quality you can expect.

A very important thing to note is that if you want to video record for your content or stream live then the HDMI output duplicates exactly what is on the panel, including audio, and as such can save expensive converters that can cost more than this monitor. (Of course these external converters may be higher end conversions like the RetroTink devices.) Of course no other converters can allow you to play the game/application in real time on the correct monitor live, whilst also outputting to your recording system, unless using some Ninja skills in OWB.

Composite Video/Audio



Composite is compatible with 15khz video signal in PAL 50hz and NTSC 60hz.

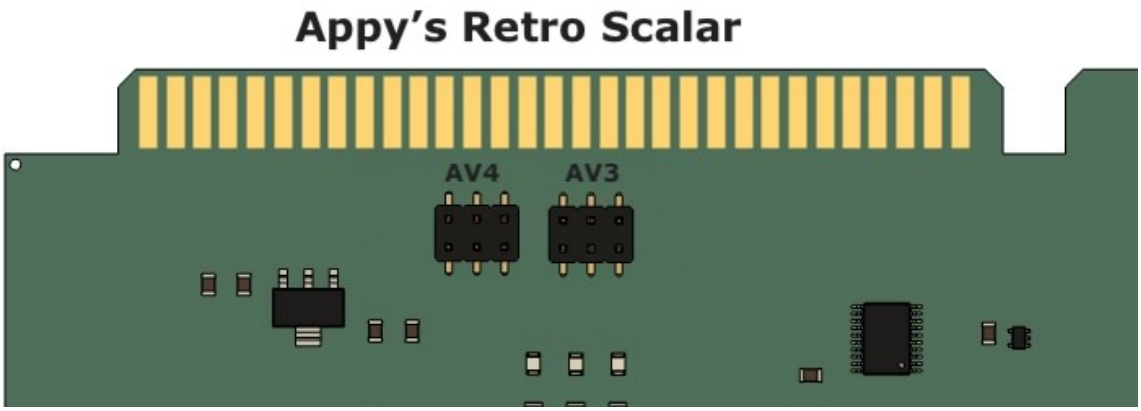
Quality of composite

By its very nature, composite is a compromise as all of the colour signals go down one cable and are mixed. Of course the best RGB quality breaks the colour signals over three cables. Also not all composite signals are as good as others; like the Apple II range that does not have the best quality composite signal, up to some of the Amigas that need the capacitors replacing etc.

The Slot 0 circuitry is good at giving the best quality possible (under the circumstances) and stabilising any interlace video signals. So if a computer is used in interlace mode then flicker is usually stabilised, non interlace will probably look excellent.

There are two AV inputs on Slot 0. These have the Yellow composite video input and a red/white audio left/right connectors. These two are named AV1 and AV2 in the monitor menu source selection. On the remote control the TV button is mapped to AV2 and the AV button to AV1.

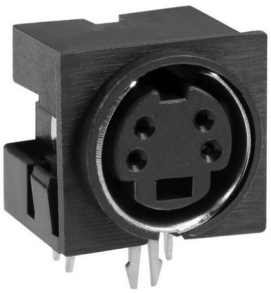
There is also a composite available through the Scart socket on *Appy's Retro Scalar*. By default this is mapped to AV3 by having 3 blocks joining the three pairs of AV3 pins near the slot fingers. There is an AV4 option as well but best leave as AV3 unless you have a good reason. Also, if the blocks are covering AV3 and AV4, just remove from the ones that are not required.



Finally on the backplane there is AV3 & AV4 video/audio lines so that these can be picked up here and mapped to the Source on the menu.

AV4 is spare so that any board that plugs into the backplane can map composite to this input and be controlled by the remote.

SVideo



If you have the *Appy's Retro Scalar* board then hopefully you ordered the SVideo upgrade. This was originally meant to be a stand alone boxed converter that would take up the third Pod space but due to help from the makers of this unit we managed to add this to the Scalar on the Mezze board that originally had the Component connectors. However, the same company make an RF converter and so we added this as well.

Two things to be aware of, firstly unlike the other inputs on the Scalar Mezze board which send the signals through VGA onto the backplane bus, the SVideo has an HDMI connector which then connects to one of the internal HDMI inputs. This is to use the best chip for the conversion and get the best quality without very high price custom chips.

The second thing to be aware of is that the output is only in 60hz regardless of whether it has 50hz or 60hz coming in. This is not ideal technically, but to be honest 90% of people would not notice if I did not tell them.

We have tried to find the best quality budget SVideo converter and we did find it, but it cannot compete with high end custom FPGA products like the Retro Tink which cost up to as much if not more than this entire monitor and are aimed at the top 5-10% of users.

RF Input (TV Tuner)

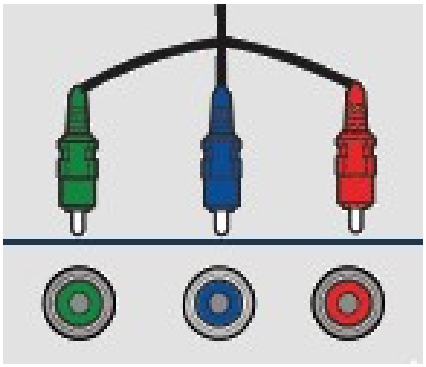
As a last addition and at no extra cost to the SVideo option we were able to add a TV tuner input so that old consoles and video players can be connected.

This needs a separate remote control that is included specifically for this, and hopefully later we can get this integrated into one remote control for everything. It was a choice, of including it for free with the remote or not having at all, so I hope you can see the benefit of having it.

Please note that the quality relies on the RF output from your machine, we have tested with Atari 2600 which looks great. My video recorder output looks great also. However, our experience with the RF output from a Commodore 64 and C128D was noisy, but when we took the composite from the C64 plugged into an RF generator test unit the quality was amazing. So please be aware, a good signal is crucial and to be honest you are better using composite if available.

This is part of the SVideo Mezze board for the *Appy's Retro Scalar*. Unlike the SVideo section we were able to make it work through the VGA/backplane bus and therefore not waste a precious internal HDMI input.

Component



The *Appy's Retro Scalar* Mezze boards have a component input and this is as accurate to true RGB you can get, and looks great through the monitor. There is a standard Mezze board that only has component, and the optional SVideo/RF board that also has component.

It supports 15khz video at 50hz PAL and 60hz NTSC inputs and benefits from the TrueView chips stabilisation and low latency.

Amiga computers and some others have RGB to component converters but you are better off using RGB to Scart for the best quality.

Component is not used a lot but it is there if you need it now.

CGA / EGA and RGBi

This is an additional part of *Appy's Retro Scalar* which was the reason Appy and I first met to add this to the project. It is absolutely necessary if you have a very old PC with CGA or EGA or maybe a Commodore 128 that has an RGBi output which is basically the same.

This benefits from the TrueView chip and the GBS-Control firmware that makes this work great. It took some custom chips and firmware to add this by Appy. (Thanks again Appy.)

In its present form it cannot do 350/400 lines but the usual 320x200, 640x200 etc work great and maybe in the future we can support more lines.

This runs at 15khz and other frequencies can vary.

You will notice on the rear some switches for the 9 pin input only. This converts the display to mono output and you can choose the colour you want, to create an old school mono monitor feel.

External VGA input on Slot 0

The secret sauce if you like to this product is that we use the VGA video as standard on this monitor in most cases. This is because it suits a lot of vintage products either directly at native VGA 31khz frequency or going through the *Appy's Retro Scalar.* Once in there we frame buffer the 15khz signals and

double the frequency to 31khz, then inject them into the VGA input with the use of discrete digital switches and arbitration.

VGA can handle 50hz, 60hz, and higher, but we use mostly 50hz PAL and 60hz NTSC.

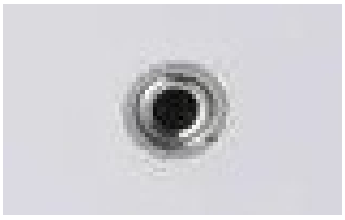
The back plane uses VGA signals which include R/G/B/H-Sync/V-Sync and the associated stereo audio input from the rear. Appy has made firmware that handles all video switching so that only one VGA feed is entered to the Slot 0 controller and displayed.

Theoretically there can be the main external VGA on the rear of Slot 0 controller, and then one or more on each Pod, which the arbitration firmware juggles.

You will notice on *Appy's Retro Scalar* that sometimes you see at the top of the monitor display in big letters, RGB or SCT. This indicates which is in use, the RGB from the CGA/EGA/RGBi 9 pin port, or the SCT on the rear Scart port.

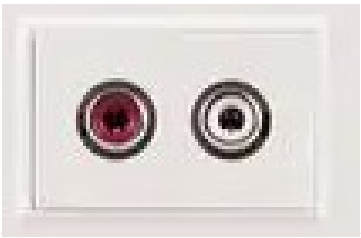
All of this is handled with the VGA button on the main controller, you will notice if you have the OLED display at the front that it gets reset each time you change the VGA channel. This is because it is switching two actual lines at a time, but pressing the Channel up/down steps through individually.

VGA Audio in



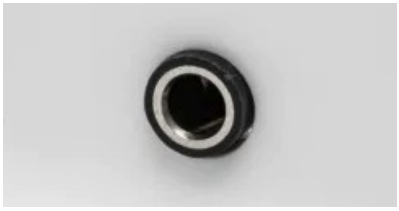
Next to the VGA input is this 3.5mm stereo input port which takes the external stereo audio source used on ANY device that feed audio into the VGA input, Scalar or other potential Backplane VGA inputs. Some like the Scart have their own, but this allows a separate audio feed into the VGA source.

Stereo Audio phono output



These phono outputs allow access to the active audio signal externally, to put into mixers or recorders, or maybe even a higher end amplification system.

Stereo Headphone Socket



This is on the rear of Slot 0 and obviously allows connection of headphones.

However, there is a connector on the backplane that will allow connection of an audio lead to mount at the front. This is not included at time of writing.

HDMI connectors

If you did not purchase the HDMI switch option then you have the following.

1 x External HDMI1
1 x Internal HDMI2
1 x External HDMI Output

If you purchased the 6 way HDMI option you have the following

4 x External HDMI 1,2,3,4 inputs in the source menu
2 x Internal HDMI 5/6 inputs
1 x External HDMI Output next to the USB sockets

These can all handle HD resolutions up to 1920x1080p, but they will all be scaled to 1280x1024 which is the resolution of the panel. These can be at 50hz PAL or 60hz NTSC inputs or even up to 75hz.

The HDMI Output is very useful for Streamers and video editors as it creates a 1280x1024 resolution at 50hz or 60hz depending on what is being displayed. It

is crucial to understand it is perfectly duplicating the 1280x1024 panel pixels and is really useful for streaming and converting while playing content and games.

Some capture cards do not understand 1280x1024 and so will not record it, this is why there is an optional HDMI-→USB3 device we offer with this monitor that will support it.

The HDMI output also encodes the Stereo Audio that is playing at the same time.

Scart input – Appy's Retro Scalar

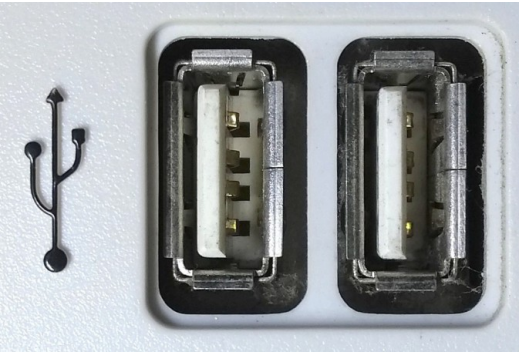
Scart was a universal connector in a lot of countries and we support this connector in the following ways:

Firstly it is connected to *Appy's Retro Scalar* and as such expects a 15kz video signal running at 50hz PAL or 60hz NTSC. Other frequencies may be possible but that is the one we promise.

RGB Video and stereo audio are used and that is the best quality, this gets routed through *Appy's Retro Scalar* and converted into VGA at 31khz.

However, we also route the Composite video and stereo audio through either the AV3 or AV4 ports mentioned in the Composite section. Please read that section for more details.

USB inputs



The Slot 0 main controller has two USB inputs which in the menu source are obviously USB1 and USB2.

These can use a USB memory drive formatted in FAT32 to enable media playback on the monitor. Obviously as the monitor is 5:4 aspect ratio, any wide screen video content will appear with black bars above and below.

You can also play high quality music through the built in speaker, which whilst not ultimate HiFi quality do a very decent job at reproducing sound, and even have an optional surround setting.

The other thing they are used for is updating the Slot 0 controller firmware by putting a file into the root of the drive and then power cycling. (See firmware update for details.)

One final thing they can do is act as an external 5v power source for external devices.

Chapter 5:

Overview of the monitor features

Design

This monitor was designed to be 5:4 and 4:3 aspect ratios to be more in keeping with the look of the old monitors we all remember. 4:3 mode has thin black bars above and below the display.

While our platform isn’t intended to be a CRT replacement, of course not, we've tried as far as possible in developing this platform to design it sympathetically. We hope you agree that our monitors will look good on top or beside any of your old computers or consoles.

It doesn't stop with the look and feel though, with the new hardware expansion possibilities we've baked in you can go beyond what is possible with normal panels and most CRT's.

Form and Function

Looks are important but having the physical case depth of a CRT when there's nothing functional to fill it is just pointless and cumbersome and expensive to ship. Using our plug in modules, called pods, we expand the base or core system. We hope that in future (as has happened with our previous Kickstarter for the Checkmate desktop computer cases) users will eventually begin to develop and build their own products for our platform.

Why not a CRT?

We get asked this a lot, and as an owner of a lot of CRT's myself I know the attraction. Short answer we'd love to, but the reality is you cannot get CRT tubes anymore. I thought at one stage we had found a couple of suppliers who advertised on the internet, but they were old sites and unavailable. Old and unavailable basically says it. We had to find something more practical and future proof.

Modular System

As we said above our monitors have a modular design that allows users to upgrade functionality and input types as required. You can even make them into an AIO or "All In One" computer by attaching a small form factor computer like the MiSTer, Raspberry Pi or any other SBC or FPGA solutions inside the case.

What is a Retro monitor?

How did we choose the specification for this display platform? All users have different ideas about this but for us, as users, they are as follows:

Look Good - When placed on top of a computer or next to a console it must look right, not retro for its own sake but reproducing the DNA of historic devices.

Great Sound - With the built in German designed 4" speakers these can outperform most monitor speakers.

15khz, 50hz and 60hz - These monitors automatically support 15khz modes in component, composite and RGB scart with our Scalar Pod. They also switch between the Pal 50hz and NTSC 60hz modes automatically.

5:4 and 4:3 Display options - They must support both 5:4 and 4:3 aspect ratios to match existing old system displays. Inputs are the Secret Sauce. Crucially they must be able to cope with the 15khz video modes which no longer exist in modern mainstream panel technology. This is the main reason why our monitors are so important.

Standard Input Pod selection - The standard core unit comes with HDMI, VGA, and 2 x Composite inputs (240/480p and 288/566p). These inputs all scale and stabilise any interlace flicker instantly without any frame buffer. Composite and component are 15khz compatible as well as 50/60hz i.e. PAL/NTSC.

XRI Backplane

XRI = eXpandable Retro Interface.

This is a part introduced by Appy that saved so many potential connecting cables and transformed this product from something only for electronics comfortable people, to a usable consumer product for anyone.

Now, it has not got rid of all the cables, but the main ones like the panel backlight, speakers, button bar, i2c cables all are pre connected to the XRI back plane. So if you add a board design for the XRI and is designed around the VGA input then all you do is plug and play.

We will release all of the connections and interface information to any interested customer. Some of this information is detailed later on in this manual.

Pods

These are a way of expanding the functionality of the whole system. There are three actual bays but one is taken by the slot 0 pod, which as the name implies must ALWAYS be in the bottom slot and which is the main controller.

Pods designed around the XRI interface should need no cables if designed well, however, some may need to not use the XRI interface, or need additional cables, or use one of our developer support boards for internal connections.

We have two Pods to start with:

Appy's Retro Scalar

Well this is the most important one and is our main upgrade to the standard controllers inputs.

Checkmate iMIGA 3k (iMIGA trademarked)

This is our custom FPGA board designed firstly to recreate the custom Amiga chips but also provide a true 68000 DIP socket to allow normal 68k chips or 68020/030/040/06 accelerators to be connected.

Raspberry Pi4 and Pi5 fitting pods

We have a pod kit that enables the simple fitting of an SBC (Single Board Computer) into the monitor at the same time as being the perfect retro system. One of the most popular, budget friendly and supported are of course the Raspberry Pi computers.

MiSTer FPGA based SBC fitting kit

We have a fitting kit for one of the best and authentic ways of simulating retro computers, consoles and arcade machines via an FPGA using the Terasic DE10 Nano based MiSTer system.

There is not the scope to explain this fully in this manual, but for now just take our word for it, it is the best.

Chapter 6:

Future features in the pipeline

Whilst we have created a monitor that we believe will please the most people in the retro world, a lot of people are concerned with the minutiae of differences between flat panels and CRT's, which as I said before otherwise are no longer available or would be impossible to make now.

Latency

CRT's have almost zero latency. These panels, while around 1/60 sec (or 16ms) or around a frame of latency, is not 0ms. It is important to understand however that retro games ran at 30-60fps, or about 32-16ms per frame. So in that world a 1 frame of latency on our panels is not noticeable, to most eyes. (See later section where I shoot that comment down in flames.)

15khz

Old monitors mostly run at 15khz frequency and few mass market panels (i.e. affordable) can match this rate. Most run at a minimum of VGA frequency which is 31khz, basically double. So in order to make this work frame buffering and scan doubling needs to happen, which it does in our *Appy's Retro Scalar*. This has the benefit of stabilising the horrible interlace flicker, but also can in some cases create artefacts as objects move un-interlaced.

We are hoping to have the new unicorn panel address this issue via Arcooda in Australia, natively supporting 15khz but naturally at a much higher cost.

Pixel blending

Modern panels have almost perfect pixels where CRT's tend to blur the edges of the pixels. What this means is a lot of old game developers used to design the graphics with this in mind to create a form of analogue anti-aliasing. Modern panels highlight this (in a not ideal way) by making it too clean. This is tricky to fix sadly, but you never know. We're looking into it.

Frame rate

Does this monitor support 50hz and 60hz? It fully supports these refresh rates. The only exception to this is the RF and SVideo module. These were designed around existing conversion chips that were selected for quality and cost, but at this point they only work at 60hz output, so any 50hz input will be converted to 60hz. It's a high priority for us to offer an upgrade that fixes this, but for now we figure most people will be more than happy with this, if they even

notice it. Those unhappy with it I hope understand this improvement will come later, but at an additional cost as the conversion chips will likely be much more expensive to make. We'll keep you posted.

Backlight strobing

OK, back to the higher than 60fps comment. I was accosted by a young enthusiastic German once at an Amiga show in Mönchengladbach in 2023. He decided to announce to me that he would not buy my monitor because it was garbage. Bit personal. Now, these are occasions you can go one of two ways, but I am old and experienced so I waited to hear him out. He said it has to do with nearly all panels lack a feature called strobe backlighting. This from Google:

"*Backlight strobing will shorten the time the image is held in the same place, making the movement much more natural to observe for the eye. For this to work, the response time of the pixels need to be fast, so the picture is fully refreshed and clear for each flash.*"

IPS panels give a bright, colourful display at any angle, but take longer to refresh, so there is no time to have a 120mhz display with black frames between each image to remove the effect, i.e. Back light strobing. This is something I want to work on in the future but will require new controller and much more expensive panels with probably poorer side viewing, which need to be addressed.

Be aware, I had to look for a good few seconds to notice it. Once you do though, then you get it. Fair enough.

I asked him to point me to research where I could learn more, but turns out as I suspected he just wanted to abuse this product for lacking something quite esoteric, and as usual with this kind of person had nothing more useful to contribute. I thought I would mention it anyway as a potential new feature. To be continued.

Future

Speaking of which, as always products are in the end always a bit of a compromise; these are ideas that can come with a much more expensive monitor (or upgrade) later in this product's life cycle. I hope you can take this information in the way it was meant, that's to say information.

Chapter 7:

XRI Backplane overview

This is a very important part of the project. It's literally the backbone, the objective of making the product more user friendly. We do this by removing as many connecting cables as possible and then most of the necessary ones connect direct to this board.

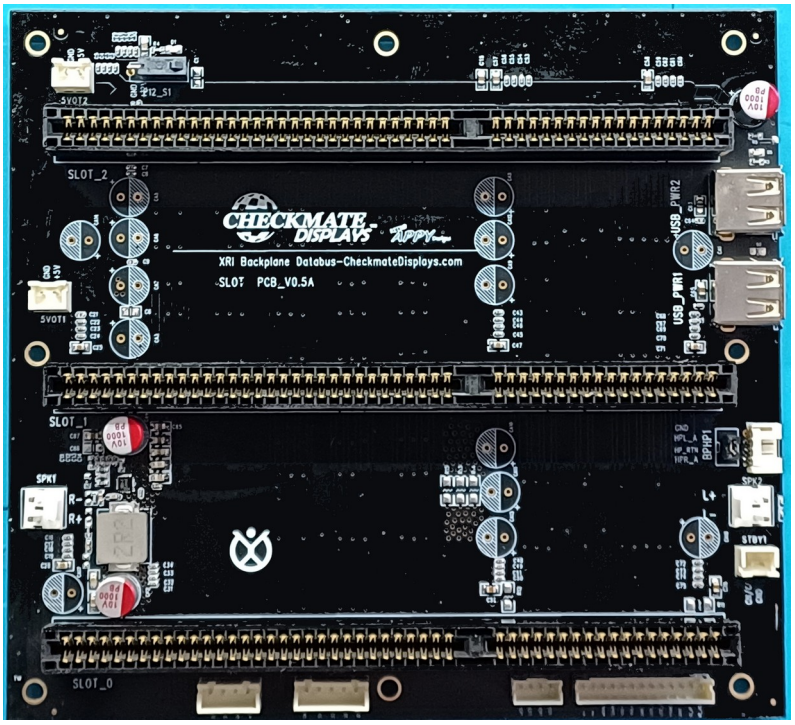
<table>
<tr><td colspan="3">This board has many connectors, here is an explanation</td></tr>
<tr><td>5v white power
12v black power

Slot 2

5v White power

Slot 1

Left Speaker connector

Slot 0, main controller only works here.</td><td> 
</td><td>

USB 5v Power

USB 5v Power

Headphone

Right Speaker connector

Front power switch</td></tr>
<tr><td colspan="3">Cable connectors in order – OLED, i2C dial, Panel backlight, front button bar and Infra Red</td></tr>
</table>

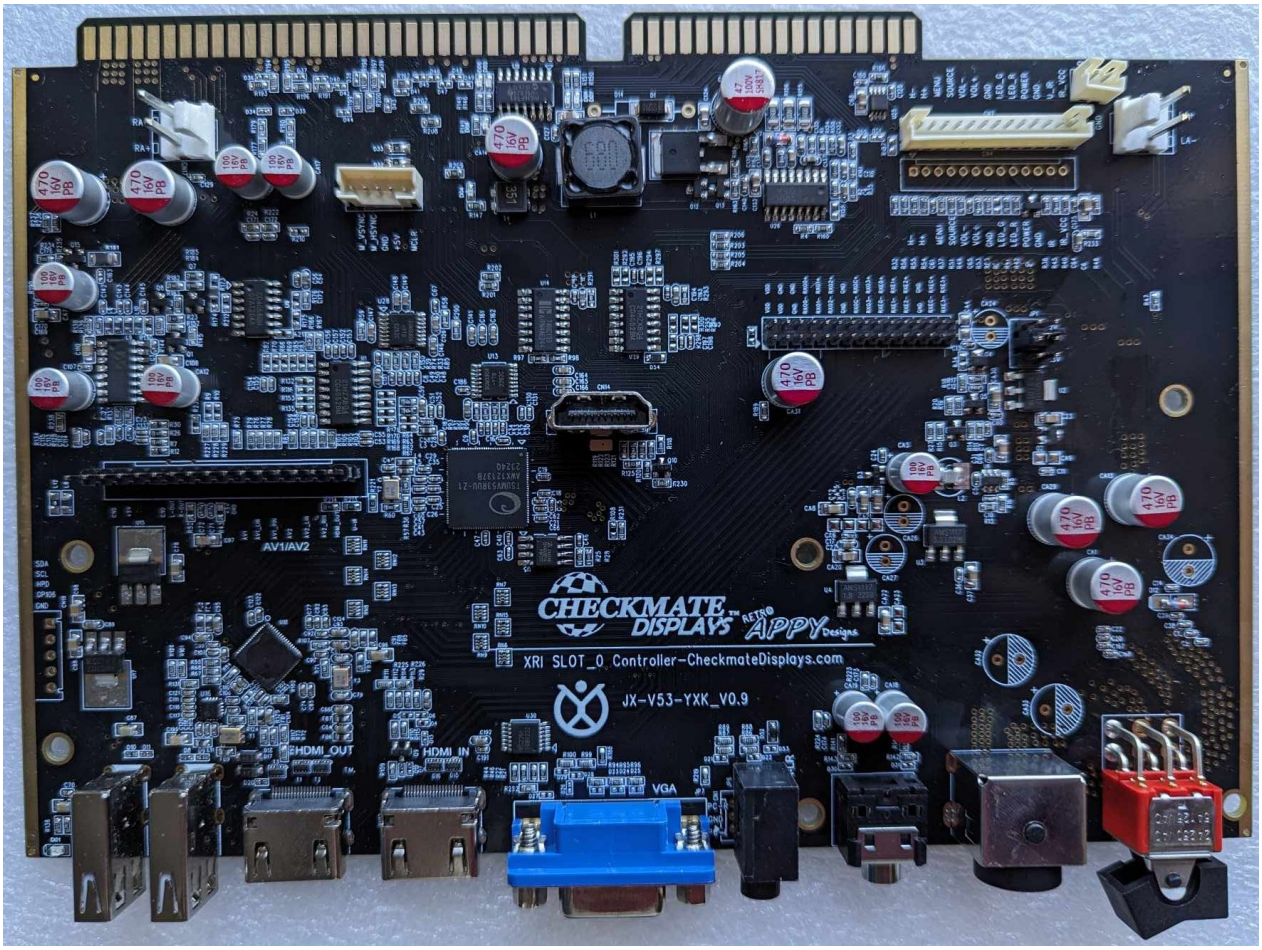
We will provide detailed information later on in this manual for the backplane and how if you feel like it you can develop your own products to work with it.

Chapter 8:

Slot 0 – main controller board

As the title says, this is board zero, the origin, most important board. This is the main video controller card and interfaces directly with the IPS panel. We took an existing AV friendly controller and with the help of the manufacturer we added more functionality than it had originally. Plus we added our own VGA card switching functionality and made it work with our backplane, again to rationalise the rats nest of cables that used to connect it all together. On top of this the board is now high quality four layer like the main cards (not the Mezze boards) and this ensures excellent signal quality and grounding.

Please note a lot of the white connectors shown may not be in the final board as they are not needed now that all users are using the back plane. Future versions may have some removed.



Inputs in order from left to right.
USB 1 / 2, HDMI Out, HDMI1 in, VGA, VGA audio in, headphone out, Power in, Power switch

USB inputs

There are two inputs that can both be used for attaching USB drives for video, sound and picture playback. Both can be used as external (low current) 5v power for devices. Note: looking at them from the back, the one on the right is the one to use for firmware updates.

HDMI Output

This is a very special feature on this device. The way it works is to split the signal going to the IPS panel and convert that to HDMI and then output it precisely matching what is on the panel. This means it is always 1280x1024 50/60hz, so your capture software needs to be able to support this mode. If you purchased our HDMI-USB converter then you will be able to use that.

This feature enables YouTubers and other streamers to record and stream as they play or work on the monitor, reproducing and converting perfectly any input on screen to a capture.

External VGA input

This is a true VGA 31khz input and will not accept any 15khz modes. If you want to use 15khz then you need to use the *Appy's Retro Scalar* board which interfaces with the VGA system, switching as needed with the remote controls, VGA button and channel select.

VGA Audio input

This is the audio input for the External VGA port, but also feeds the entire VGA video path that includes the *Appy's Retro Scalar* board. This keeps the audio in one place for the entire retro video system (VGA line).

Stereo headphone jack

This is a stereo headphone socket. Remember also on the backplane is a 2 pin header if you want to run a socket to the front of the monitor for convenience. The key thing to remember is plugging in the headphone jack will mute the built in speakers

Power connector

This is a highly customised power block and automatically works in the 110v and 234/240v regions. It has a special 4-pin connector to ensure it is not compatible with anything else and should only be used with this monitor.

We do not include a cable because there are too many different standards dictated by the country of origin, but the good news is they are easily available.

The 4 pins are: 5v, 12v and ground. It is rated at 12v and 2 amps, and 5v and 5 amps, which is enough for most products you may want to fit internally.

Raspberry Pi5

Please note this is not a USB-PD power supply so if you fit a Pi5 the unit will run but complain that there is a maximum 600mA of power to external devices. This is outside our control, I blame Raspberry Pi, but fortunately there is plenty of power connectors internally for devices that need higher current.

Power Switch

Self explanatory but you will notice that all Pods use the same type of switch, except the one on the Slot 0 board which is the master power switch. All pods can be disabled individually by turning off their switch.

Front power button

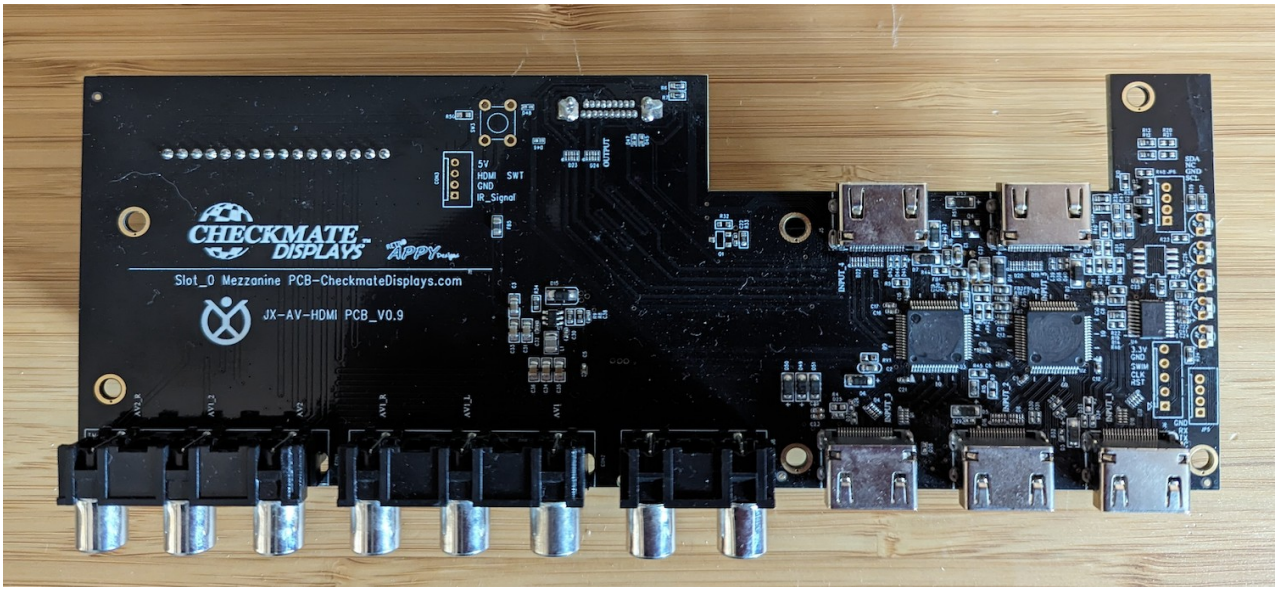
This button only puts Slot 0 to sleep mode, it has no effect on the other pods, this is by design so you can leave the other pods running while monitor is in sleep mode, but you must remember this as they are still drawing power.

Mezze boards

There are two Mezze board choices: the first is just 2 x “Composite, Left/Right” Audio connector plus a stereo output phonos, the second adds a five way HDMI switcher.

AV2 – Left/Right/Composite, AV1- Left/Right/Composite, Stereo L/R audio output

HDMI Switcher version



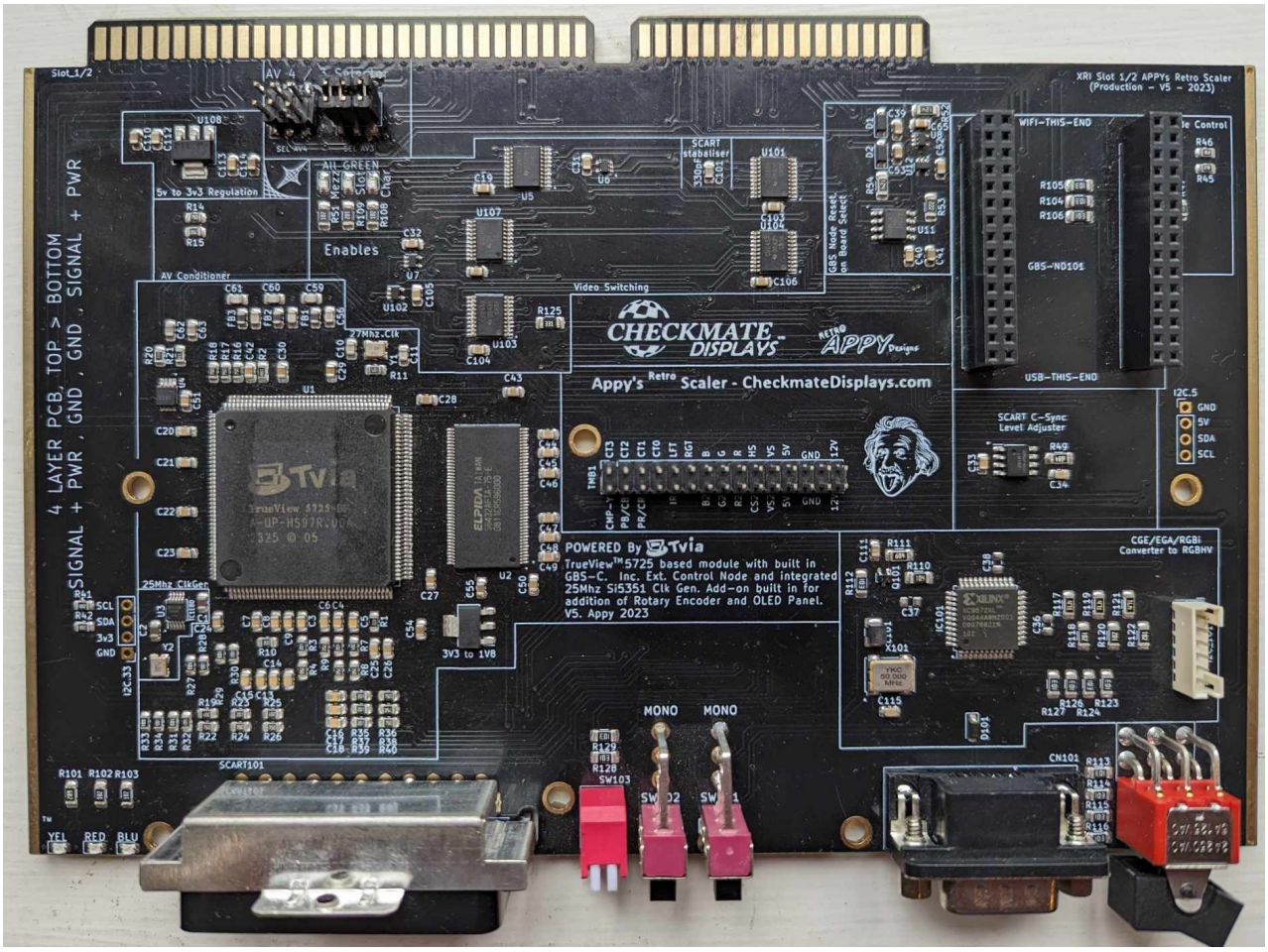
Inputs in order from left to right.
Top right – HDMI-5, HDMI-6
Lower- AV2 – Left/Right/Composite, AV1- Left/Right/Composite, Stereo L/R audio output, HDMI-4, HDMI-3, HDMI-2

Chapter 9:

Appy's Retro Scalar board

This board was originally based on the GBS8200, but due to noise issues we redesigned it from the ground up using the TrueView chip and the Scalar Control Node. We also added Scart RGB, Scart composite, EGA, CGA, RGBi, SVideo and RF inputs.

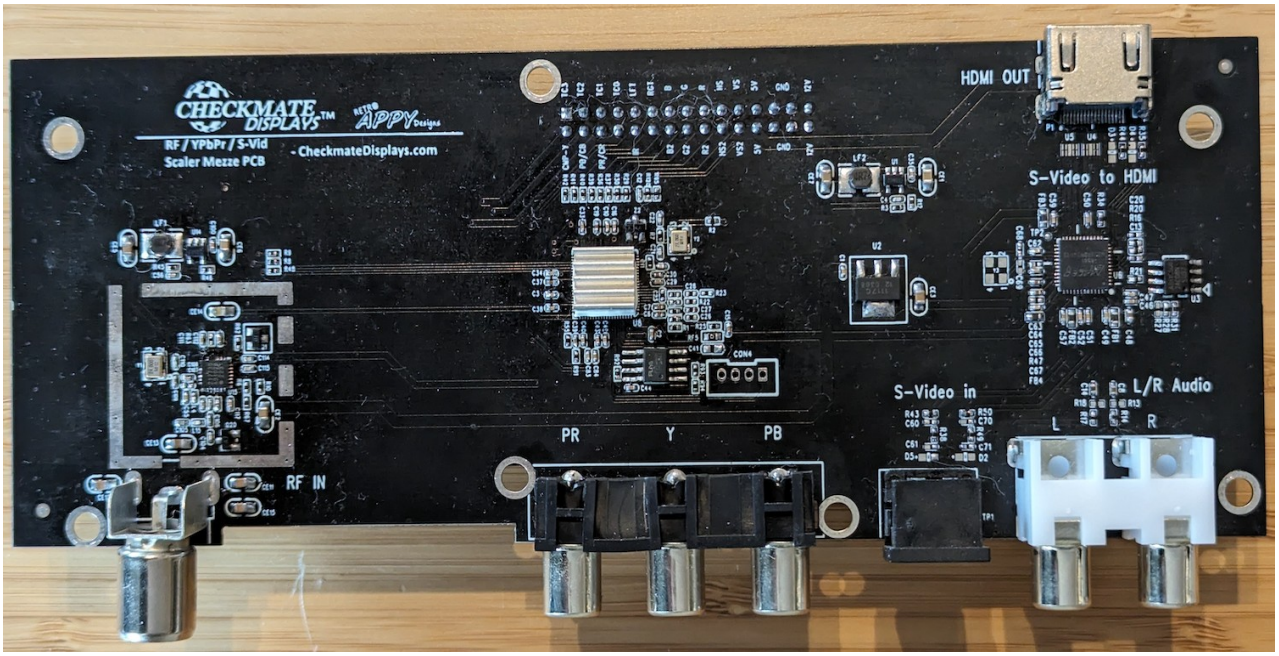
This is the main card
The black jumper blocks at the top left selects if Scart composite is AV3 (default) or AV4 in the main menu selection.
The GBS Control Node is on the right (see GBS section later in this manual).



Connectors and switches from left to right:
Scart RGB/Composite/Audio, Mono colour select, Mono Off/On, CGA/EGA/RGBi Brown fix, CGA/EGA/RGBi input, power switch.

Note: Standard Mezze board has only Component Inputs.

This is the SVideo/RF optional board



Inputs from left to right:
Top right, HDMI output for the SVideo board, connect to internal HDMI in.
Bottom, RF (Arial), Component Red/Green/Blue, SVideo in, Svideo Audio L/R

Important: SVideo to HDMI

The RF video signal goes into the VGA path through the backplane, whereas the SVideo goes to an HDMI output, to give the best quality, and this is plugged into the internal Slot 0 HDMI input. Depending on which Slot 0 Mezze board you have, we will usually connect to HDMI-2 (default Mezze) or HDMI-6 and this is simply to keep ribbon clear of the backplane sockets.

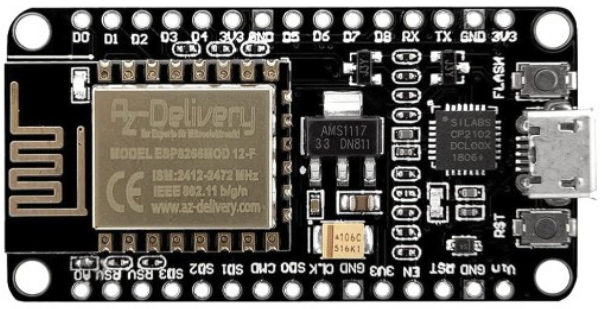
Remember: Both these output at 60hz regardless of the input, this is why we can supply them inexpensively around £45 for both as opposed to the £250+ of other systems for just the SVideo.

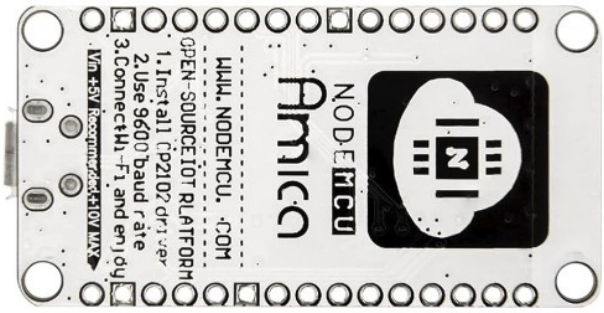
GBS-Control Node

This is a very special part of our system that also allows *Appy's Retro scalar* to have low latency and great programmability.

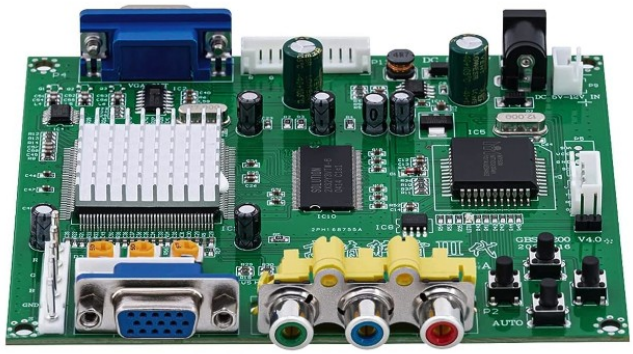
This is the module that contains the firmware created by Robert Neumann in 2017. It was originally developed to improve the performance and quality of the very low cost GBS-8200 series of boards.

https://ramapcsx2.github.io/gbs-control/Wiki/

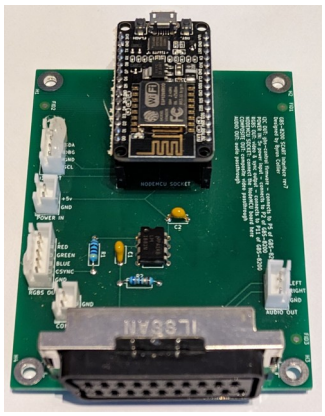




Originally this (below) was how the monitor scalar was placed into the Slot 1 or Slot 2 position and joined together with about 5 cables.



GBS-8200 mk4



Byrons initial board

The GBS 8200 was good and offered a very low cost way of connecting retro computers to a VGA monitor by upscaling. However, it suffered from noise, due to its two layer design and layout, but also more importantly – latency.

The GBS-Control firmware disables the GBS-8200 processor firmware and replaces it with Robert's custom version in the NodeMCU. This transforms the latency performance of the original GBS-8200. Sadly it could not cure the

noise. The noise was fixed by the final design of our board that used the TrueView chip and memory and built on a 4 layer board.

Controlling the NodeMCU

There are two ways to do this, and note these are not exhaustive tutorials.

Firstly, we have preset a few setups to help you get started and these can be controlled by the jog dial and OLED at the bottom left of the monitor. Just select Presets from the menu and then try the presets numbered 1-7. Preset 1 is the default and set for a standard SCART setting. To activate the preset press the dial. The different presets are clearer when looking at the web server section. Wait, what?

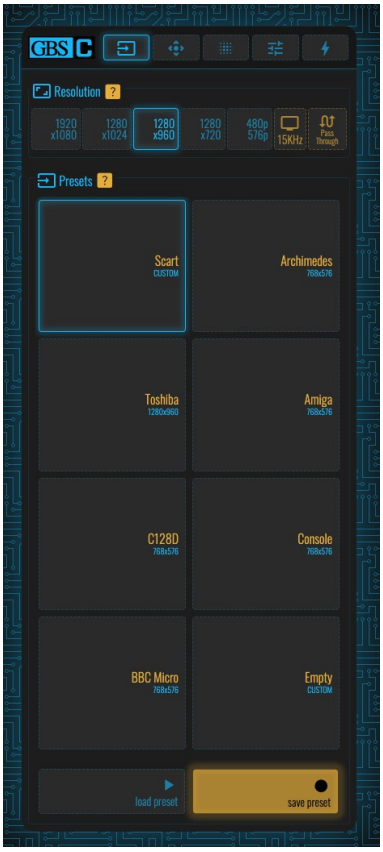
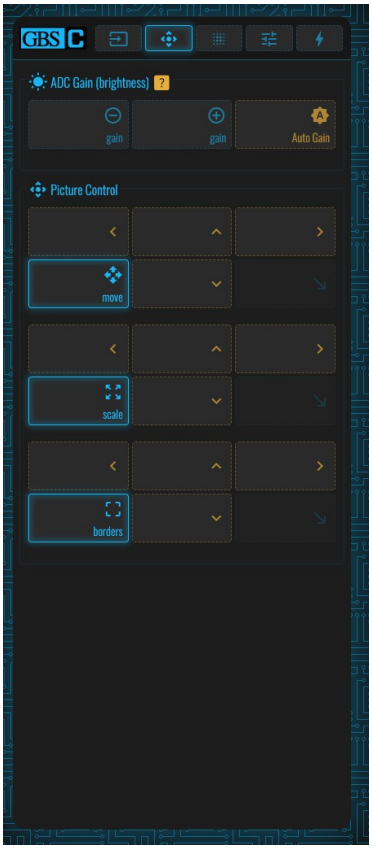
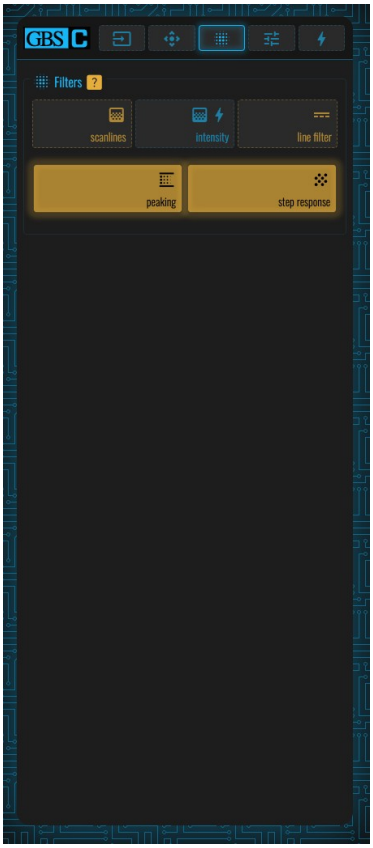
Yes, the cool thing about the NodeMCU is that it has a built in Wi-Fi station and Web Server that you can connect to.

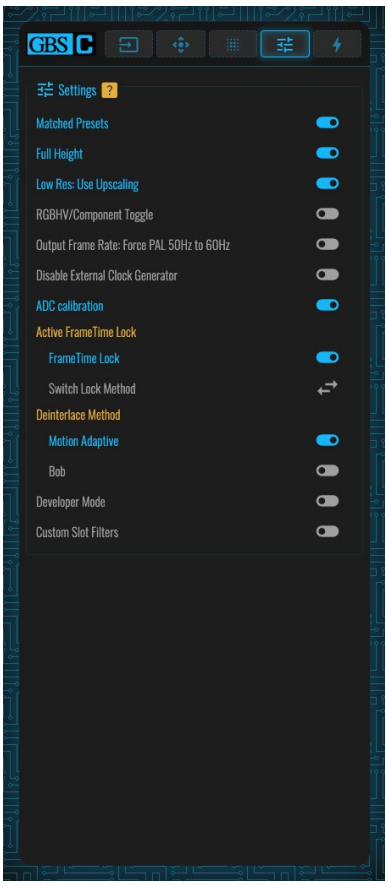
To do this open your Wi-Fi setting and join the access point “GBSControl”

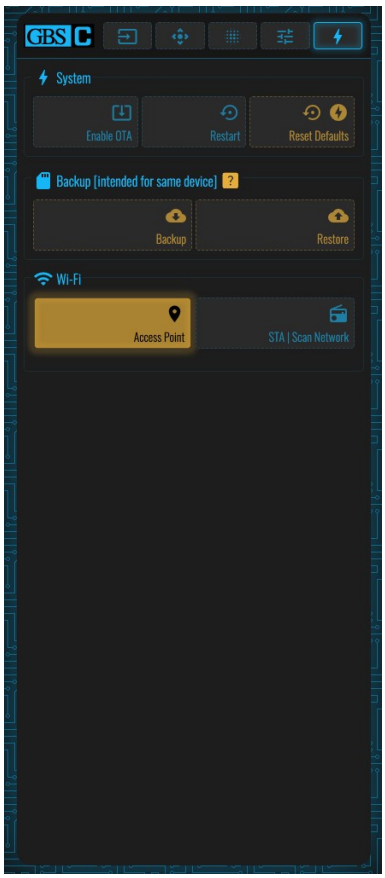
The default password is “qqqqqqqq”

Open `http://gbscontrol` (or `http://gbscontrol:80`) (or `http://gbscontrol.local`) in a browser.

As I said this is not a tutorial, but these images can show what is available to modify these settings if you wish to.

Presets	Picture scale/move	Display effects
		
Advanced settings	Access point & Backup	


GBS C
Settings
Matched Presets
Full Height
Low Res: Use Upscaling
RGBHV/Component Toggle
Output Frame Rate: Force PAL 50Hz to 60Hz
Disable External Clock Generator
ADC calibration
Active FrameTime Lock
FrameTime Lock
Switch Lock Method
Deinterlace Method
Motion Adaptive
Bob
Developer Mode
Custom Slot Filters


GBS C
System
Enable OTA
Restart
Reset Defaults
Backup [intended for same device]
Backup
Restore
Wi-Fi
Access Point
STA | Scan Network

Chapter 10:

Checkmate iMIGA 3k (iMIGA trademarked)

This is our custom FPGA board designed firstly to recreate the custom Amiga chips but also provide a true 68000 DIP socket to allow normal 68k chips or 68020/030/040/06 accelerators to be connected. However, it also allows the amazing PiStorm 500 to be plugged in and to run at unheard of speeds whilst also giving RTG graphics! I won't lie this is very cool.

More details as soon as we have finished them, but they are already running great.

Chapter 11:

Assembling / Disassembling the Monitor

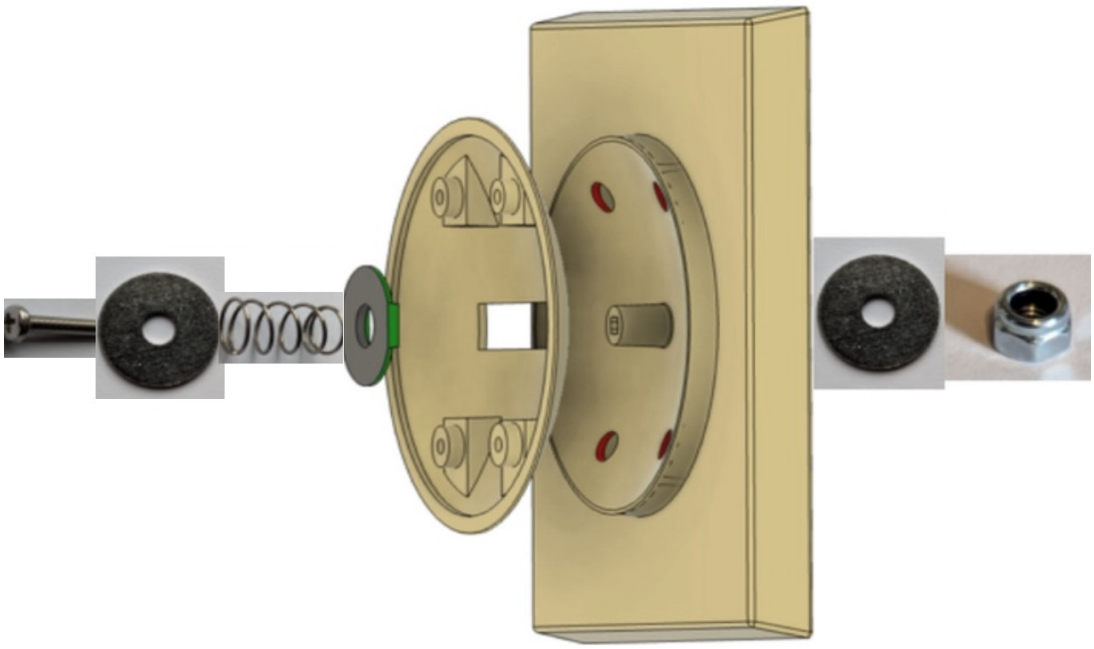
This section is for guidance and completeness only because of course you will have received your unit fully assembled. Take this as a guide to how we assemble our units in case you need to disassemble yours at a later date.

Step 1 – Assemble Stand
Step 2 – Fit stand to rear panel base
Step 3 – Fit speakers and cables to rear panel
Step 4 – Fit metal chassis – Rear screws fixing
Step 5 – Fit metal chassis – Front screws fixing
Step 6 – Assemble buttons to button bar and fix OLED panel
Step 7 – Fix button bezel to chassis
Step 8 – Fix side card rails both sides
Step 9 – Fit Backplane circuit board to inside on metal chassis
Step 10 – OLED, Jog Dial, Button bar and speaker cables to the backplane
Step 11 – connect speaker cables to the backplane
step 12 – Connect IPS panel backlight cable to bottom left rear side
Step 13 – Mount 19” panel to the front of the chassis
Step 14 – Connect the panel backlight cable to the bottom of the Backplane
Step 15 – Mount 19” bezel to rear panel
Step 16 – Insert Slot 0 board into backplane, connect panel control cable
Step 17 – Fix 2 x Blank panels

	1	M5 Nylon locking Nut Stand assembly
	2	Stainless Steel,16mm OD,1.2mm Wire Size,9mm Compressed Length,30mm Free Length Stand assembly
	3	25mm Washer M6 hole Stand assembly
	4	Pozi drive / Flange Head M5 x 30mm bolt stand assembly
	5	M3 Rear pod mount frame bolt thumb screw
	6	M4 Nylon Locking Nut Speaker Assembly and fit stand to rear panel

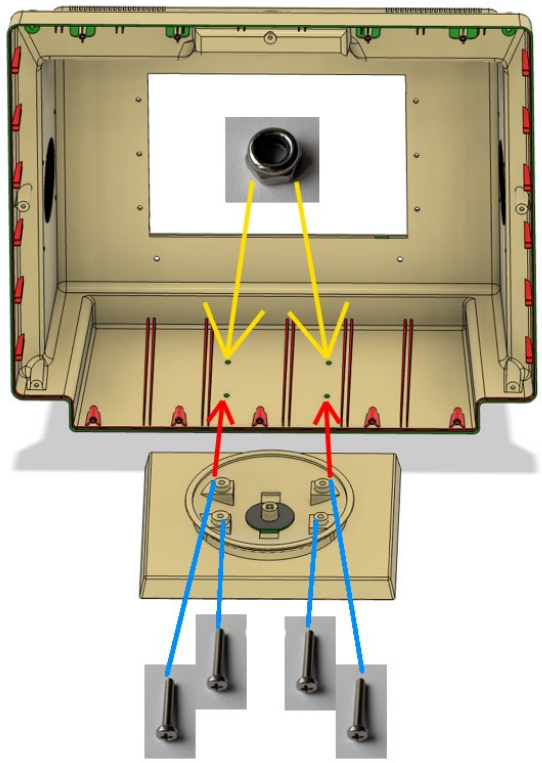
	7	Anodised M4 Allan Key bolt Speaker Assembly and Rear panel mount to chassis
	8	Pozi drive/Pan Countersunk head M4 x 8mm Metal chassis to rear panel interior
	9	Pozi drive/Pan head/Countersunk M3 x 6mm Plastic part to plastic parts
	10	Pozi Drive/Flange head/Countersunk M3 x 8mm Fit Bezel to rear panel
	11	M4 Pozi / Flange head x 25mm Stand to Rear panel bolt

Step 1
Assemble Stand



Step 2
Fit stand to rear panel base

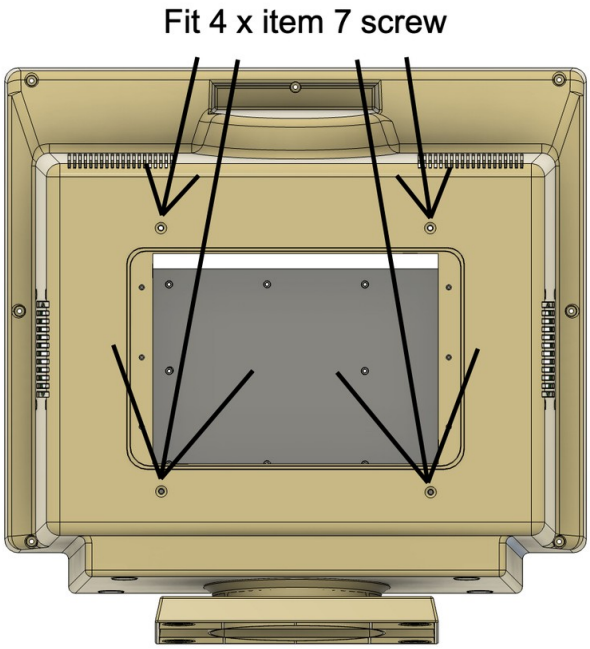
Four x item 4 bolts through stand into rear panel and fixed with item 1 nuts.



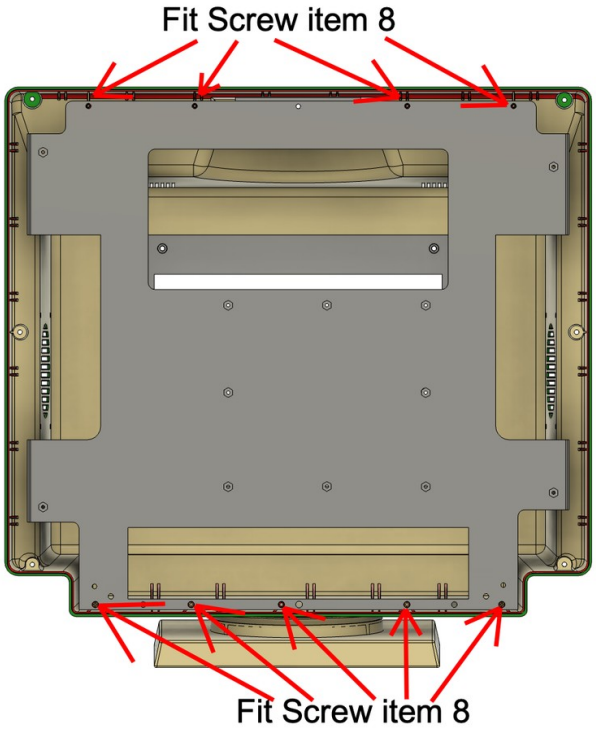
Step 3
Fit speakers and cables to rear panel

Using 4 x part 6 and 7, fix to side of rear panel
Repeat on opposite side.

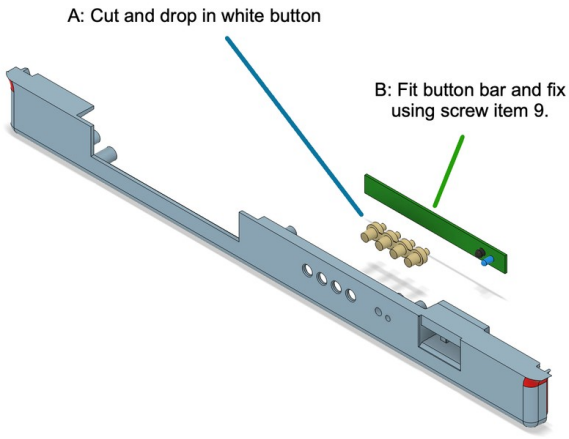
Step 4
Fit metal chassis – Rear screws fixing



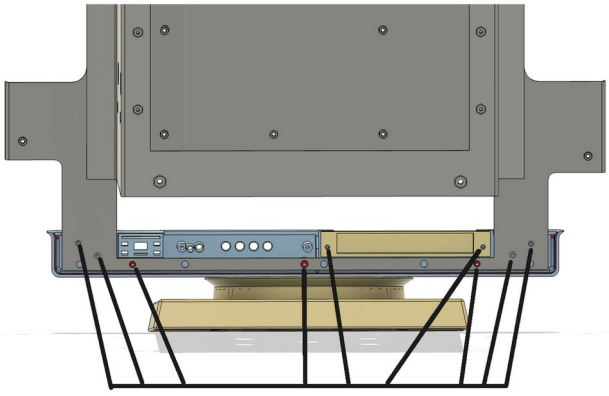
Step 5
Fit metal chassis – Front screws fixing



Step 6
Assemble buttons to button bar and fix OLED panel

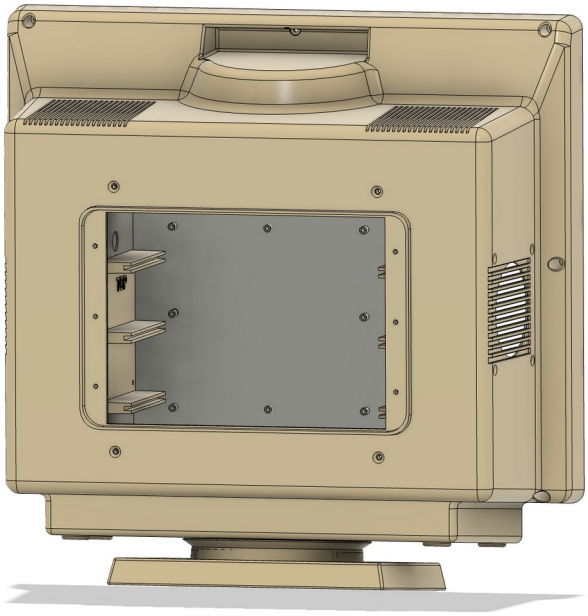


Step 7
Fix button bezel to chassis

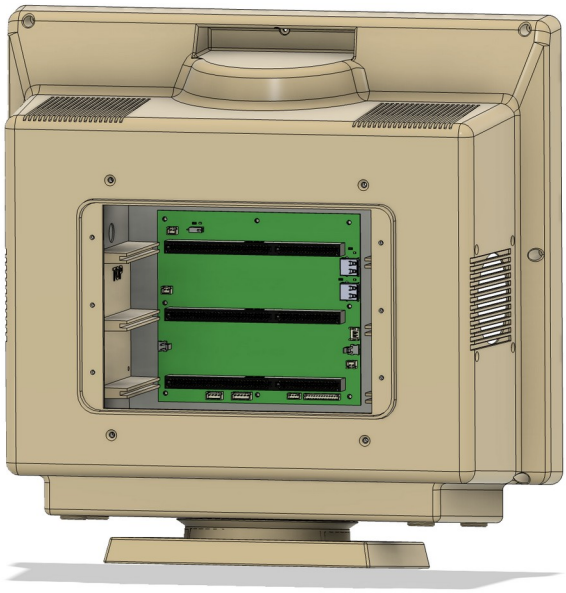


Fit 7 x item 9, M3 x 6mm Countersunk pozi screw
IMPORTANT Rear panel must be fit first !!
Hidden here for picture

Step 8
Fix side card rails both sides

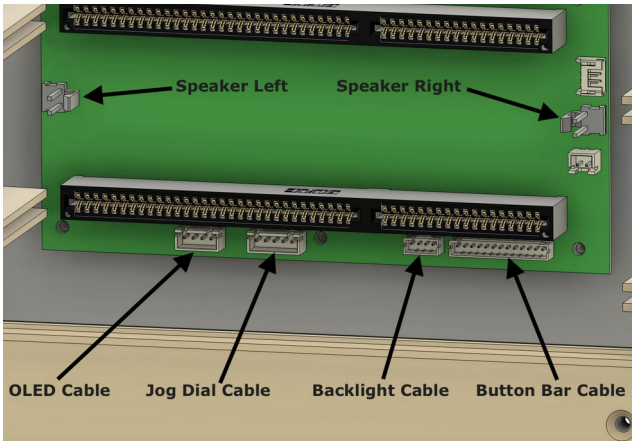


Step 9
Fit Backplane circuit board to inside on metal chassis

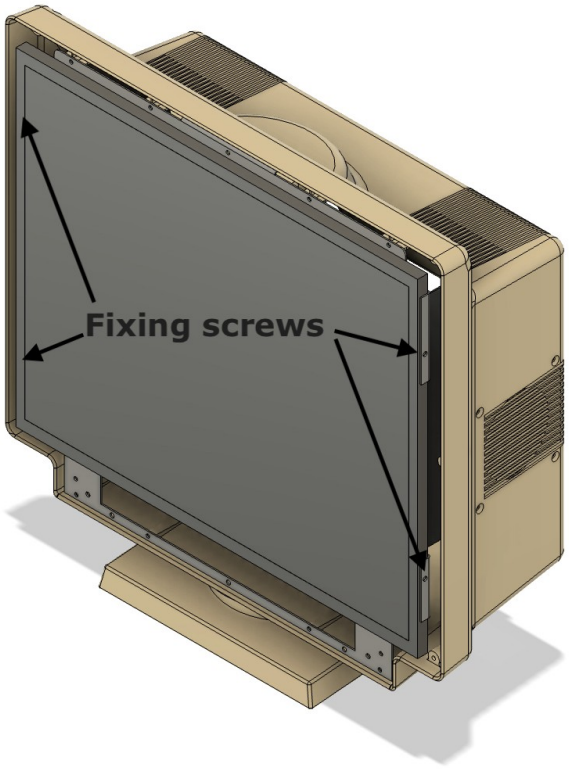


Step 10-12
OLED, Jog Dial, Button bar and speaker cables to the backplane

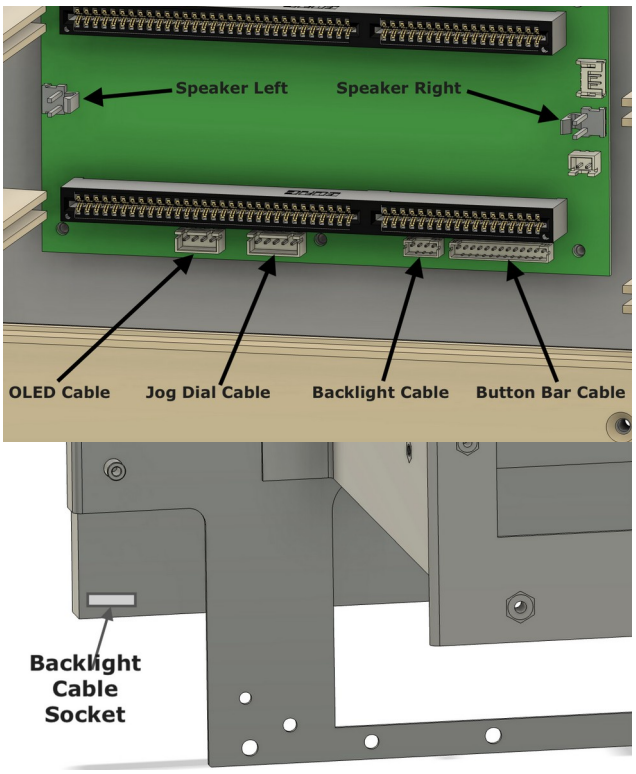
Step 13
Mount 19” panel to the front of the chassis

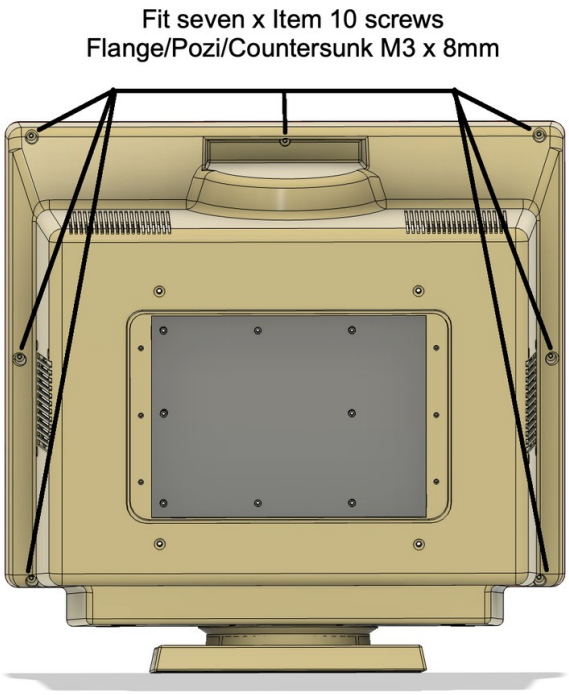


Step 14
Connect the panel backlight cable to the bottom of the Backplane

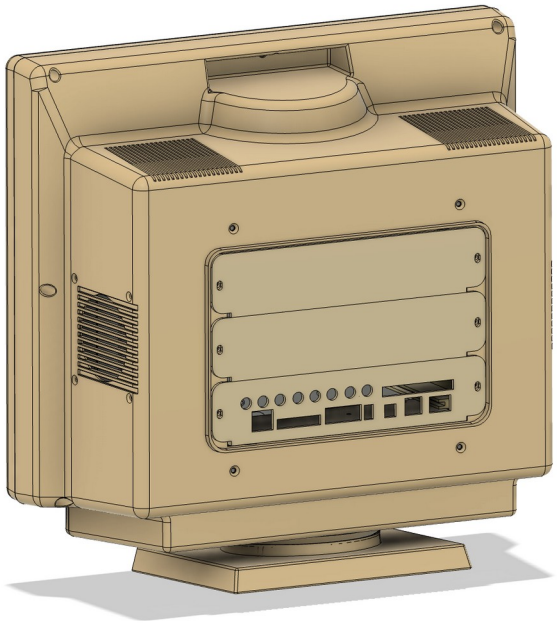


Step 15
Mount 19” bezel to rear panel



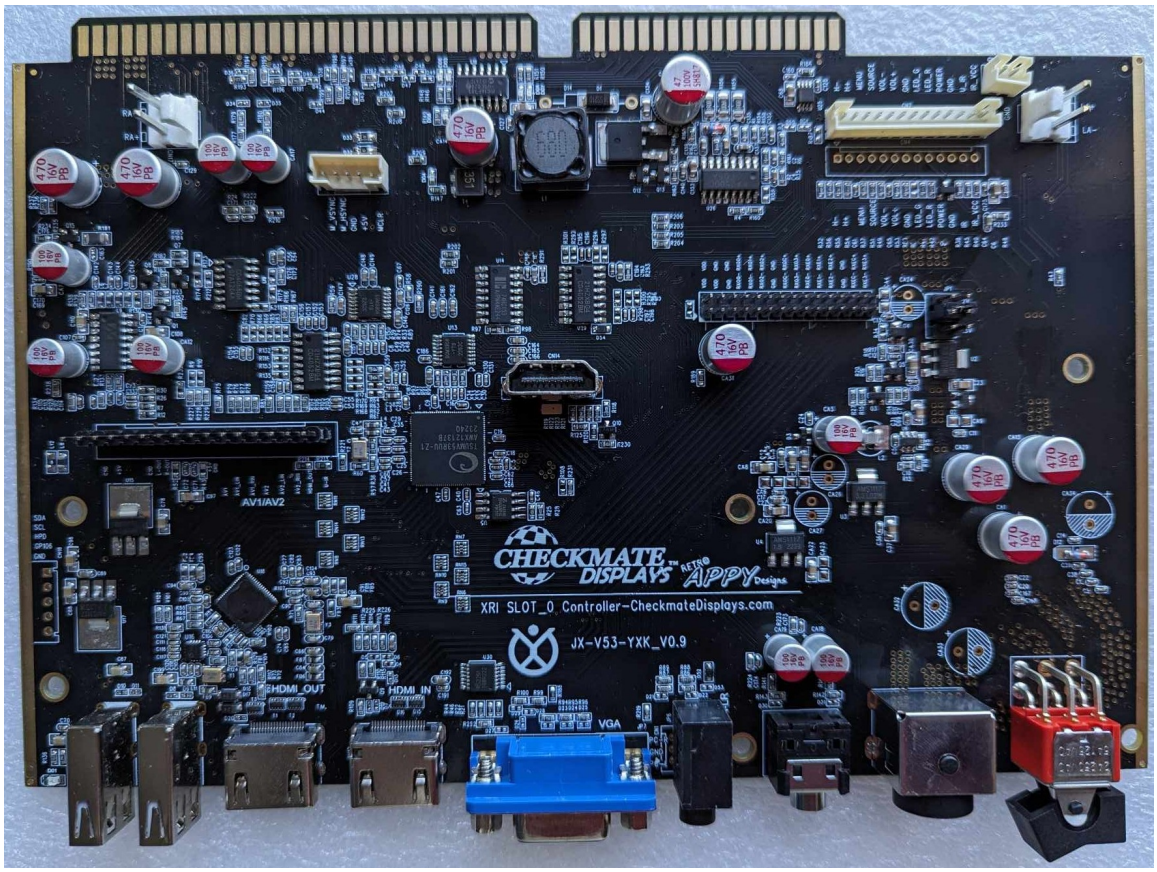


Step 16-17
Insert Slot 0 board into Backplane, connect panel control cable
Fix 2 x Blank panels



Chapter 12:

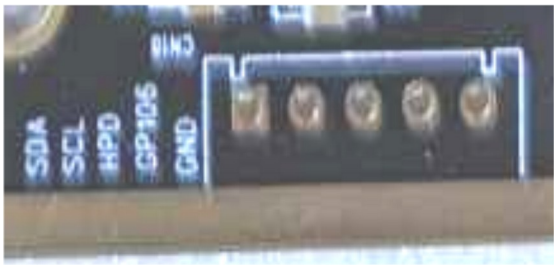
Appy’s Technical section



XRI Slot_0 Controller

Programming Ports

Not for Users. Do not Use! Seriously.



Programming Ports

Header To Mezzanine PCB

Slot_0 Mezze Interface

This is a 16 Way Pin Header for connecting to the Slot_0 Mezze board, the pins consist of main AV signals and also control signals for the HDMI Switcher also on the Mezze board.

AV1/AV2

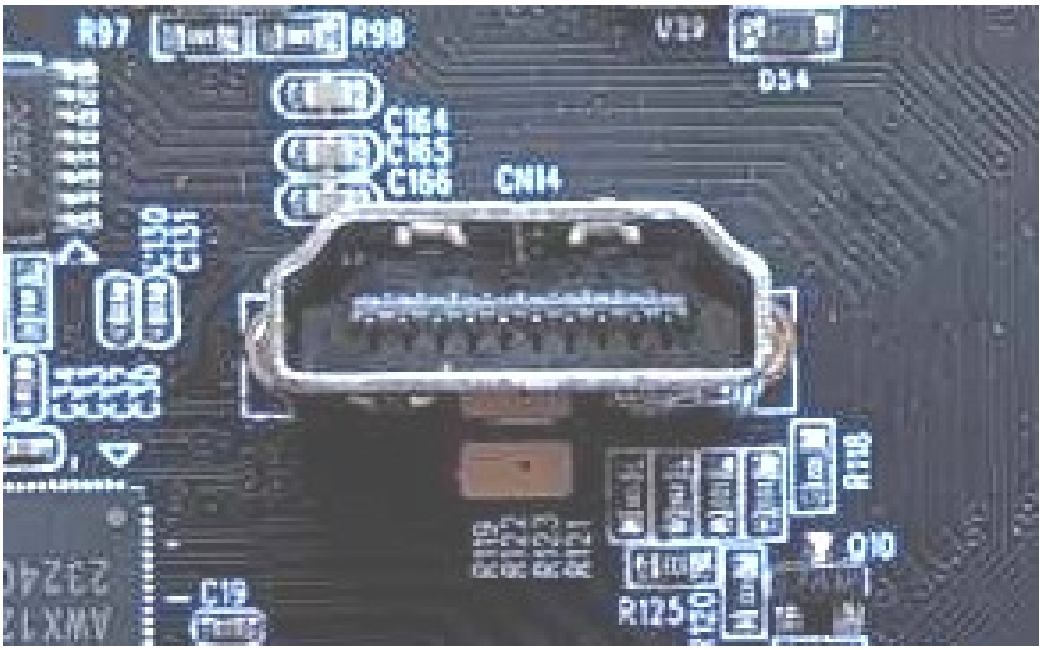
AV1/AV2 Signal

Pin	Signal	Description
1	GND	Ground
2	+5V	Supply
3	NC	
4	GND	Ground
5	L-OUT	Audio left OUT
6	R-OUT	Audio Right OUT
7	+5V	Supply
8	GND	Ground

Pin	Signal	Description
9	AV1	Audio/Video1 VIDEO
10	AV1_LIN	A/V1 Audio Left In
11	AV1_RIN	A/V1 Audio Right In
12	AV2	Audio/Video12 VIDEO
13	AV2_LIN	A/V2 Audio Left In
14	AV2_RIN	A/V2 Audio Right In
15	HDMI_OUT	Redundant U/S
16	U_IR	Infra-Red Signal

Descriptions

HDMI2 In



HDMI2 In

This is primarily intended for connection to the Slot_0 HDMI Switcher Mezze board, and is the input from the on-board HDMI Switch. However, if you do not have a Slot_0 HDMI mezze plugged in, it can be used as a standard HDMI in port.

LVDS Interface

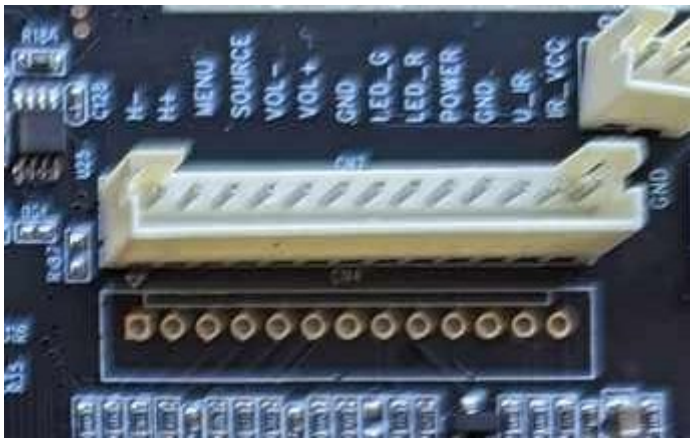
LVDS Interface

This is the main Panel out control interface, which carries the LVDS signals between the Panel and the Controller. Pin1 is on the bottom left hand side, (notice the tiny white triangle), as are the Power Signals on Left, so the Red wires of the cable loom go to the left if ever you have to reconnect this cable.

The HDMI output intercepts this port and recreates an HDMI output at the same resolution as the panel which is 1280x1024 and matching either the 50hz or 60hz of the current input.

This is an industry standard interface, and pinouts can easily be found online.

Front Panel Button Interface



Button Bar Connector

If you are using the Slot_0, connected to the XRI Backplane, this connector is not required and should not be connected. Otherwise, it is used for connecting the manual buttons that are on the front of the monitor.

Button Bar Signal

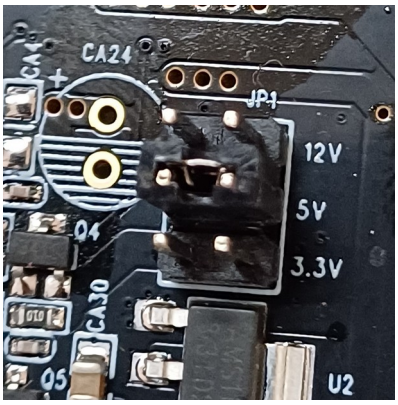
Pin	Signal	Description
1	CH+	Channel Up
2	CH-	Channel Down
3	MENU	Show Menu
4	SOURCE	Change Source
5	VOL -	Volume Up
6	VOL +	Volume Down

Pin	Signal	Description
7	GND	Ground
8	LED_G	Show Green Stdby Led
9	LED_R	Show Red Stdby LED
10	POWER	Sleep/Awake Slot_0
11	GND	Ground
12	U_IR	InfraRed Signal
13	IR_VCC	InfraRed Power

Descriptions

Panel Back Light Voltage Selection

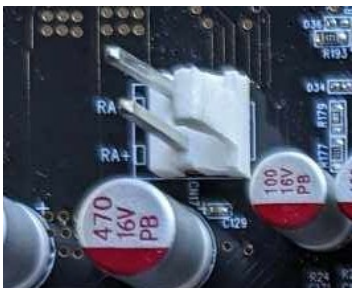
**** ONLY ALTER THIS IF YOU REALLY KNOW WHAT YOU ARE DOING! You Will Damage your Panel. ****



Back Light Voltage Selector

Using our standard Panel, leave this set to 5V, using the shorting tab, if using any other Panel, please refer to its technical specifications. Only 12V, 5V and 3V can be selected. Note: Changing this will void your warranty, fair warning.

Speaker Connections Left and Right

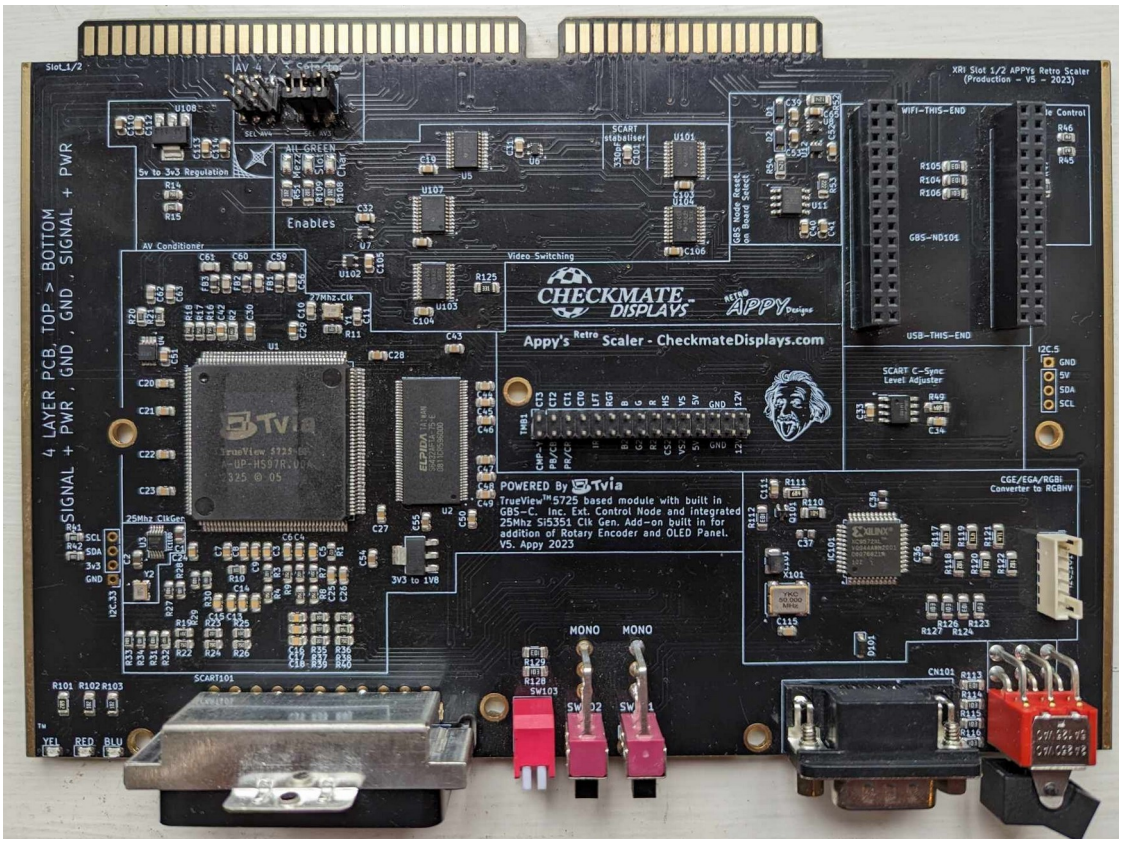


These are to be used, only if you are not connected to the XRI Backplane, and connect the Slot_0 PCB to the monitors speakers.

The XRI – Appy's Retro Scalar

Appy's Retro Scalar, or "scaler" as that's what it is, adds a great number of inputs, but also enables further features and inputs through its Mezze interface. The board uses only the 5V from the XRI Backplane, but also passes 12v through to the Mezze interface. With the 5v, a further 3.3v and 1.8v are generated through onboard LDO Regulators.

At the heart of the board, it is powered by the TVIA TrueView TV5725 scaler chip, which people may know has been used on the GBS line of scalers. However, twinned with its 64Mb of SDRAM, the board also features the GBS-Control node, (which replaces the TV5751 Firmware by Robert Neumann) which is known as GBS-control, a continuation of previous work by dooklink, mybook4, Ian Stedman and others.



Appy's Retro Scalar board

Other features that are part of the scaler section, is a separate external clock generator, Si5351A controlled by I2C feeding direct to the TV5725 external clock input, and through the I2C onboard bus, feeding the XRI Backplane. An external OLED screen and JOG dial (a rotary Encoder) can be added for manual control of the Scalers settings.

The scaler function is only one feature of the *Appy's Retro Scalar* board, although it takes mainly SCART video/audio (with composite), Component (on Mezze) or RGB video in and scales it to be VGA compatible.

The scaler board also has a number of video switching circuits for handling several Video channels, as well as a comprehensive RGBi / CGA / EGA conversion and colour control.

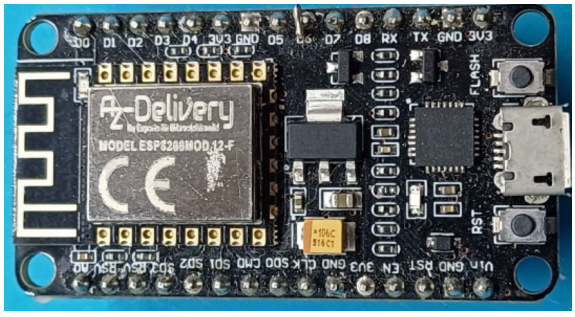
For the SCART and RGB video signals, there is a video switch controlled by the XRI_Slot_0 controller allowing selection of which input, is outputted to the scaler function. There is also a separate video input to the scaler, which is dedicated for Component input, although there is not enough room for a component 3xSocket on the Scalar board, there will be one on Mezze boards for this input.

The scaler has a Xilinx CPLD on board, this handles the RGBi / CGA / EGA inputs. The boards then takes the digital input and creates an Analogue RGB output to the scaler. This CPLD has colour control as part of its firmware, this allows for several useful features, which are Brown Fix and Mono-Colour mode.

The brown mode, is used to replicate a circuit that used to be in CRT monitors, to modify the Dark Yellow from a mucky yellow to a Brown colour. The mono colour mode, allows you to convert the analogue RGB colours, to individual shades of Grey, Green, Amber or Blue, by using a 2 position DIP switch to select between them.

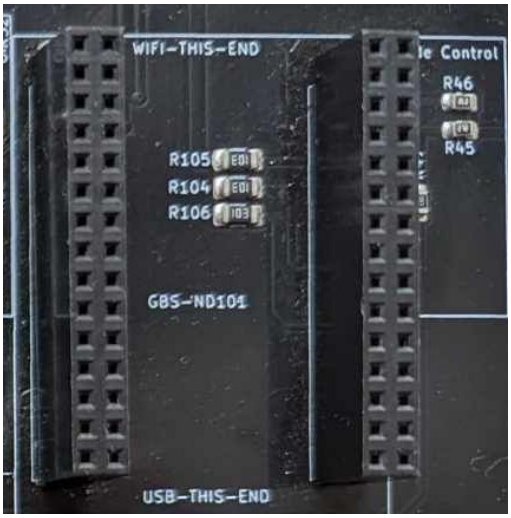
On-board Connections

The scaler board, has two socket interfaces, one for the GBS-Control node and the other for a connection of a Mezzanine (Mezze) board. The GBS-Control node is a 30pin sub-PCB containing the ESP8266 for taking over the firmware of the TV5751, the interface uses 2 x 30 way 2x15 2.54 pitch header sockets. The Mezze interface is a 2 x 15 2.54 pitch header socket.

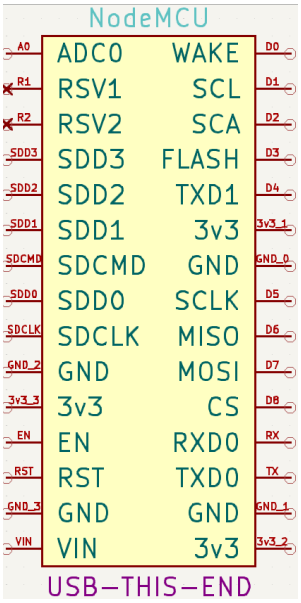


The ESP Control Node

The ESP socket



On-Board Interface



Interface Pinout

Mezze Interface

Mezze Pin Header Interface

Pin	Signal	Description
1,3,5,7	VGA Sel	VGA switch control
9	Audio Left	VGA audio from Mezz
11	Audio Rgt	VGA audio from Mezz
13	VGA BLU	Blue VGA Signal from Mezz
15	VGA GRN	Green VGA Signal from Mezz
17	VGA RED	Red VGA Signal from Mezz
19	H_SYNC	VGA Hoz. Sync from Mezz
21	V_SYNC	VGA Vert. Sync from Mezz
23, 24	+5V	+5 Volt supply to Mezz
29, 30	+12V	+12 Volt supply to Mezz
2	COMP-Y	Component Luma & Sync
4	PB/CB	Component Blue
6	PR/CR	Component Red
10	IR_IN	IR Pulses from IR Receiver
14, 16, 18, 20, 22	RGB2	Reserved for future use
8,12,25, 26, 27,28	GND	Ground return

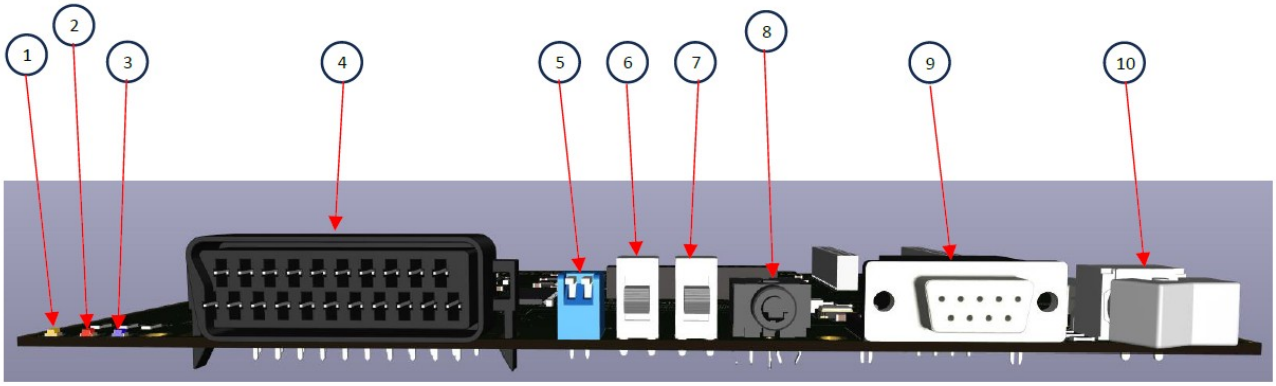
Header Pin Description

SCART AV Out Selection

AV Selection Headers

If the signal connected Via SCART is also an AV signal through the Video in-line (i.e. not just C-Sync signal but composite), then connecting shorting tabs across either one of these 6 pin headers, to select which AV channel, will display the SCART AV Signal.

Rear Connections and Switches



Rear Connections and switches

The above figure shows the rear of the Scalar board, without rear panel.
A description of each of the items are described in the following:

1.	Yellow LED	-	+12V power is available on-board
2.	Red LED	-	+5V power is available on-board
3.	Blue LED	-	+3V3 power is available on-board
4.	SCART	-	SCART input socket
5.	DIP Switches	-	Mono-Colour select, see table below…
6.	Mono Select	-	Switches RGB mode to mono-colour display Down position is ON
7.	Brown Fix Select	-	Selects whether to apply Brown fix or not Down position is ON
8.	RGBi/CGA In	-	9way d-sub socket for RGBi and CGA
9.	PCB Power	-	Switch Power on / off to main Scalar board.

Mono-Colour Selection

SWITCH POSITIONS	Colour
	GREY
	GREEN
	AMBER
	BLUE

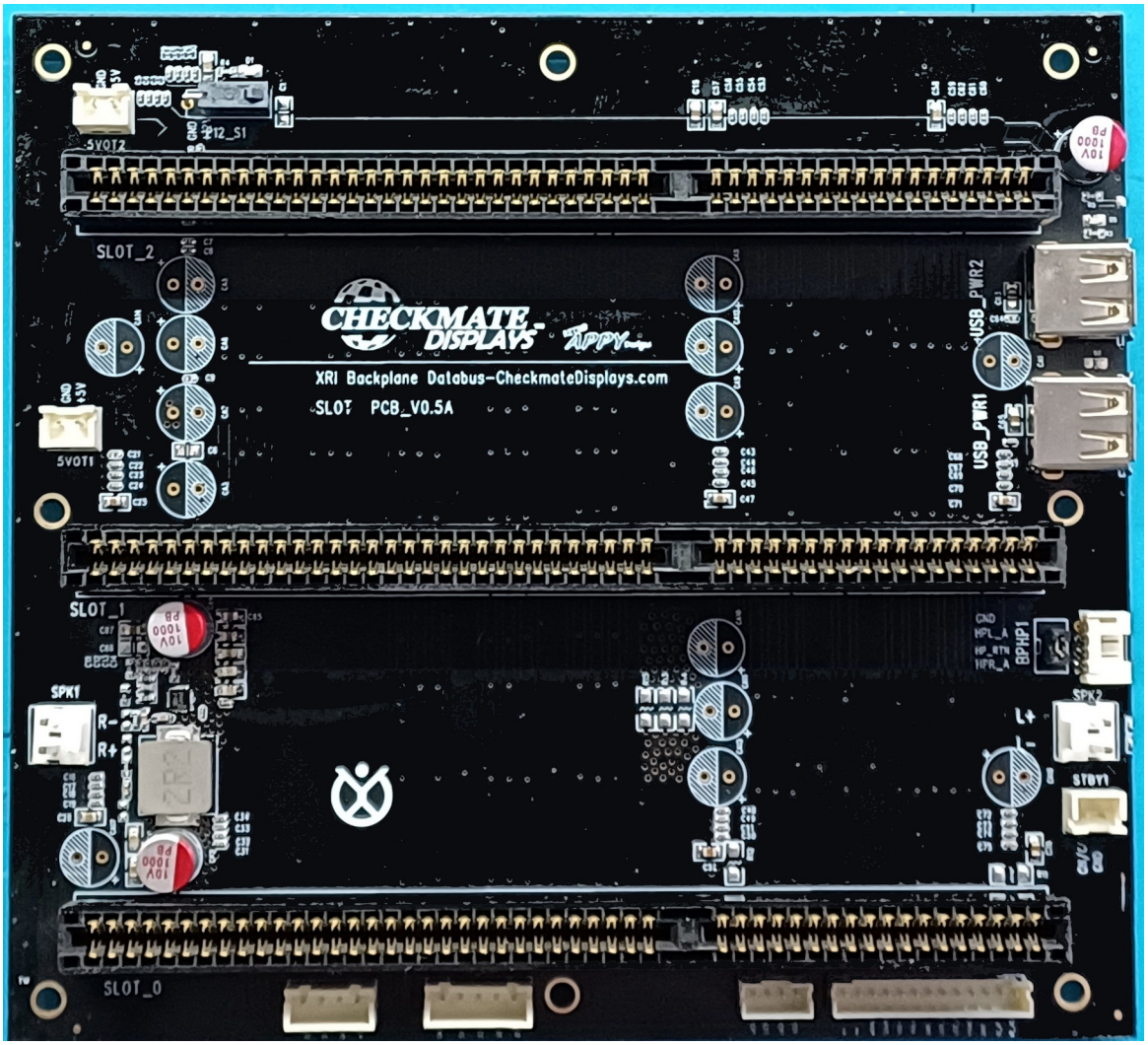
Mono-Colour Shades

The XRI – Backplane

The backplane is crucial to making the monitor as expandable and as cable-free as it can possibly be. This also allows a hassle-free method for adding new Pods.

Having the XRI, or e**X**pandable **R**etro **I**nterface, inside your monitor gives you room for two additional Pods as well as the bottom slot, the Slot_0 controller, which handles all the video switching for the other two slots.

Here you can see the backplane and its connectors. There are two types of connectors, system and user. If you buy your monitor with the backplane included (all future monitors will include it as standard) they will already be assembled into the monitor. The next paragraph will go through these steps in detail in case you need to assemble it yourself, or need to make some modifications.



The overall backplane.

The System Connections

The system connections are all positioned on the PCB below the Slot 0 edge socket, these all connect to specific places within the monitor housing.

GBS-C Connections

There are two connectors under the slot 0 socket, on the left side, labelled I2C1 and R_EN1, with individual signal labels describing each pin.

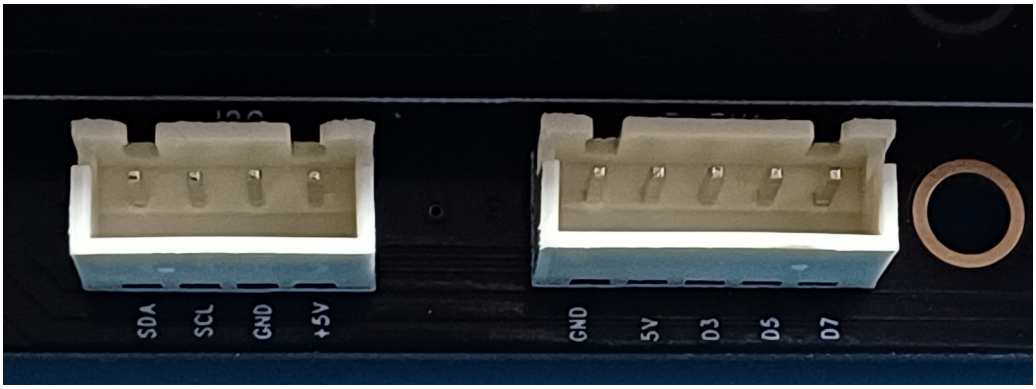


Fig ##.2 GBS-C Connectors

I2C1 is for connecting to an OLED display allowing a separate visible screen for displaying GBS-C information. The R_EN1 connects to a Rotary Encoder that allows the control of the menu system of the OLED for changing settings of the GBS-Control board. These will only work when *Appy's Retro Scalar* Pod is installed in the monitor.

I2C1

Pin	Signal	Description
1	SDA	Signal Data
2	SCL	Signal CLK
3	GND	Ground
4	+5V	5v supply

I2C1 Signal Descriptions

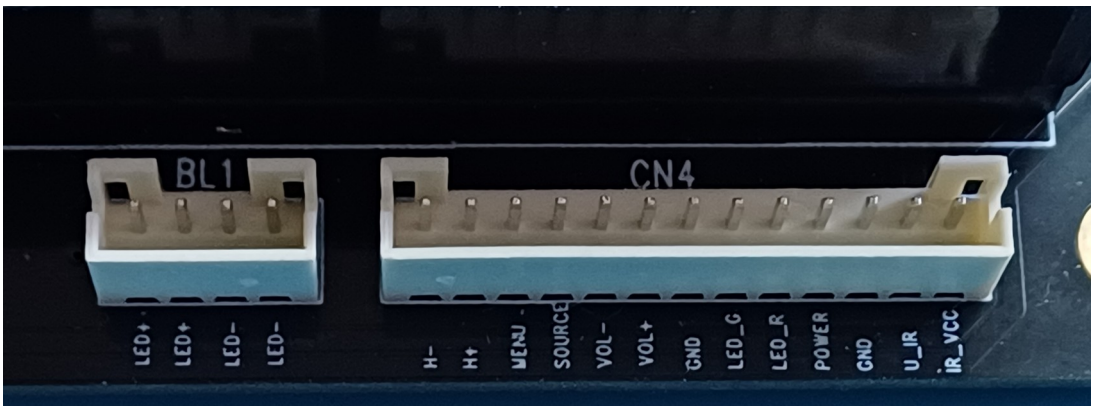
R_EN1

Pin	Signal	Description
1	GND	Ground
2	+5V	5v supply
3	D3	Switch
4	D5	Data
5	D7	Clock

R_EN1 Signal Descriptions

Panel & Button Bar Connections

There are two connectors under the slot 0 socket, on the right side, labelled BL1 and CN4, with individual signal labels describing main pins.



Panel Display Connectors

BL1 is the main power to the display backlight, with CN4 connecting to the front control button bar, and IR sensor.

BL1

Pin	Signal	Description
1	RED	Power
2	RED	Power
3	BLK	Ground
4	BLK	Ground

BL1 Signal Descriptions

CN4

Pin	Signal	Description
1	NC1	Not Connected
2	NC2	Not Connected
3	MNU	Menu
4	SRC	Source
5	VL-	Volume Down
6	VL+	Volume Up
7	GND	Ground
8	LDG	LED
9	NC3	Not Connected
10	1/0	Standby Power On/Off
11	GND	Ground
12	IR	Infra-Red Signal
13	I_VC	Infra-Red Power

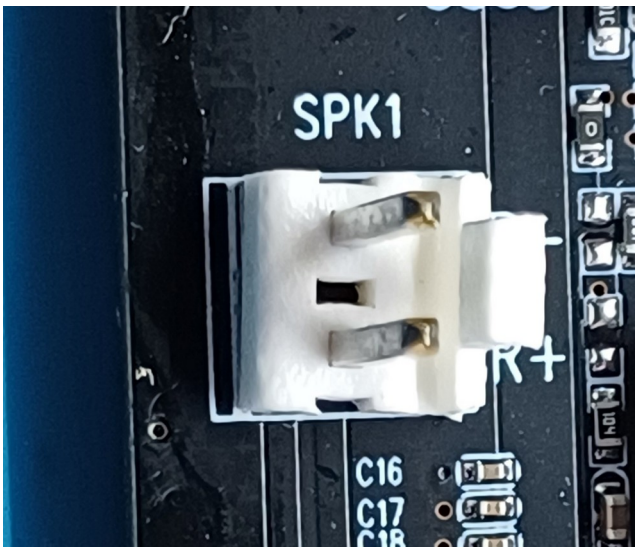
CN4 Signal Descriptions

Audio Connections

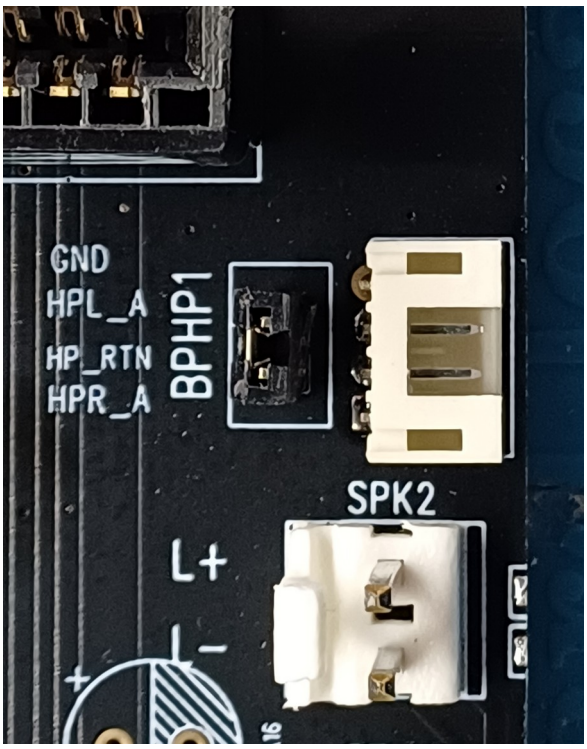
On the backplane there are 2 Speaker Headers, for connection to the internal monitor speakers, one left and the other Right.

The is also BPHP1 (Back-Plane Headphone connector), If you intend to use the Headphone socket on Slot_0 then leave this un-connected, and also with a Shorting Tab across the 2 pin header which allows audio through to Slot_0 head Phones.

If you have a built in headphone socket on the Monitor then wire the Socket to this Connector using a 4 Pin plug, and remove the shorting tab from the 2 Pin Header, to allow audio out through internal Monitor Headphone audio Jack.



Speaker Connectors



Internal Head-Phone Connector

SPK1 / 2

Pin	Signal	Description
1	R-	Right Neg
2	R+	Right Pos

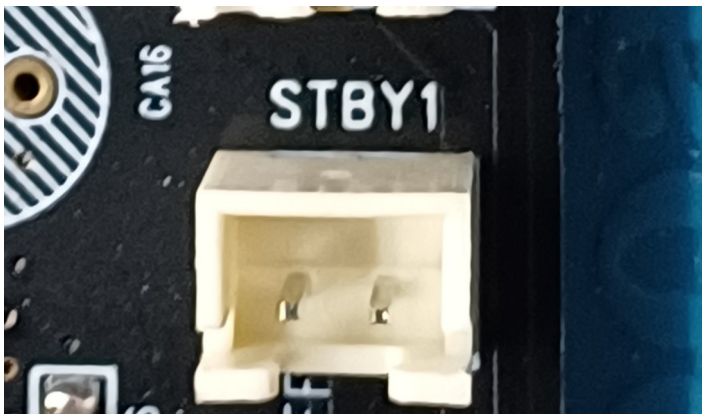
CN4 Signal Description

BPHP1

Pin	Signal	Description
1	HPR_A	Right Audio Neg
2	HP_RTN	Hot Plug Return
3	HPL_A	Left Audio Neg
4	GND	GND

SPK1 & SPK2 Signal Descriptions

Standby Connector



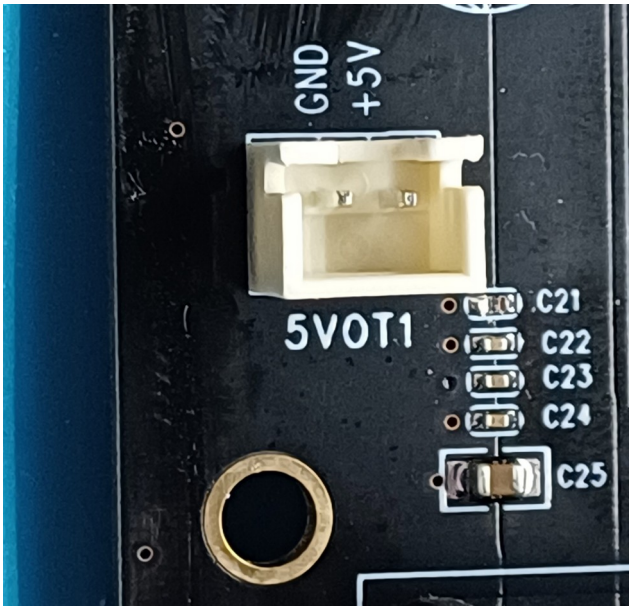
Front Standby Power Switch

This is used for the connector of the non-latching Front Power Button, to switch the Slot_0 system in and out of Standby Mode. Please note this only puts the Slot_0 controller to sleep, any other boards in slots 1 or 2 are still awake and using power.

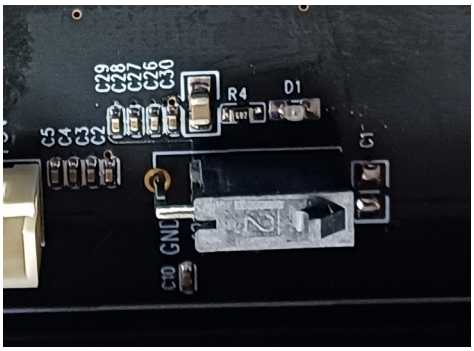
The User Connections

The user connections are for enabling external modules to be powered by the main monitor power supply, through the backplane, allowing users to connect to the 5V supply, or the 12V supply.

5 Volt Supply Connections



12 Volt Supply Connector



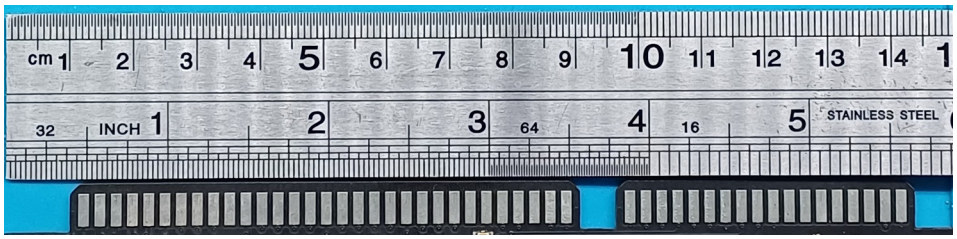
The XRI Protocol Revision 1

This section will cover in detail the XRI Protocol which is implemented through the Backplane and controlled by the Slot_0 Controller. Hopefully with this information developers who want to can create their own pods to slot into the monitor, to add their own interface or application.

The Internal Connector

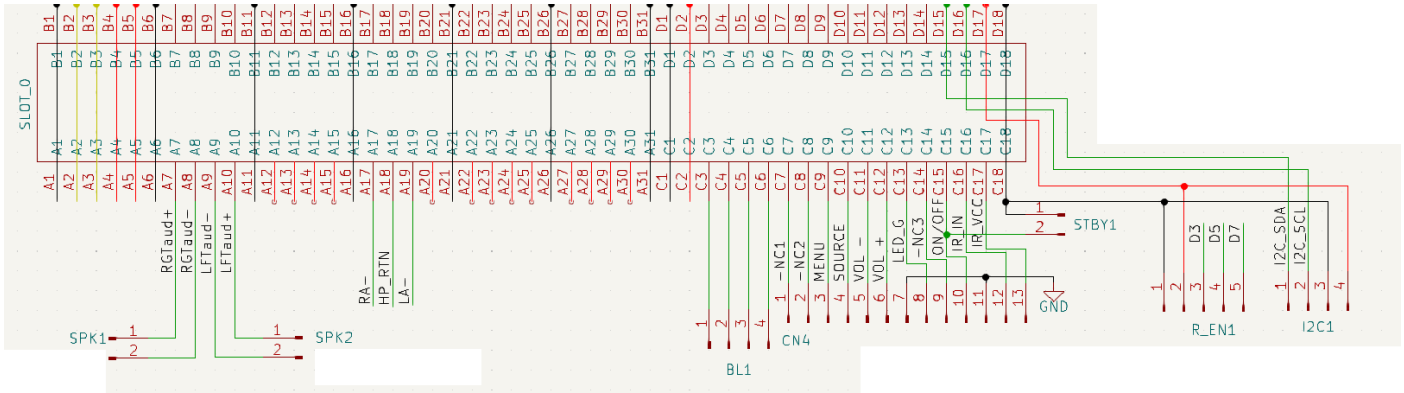
This is a 98 way PCB Edge connector slot, split into 4 pin labels, with A1 to A31 and C1 to C18 on the bottom edge, and B1 to B31 and D1 to D18 along the top edge. It is shown in the figure below.

As can be seen there is a keyed divider between A & B to C & D pins. This then will house a POD, with a matching edge connector, to simply slide in. The card edge connector is shown below, and a full description of pod sizing and design, is explained later on in this section.



The backplane connects each of the signals from Slot_0 to Slot_1 and Slot_2, although Slot_0 connections are slightly different to Slot_1 and 2 and therefore, the Slot_0 Controller must only be ever used in Slot_0 also no other card should be inserted in to Slot_0.

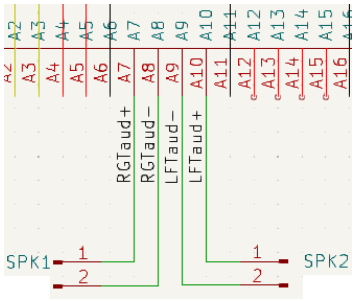
Here is the schematic of the connection for SLOT_0 **ONLY**



Connections Specific To SLOT_0

Looking at the bottom row, from left to right, here follows a description of each connection that is specific to Slot_0 only.

Speaker Connections

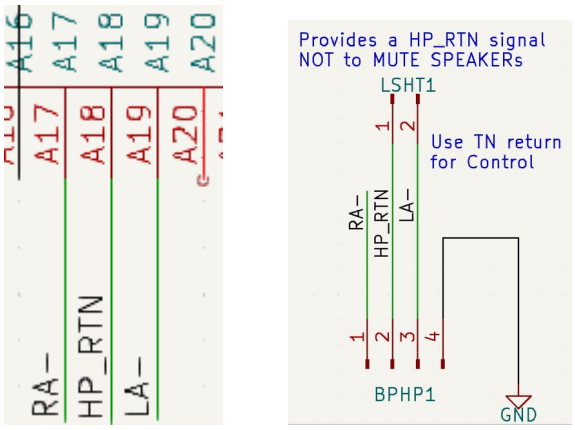


Monitor Speaker Connections

These take the final audio signal for Left and Right from Slot_0 to the backplane and out to the speakers. These are differential signals and therefore connect to a five-pin audio stereo socket, as connection of the Negative (-) line to ground will blow the on-board stereo amplifier, resulting in loss of all audio.

Backplane Headphone Socket

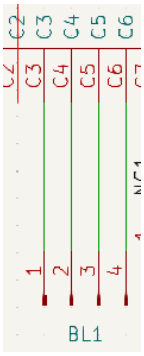
Slot_0 has its own built-in stereo headphone jack socket, and arranged so that when headphones are plugged in the speakers will mute. However, the backplane also has a pin header for the connection of an external headphone jack on a fly lead. This connector is in parallel to the jack on slot_0, therefore for correct detection of connection of headphones in either jack a separate shorting header has been added to the backplane next to the pin header, so as not to mute the speakers.



External Headphone connecting pins

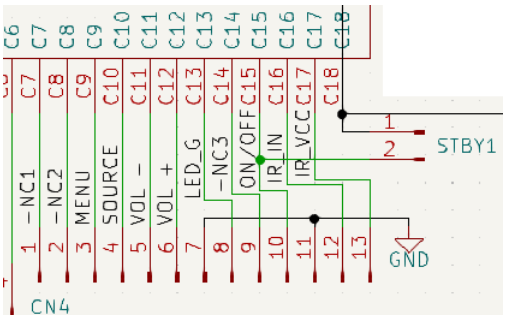
Backlight For Panel

Slot_0 generates the correct voltage through a header select socket for the Backlight of the Panel. This is fed to the backplane so a direct connection from the back plane can be connected. This saves having the cable connected to Slot_0.



Button Bar for Controller

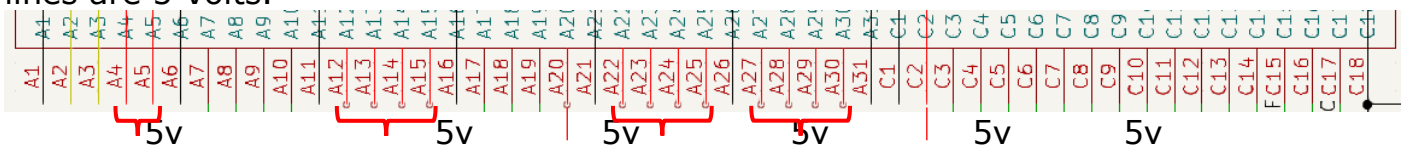
The monitors front button bar with IR receiver is required to connect to slot_0 but again to save having to keep plugging and unplugging the cables the backplane takes the signals. This means unless disassembling the whole monitor these cables are fixed permanently. The monitors main standby button is also connected through this interface.



Interface for Button Bar and Standby Button

5 Volts Main Interconnect

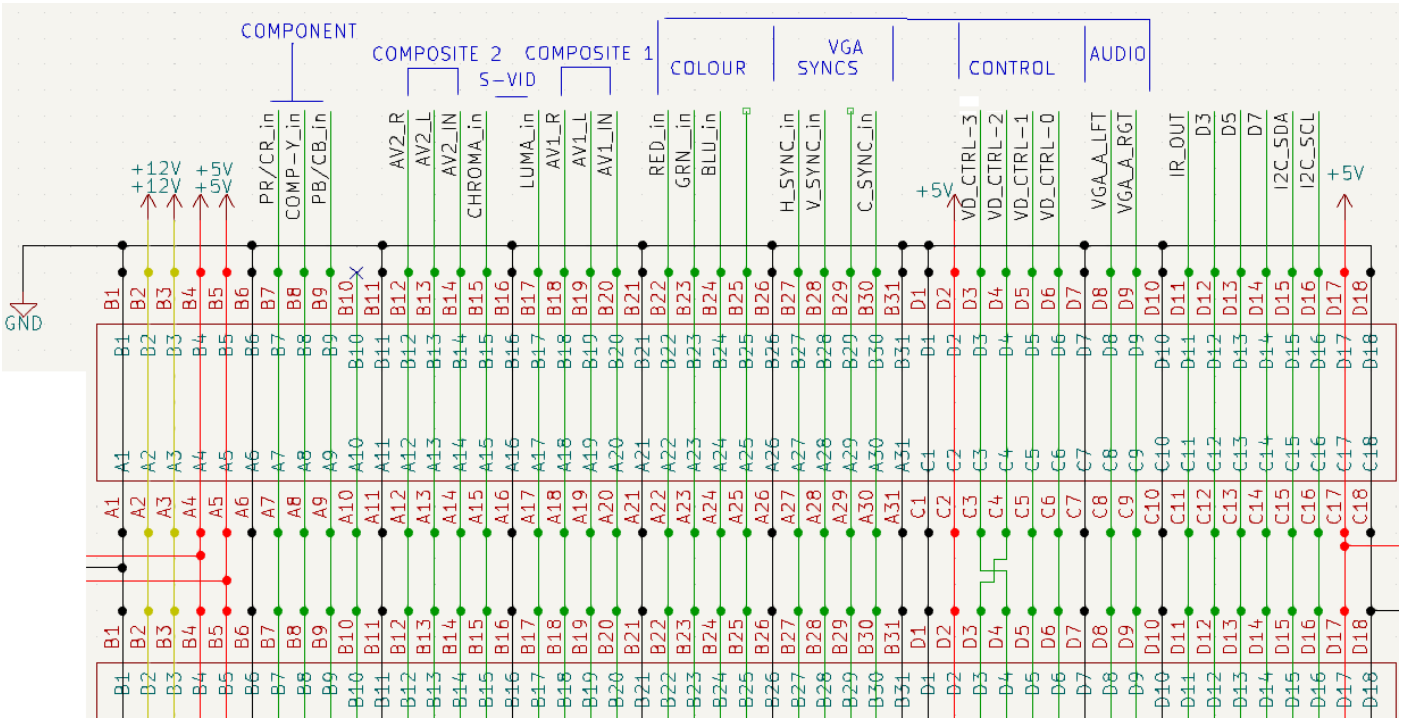
Although there are 4 main tracks for 5Volts to all slots, Slot_0 has extra to help in the reduction of voltage drops across Slot_0, thereby supplying the backplane with the full voltage at currents up to 5 Amps. Slot_0 does not use the 5 volts from the PSU, but derives its own from the 12v supply. All the red lines are 5 Volts.



5 volts connections to backplane

Connections To All Slots

Looking at the Top row, from left to right, here is a description of each connection to all slots on the XRI Backplane.

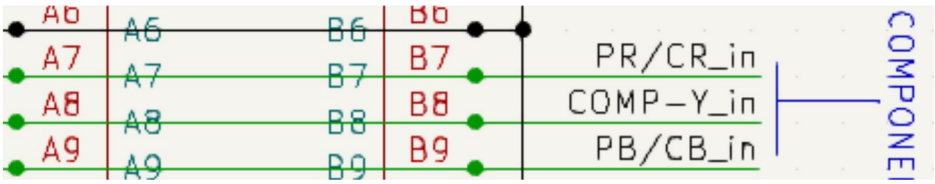


All slots inter-connections

To the left side of the inter-connects are the main power lines with 12volts supplied through A2, A3, B2 and B3. 5 volts has been supplied through A4, A5, B4 and B5 with additional connections on C2, D2, C17, and D17. Grounds are spread through out the signals on, A1, B1, A6, B6, A11, B11, A16, B16, A21, B21, A26, B26, A31, B31, C1, D1, C7, D7, C10, D10, C18, AND D18.

Component Video

Composite video lines were added for the purpose of cross-connecting the video signals to all slots, to ensure if needed the signal lines were there and could be used.

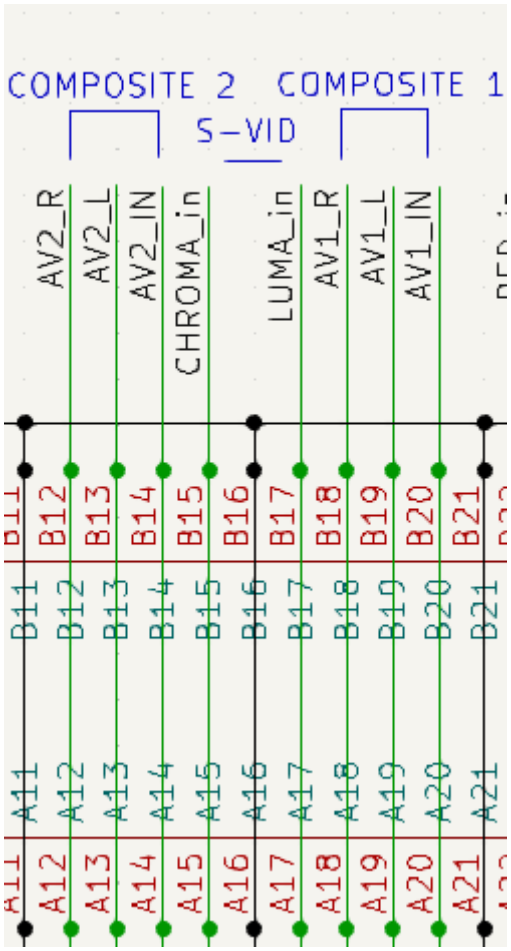


Component Signals

However, as the circuitry developed it was soon realised that Component did not need to be controlled or display through Slot_0, and only resides on '*Appy's Retro Scalar*' using it's Mezze board. This takes Component and converts it to VGA, which then goes on to the backplane. So these 3 lines are now Reserved for Future Use if needed.

Composite 2 and 1

Composite 2 and 1 each uses 3 signal lines each, one for composite video, and 2 for stereo audio left and right. Although on the XRI backplane these are labelled 1 and 2, they are actually mapped to AV3 and AV4 on the Panel Controller with Slot_0 having its own Composite signals for AV1 and AV2.



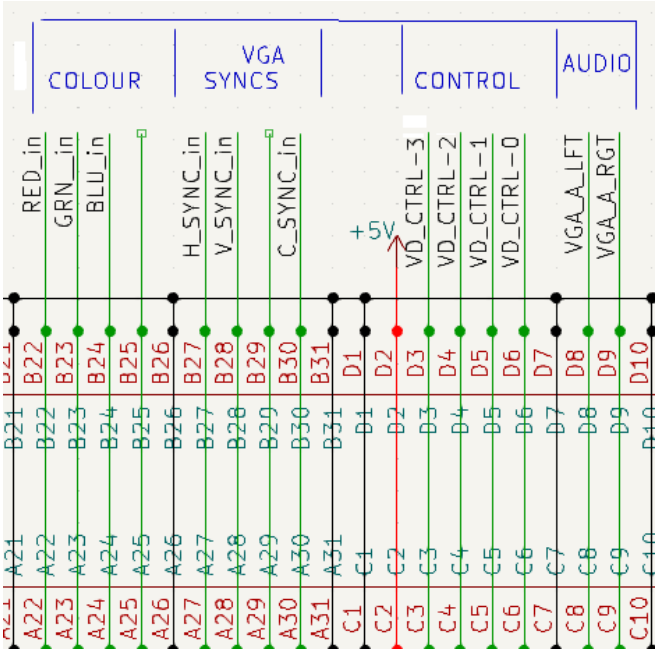
AV x 2 and S-Video Signals

S-Video

S-Video is similar to Component Video, in that, signal tracks were assigned for it if needed, but with the improved development of the 'scaler' mezze board, S-Video is now handled on that board, and then is directly connected through HDMI to Slot_0 to display on the panel. Therefore these 2 signal lines are reserved for future use.

VGA Video signals and Control

VGA is very important and an integral part of the monitor and thus a large part of the XRI protocol with its own Colour signals, Sync lines, Audio, and Switch control signals.



The VGA signals of the XRI Protocol

Colour

These are the Analogue colour signals for the VGA signal, carrying the red green and blue information on A22, B22 A23, B23, A24 and B24 respectively with each signal on both the bottom A and top B pins. These are then used by Slot_0 to display the information.

SYNCS

VGA protocol only uses H-Sync (horizontal) and V-Sync (vertical) sync pulses to derive its screen resolution and sync the image to that. These are on A27, B27, A28 and B28 respectively. There is then a future reserved line on A29 and B29 before the C-Sync (Combined sync). The C-sync line is just in case a special type pod is used which outputs c-sync. This will be separated into H and V syncs for the VGA to display.

Audio

The two lines are for carrying single ended left and right audio, to accompany the VGA image data.

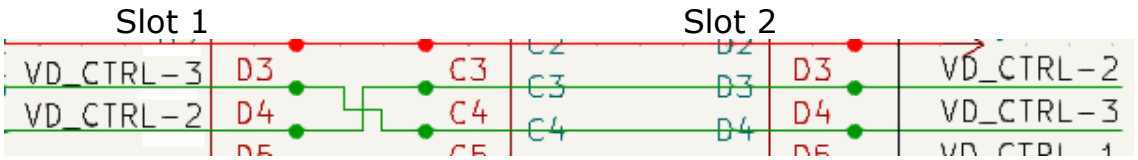
VGA Control

These 4 signals are used to select which slot takes priority for displaying its VGA information and connecting it to the backplane. Note: each slot can have up to 2 VGA channels, so again, selecting which VGA on that slot is to be connected to the VGA bus on the backplane.

VD_CTRL-0 and VD_CTRL-1 signals control the VGA channel on each slot pod, with VD_CTRL-2 and VD_CTRL-3 determining which Slot to allow its VGA information on to the backplane.

VD_CTRL-2 and VD_CTRL-3

As mentioned previously the two control signals determine which slot has the VGA signals connected to the VGA bus on the backplane.



Cross over from Slot 1 to Slot 2

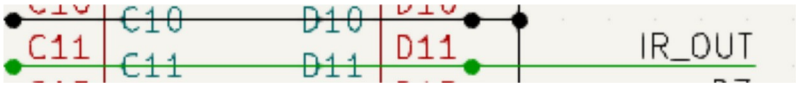
There is a cross-over between VD_CTRL-2 and VD_CTRL-3, this is to save on extra decoding that would be required on the POD. This way the POD just needs to use the 4th Line for the VGA switch. If VD_CTRL-2 is Selected (Low) then C/D 4th Line on Slot 1 is Low therefore selecting it, where as if VD_CTRL-3 is Selected (Low) then C/D 4th Line on Slot 2 is Low therefore selecting it.

This determines which slot is selected but using the same line on the POD, allowing it to be plugged in either slot.

If slot_0 sets VD_CTRL-2 and VD_CTRL-3 both to (High) so neither is selected, then *'Appy's Retro Scalar'* will recognise this, and connect its RF Mezze board to the VGA bus, but this is a SPECIAL CASE, and not to be implemented by any other pod.

IR_IN

The XRI protocol has a signal line for the interconnection of the Infra-Red Signals produced by the IR receiver on Slot_0. This allows pods in any slot to decode the signal and use button presses on the main panel remote control on their own pod.



Infra-Red signal Line

D3, D5 and D7

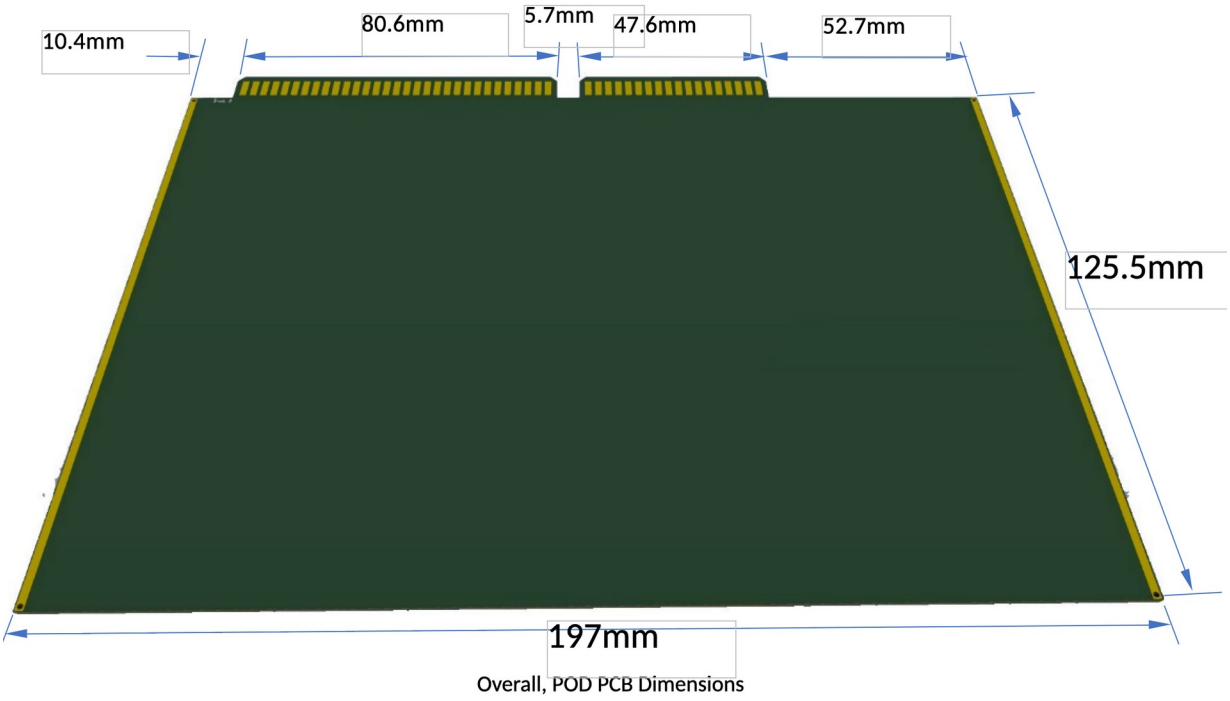
These 3 signal lines are used by *'Appy's Retro Scalar'* and the on-board Scaler Control Node. This provides input from a rotary encoder to connect direct to the backplane. To interact through a menu system displayed on a OLED display to select setting for the Scaler Control.

I2C_SDA and SCL

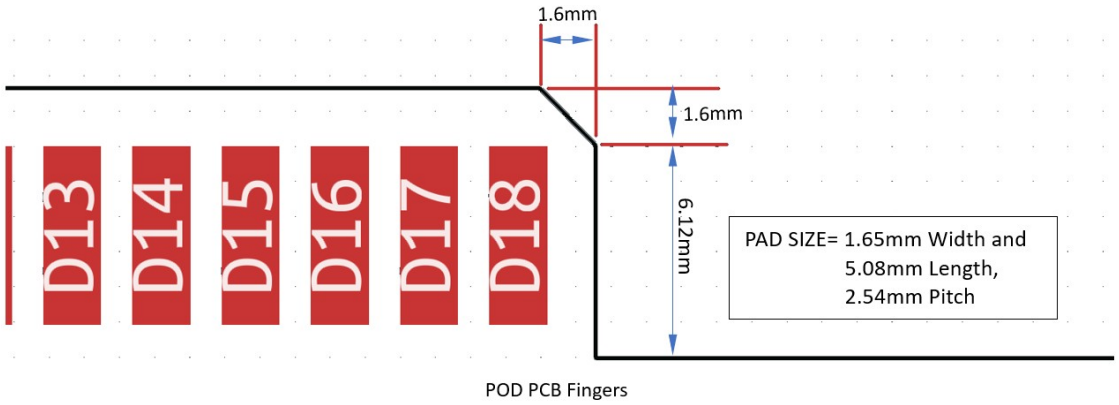
These 2 lines are I^2C (pronounced "I squared C") allowing control signals onto the backplane. At present the only 'Master I2C' controller is on the scaler board through the scaler controller. These signals feed and control the displayed data on the OLED, which interacts with the Rotary Encoder.

Monitor POD Design

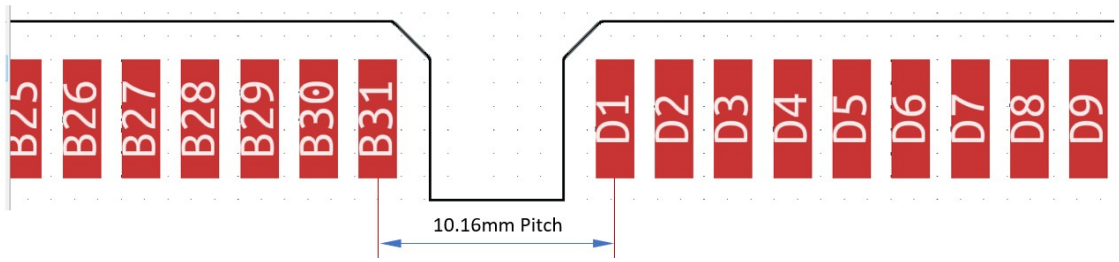
Shown Below is the overall dimension of the POD PCB's, these need to be accurate, so as to not only fit into the Slots, but to make a good sound connection with the XRI backplane.



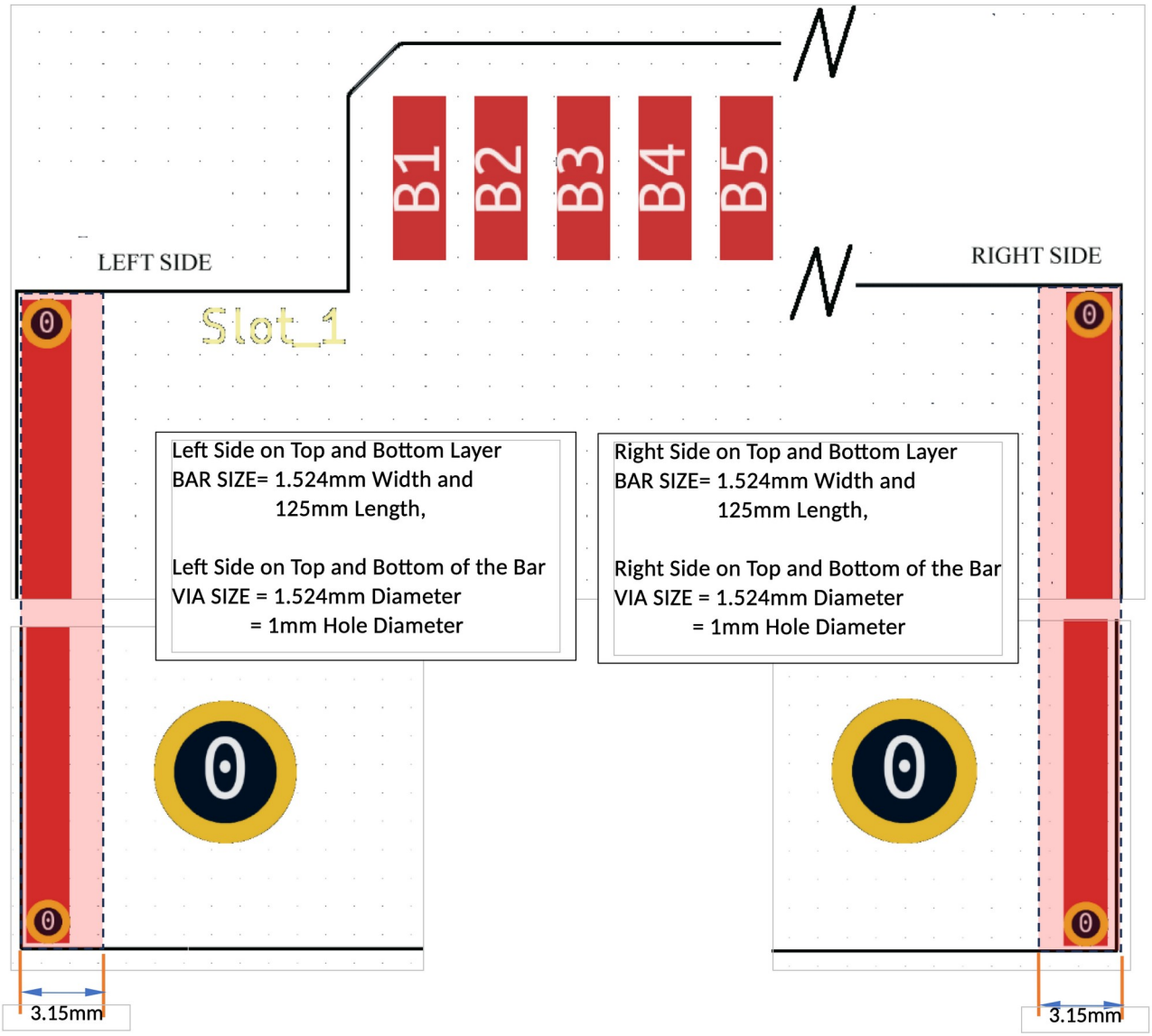
Overall, POD PCB Dimensions



POD PCB Fingers



Also on the POD PCB, on each side (far left / far right), and top and bottom layer, there is an exposed tinted copper bar for grounding purposes.



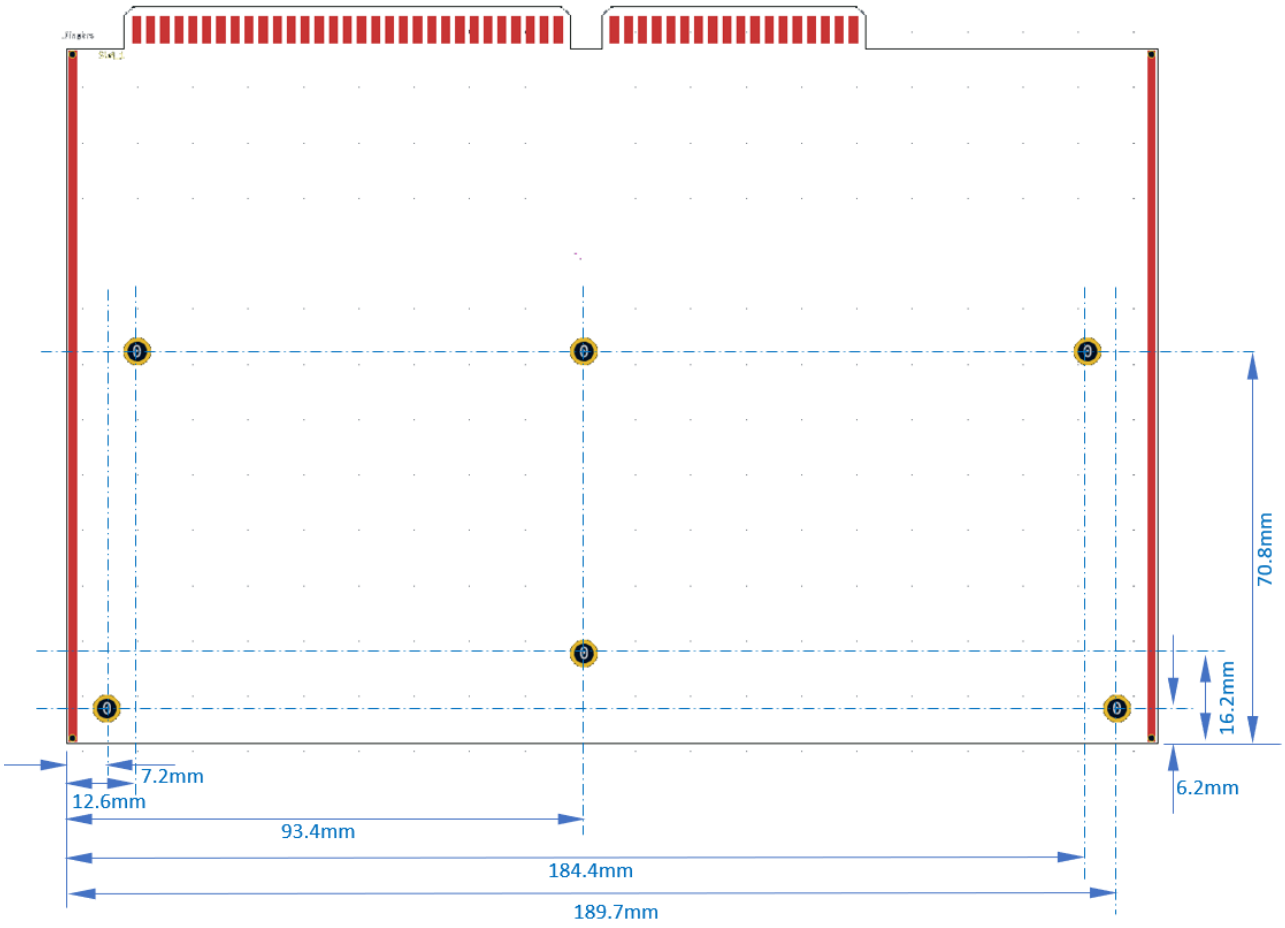
Also, on the Left and Right of the PCB, there is a 3.15mm exclusion zone for components, this area should be clear, for the PODs to slide in easily in to the rear of the monitor using the guidance rails built in.

There will be a link later to allow you to download these PCBs as a template for use in KiCad 7 +

Mounting Hole to Fix to Monitor Rear POD Plate.

To mount the POD to the monitor, rear plates, which all PODs are mounted on, allow easy plugging and unplugging from the Backplane, but also fixings and holes for rear connectivity. You can add as many mounting holes as you may

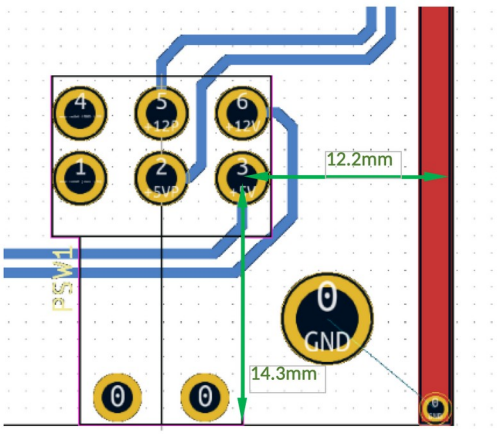
require and also, if implementing a Mezze board to increase rear connector space, holes to fix the Mezze to the POD. But we recommend a minimum and standard positioning of 6 Mount holes.

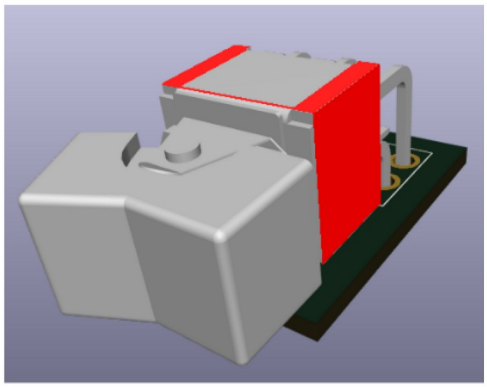


POD Power From Backplane

As standard, all our PODs take 5V Dc and 12V Dc from the backplane, this then powers the POD by an on/off switch at the rear of the slot. This allows each POD to be individually switched on or off, when not needed. Remember the Standby button on front of monitor only puts Slot_0 in to sleep, but any POD with Power Switched on, will still be powered.

These power switches should be in the same position on each POD, for neatness and easy locating of the switch which is on the rear of the monitor.



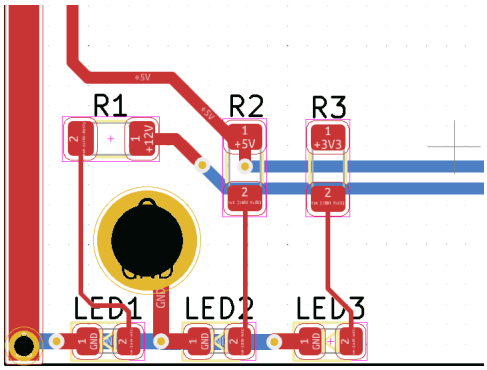


Part info.

E-SWITCH DPDT ROCKER p.no. 300DP1J1BLKM6QE MOUSER - 612-300DP1J1BLKM6QE

Power Indicator LEDs

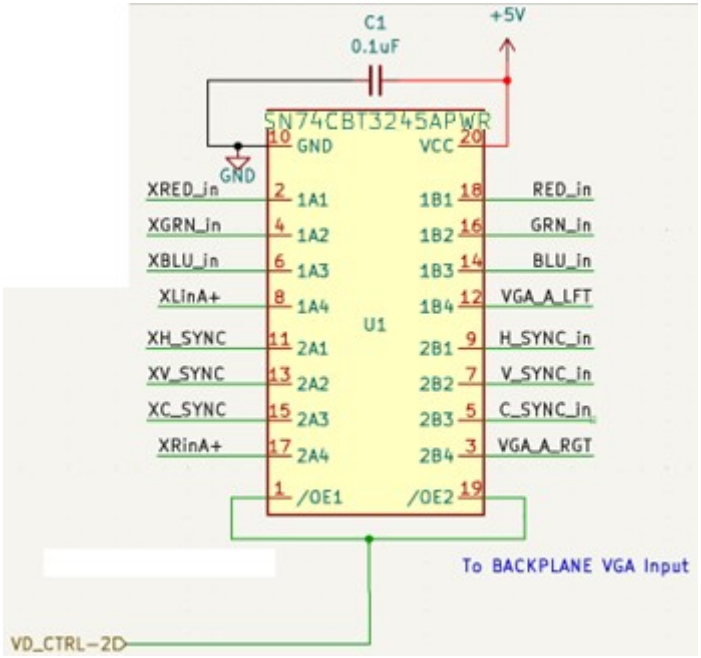
On our PODs we have LED Power indicators, visible confirmation that the Power Switch is on and power is available. They are placed at the rear left of the board. These are optional, however we use a Red LED for 5V, Yellow for 12V, and Blue for 3v3. So if used, try to follow our colours so as not to be confusing.



VGA Switch to Connect to VGA BUS

If your POD requires connection to the VGA Bus then an Isolating Switch is required. This is so that when the slot selected is *not* the slot your POD is in, it is fully disconnected from the VGA lines, does not conflict, or cause VGA noise.

It is recommended to use a switch similar to the SN74CBT3245APWR, this has 8 isolating switches, allowing R, G, B, 3 x syncs and 2 x Audio to be all switched together in a single IC package.



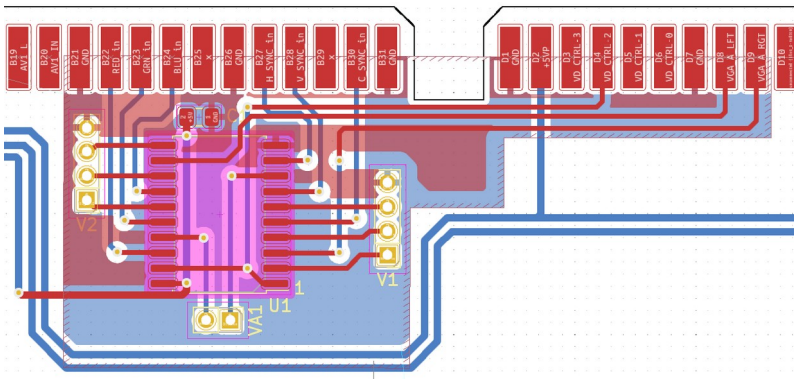
VD_CTRL-2 is used for the switching, as this will allow the use of the POD in either Slot_1 or Slot_2 sockets.

Any input lines should be tied Low, any output lines not used, leave disconnected.

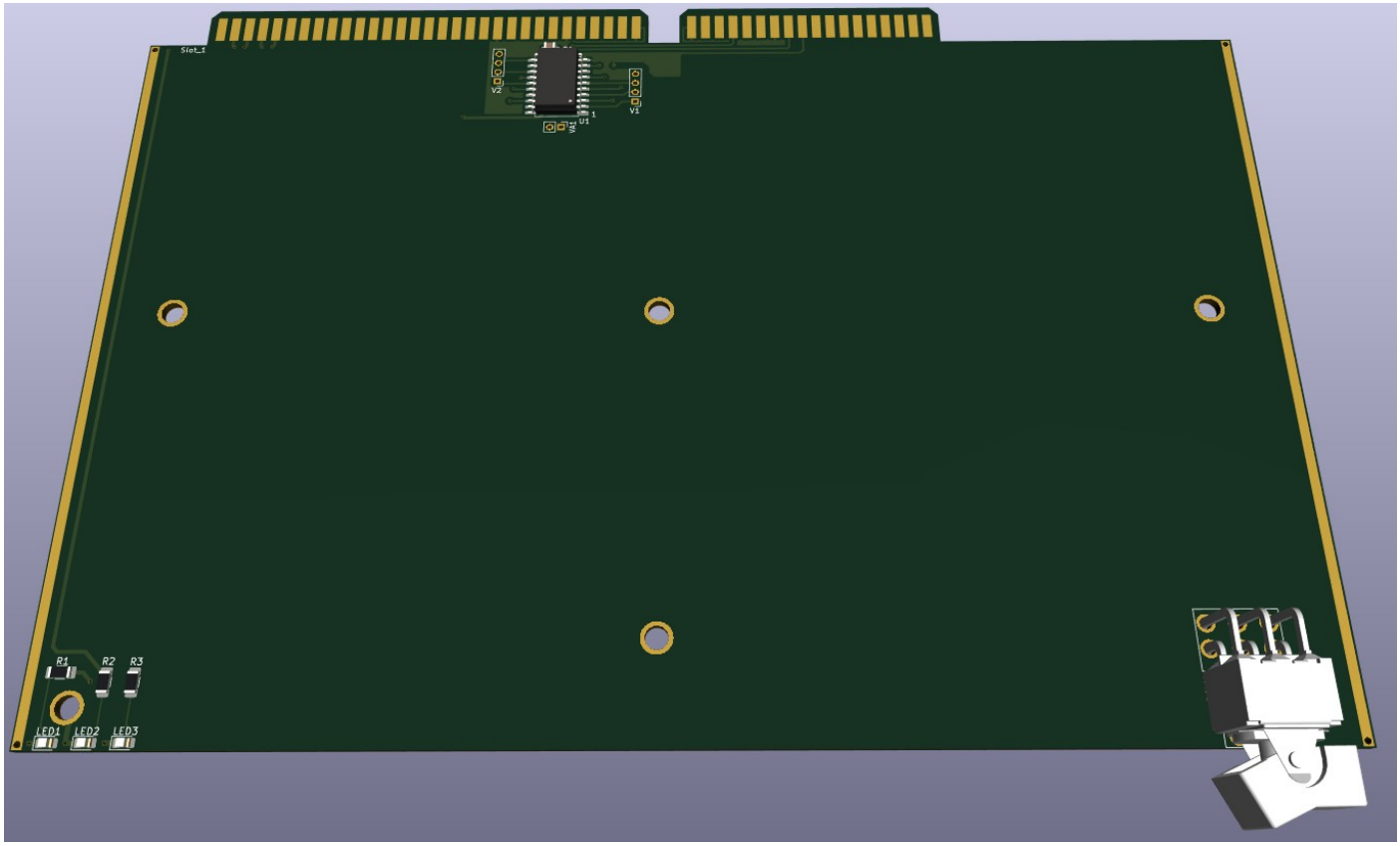
With just the one switch, this gives you only one VGA channel, which will be switched on, whenever the slot the POD is in is selected, so will display for both Channel 1 and Channel 2.

If you wish to have 2 VGA outputs, one on each channel, then you need either 2 more switches (3 in total) controlled by VD_CTRL-0 and VD_CTRL-1 feeding into the Slot VGA Switch, or just two switches, using an OR gate for each switch control. So (VD_CTRL-0 **or** VD_CTRL-2) for one, and (VD_CTRL-1 **or** VD_CTRL-2) for the other.

On our Template, we just have the one VGA Switch, the main one connecting to the VGA Bus. If more are required, simply duplicate the switch circuit, as needed.



Overall Template POD 3D Look



HDMI out

If your POD is going to have a HDMI out (internally connected), then we strongly recommend its placement to the Right of the Slot-fingers. The backplane does not stretch the full way across to the Right and so there is more space for fitting a HDMI Connector into the Socket.

Chapter 13:

Meet Appy

A profile of our Chief Engineer

We wouldn't be able to do what we do at all without the almost magical electronic skills of our chief engineer and designer Paul, who always goes by his nickname "Appy". Appy's had a difficult journey to get here and we thought we'd share his story because personally we find it inspiring.

It's not easy growing up with mental health problems; we all have them in one form or another from time to time and we all deal with them in our own way. In Appy's case for years he was undiagnosed but was living with what used to be called Borderline Personality Disorder (or BPD) but which was recently renamed officially as Emotionally Unstable Personality Disorder (or EUPD.) This disorder means you have difficulties with how you think and feel about yourself and other people, and these difficulties make it hard to cope day to day. Experiences of BPD are different for different people, but commonly you may experience emotions that are very intense, overwhelming or changeable. Obviously this does not make for an easy life. People suffering from BPD

unintentionally alienate those around them, even those they love, and this creates a lot of suffering and heartbreak.

As Appy says *"I've been through a few courses of dialectic behavioural therapy (DBT). I've done bits of CBT (cognitive behavioural therapy) but they're just short treatments. DBT is a year-long program. Through that I'm trying to learn not to react to emotions so strongly. So if someone upsets me instead of going off the deep end, I'll pull back a bit further. It's ruined many a party. The whole party would end up erupting because of me."*

Appy is quite open about his mental health status, and talks about it quite freely about how he copes and tries to live a mostly happy and fulfilled life doing what he loves the most. Building stuff.

From Pubs to Subs

In his youth any time he was annoyed by something he became uncontrollably angry, and everything people tried to do to help seemed to make it worse. Some sufferers describe BPD as being like the emotional equivalent of a burn victim, where everything people say and do seems very intense and painful and they have no protection against it.

If Appy was angry he was super angry, if he was sad or depressed it was overwhelming and disabling. These feelings would persist for days or change abruptly to another deeply felt and hard to tolerate emotion. In the end the only way he could get through the day without blowing his life up every five minutes was to drink. Obviously for a variety of obvious reasons this is not an ideal solution, but for him it works in a way that medication doesn't. He can't drive ever obviously, but in every other aspect of his life he can cope and concentrate and live productively.

"My way is just to drink through it. But when I say I'm an alcoholic, I'm not a (I hate this phrase but my psychiatrist always used it) an 'under the bridge' alcoholic. You know, what people think of as sitting under a bridge with a bottle of vodka. I don't drink to get drunk. I just drink from when I get up and it keeps me steady all day. In fact I can't function without it. If you've seen some of the soldering I have to do, I have to have at least three cans before I can address it as I am. We're talking chips with 160 pins!"

Mental health problems and high intelligence often go hand in hand, and Appy is super smart. From quite modest working class beginnings he was always

eager to learn about mechanical and electronic devices, taking stuff apart and putting it back together again. But he was in his own words not in the sort of family that expected to move into higher education, so he had to be self taught and he learned through experimentation. That said he now has two degrees that he earned through the Open University in Electronics and Computer Engineering so he's done the book work and got the gongs to prove it.

"I came from not an educated family, you know? My dad worked for the council digging holes in the roads and pavement. My three older brothers hardly went to school, and skived off most of the time. I was the only one to go to a different final school. The school my brothers went to was one of the worst schools in the area. Everything I know was self taught or already built in.

"Back then I was constantly taking VHS recorders apart and satellite decoders, and sometimes my mates would say could I mod their games console. Like the one mod I used to do was for the Sega Mega Drive to make it so you could switch between NTSC and PAL, things like that.

"I never had a games console. 1) I wasn't really interested in games and 2) I needed money to buy my computer."

"When the Amiga 1200 came out I just had to have one. I really loved the 1200. And because I wasn't really into playing games, it didn't bother me that half the games didn't work on it. I was in it for the music. I loved the extra chip RAM so I could have bigger samples. The amount of colours was massively increased. It's just great. And AMOS worked even better on the 1200."

But being smart means you have PROJECTS and he had to fund his electronics exploits and computing and music. So he started off his working life, initially in pubs, rising quickly from the role of glass and bottle boy to publican. But although access to alcohol to smooth his emotional rollercoaster was useful, his mind was unsatisfied with the work and this frustration was amplified by his condition. He had to get out and do something.
He decided to stop pulling pints and serving food and be what he really wanted to be, and that was an engineer. He joined the Royal Navy initially for a 4 year apprenticeship as a weapons engineer including mechanics, welding, turning and metalwork.

A Life on the Ocean Waves

Fortunately for Appy there was a culture of drinking in the Navy. In the olden days of sailing ships it was a rum ration, but in the modern Navy every "mess" (an area where personnel socialise and eat) has a beer fridge. The problem was that these beverages were doled out at a certain time of the evening and were locked at other times. That is, it was a problem until he'd discovered that one of the cabinets from his computer room had the same keys as the beer fridge.

After 5 years of learning and service he was eventually discharged from the Navy during a bout of mental health problems as "temperamentally unsuitable". He jokes it was *"because I didn't want to be on ships. I wanted to be shoreside where I could go to the pub every day."* So from his discharge he went back to the shore base, HMS Collingwood. While apparently temperamentally unsuitable for work aboard ship, clearly the Navy didn't want to lose his talents because once installed shoreside he got a bump in rank from Leading Hand to Lieutenant and a post as an instructing officer, teaching there for an additional 2 years.

"I ended up teaching the Royal Navy personnel, but civilian personnel too because we were teaching apprentices for companies like BAE Systems, Kinetica and all the other ones. So I was teaching them and on final presentation day their bosses came in and I got chatting with one of the BAE bosses. Next thing I know he took me up, I got a job at BAE working on torpedos and testing them."

Working at BAE was really good for Appy, and the evidence is in the fact he was working there for 15 years. A part of the success of the job was due to his co-workers who understood and supported his mental health issues. As time wore on however many of these supportive co-workers began retiring and there were redundancies too. At the same time Appy was going through some personal problems too, with a stressful and difficult separation from the mother of his children. So after 15 happy years at BAE he retired due to ill health.

"My mental health just wouldn't cope with the working environment. Lots of people I relied on for support left. HR and the company doctor said 'we can't cope with the amount of time off you have'. Because by that point I was having a year off on full pay, and then working a year, then having another year off on full pay. I did that for about the last 5-6 years. They wouldn't give me redundancy, so I said well, I'll go for a medical retirement. Straight away I

got a letter back saying no. So I appealed it and I had to go through some tribunals etc. Then they came back 'We're retiring you. Here's a big pension and here's a big lump sum."

This of course worked out well for us when we met him because although our ideas are, of course, *amazing* and we are geniuses at bolting stuff together, Appy adds a bespoke neatening up of our ideas using his unique set of technical skills.

All Round Engineer

Technically speaking Appy brings a lot to the table. He has two degrees and a masters in engineering. He is an electronic engineer. He has CNC machines, milling machines, a pillar drill and a metal bending machine. He's experienced in welding, turning and all types of metal work. The reason for this all round expertise is partly to do with life as an engineer on a ship.

"When I did my apprenticeship in the Royal Navy, we did everything hands on. Because the way they see it is when you're on a ship, if something breaks and there isn't a spare in stock on the ship, you have to make one out of raw materials."

Appy is also qualified, and everything he designs for us is military specification.

"I've been doing electronics since I was 12 and I'm 48 now so that's 36 years. But a lot of experience as well and not all in one area. From Navy engineering, teaching engineering then designing weapons and test systems for those weapons. I'm also a bit of a perfectionist and when it comes to engineering and I'm a professional. It has to be a professional product.

"Military Spec is just a little bit more hardy, like the temperature coefficients, the temperatures it has to operate over are wider. You also have to take into consideration IP or Ingress Protection, so how much water could it withstand before it would leak or break or how big a finger can you put into it, you know, for safety. There's also environmental conditions, like you don't want condensation, so you might have to put heaters in to stop it condensing when it's not on. You've got to do drop testing as well where you literally drop it and hope it still works."

IP protection is pretty standard these days but Appy's Navy training has also made him an expert in areas which are much more important in consumer electronics now than they used to be, like EMI or electromagnetic interference.

"One aspect is how much information does it radiate out. The other is how much of a lightning bolt strike nearby could it handle without being damaged. With the old CRTs if you left a door open on a ship, another ship that was passing you would be able to pick up the radiation from the CRTs and display them. You don't want noise interfering with other systems, but you certainly don't want the noise being picked up by the enemy, who could then decode them and learn your secrets. It's easy to pick up someone's noise and regenerate it back into what it was."

In this modern age of cybercrime obviously that sort of awareness is crucial to creating safe and secure products.

An Appy Future

When we met Appy we were fascinated by his skills, and his story, and knew he could bring something amazing to the table. We accept and support his mental health issues and are in awe of his ability to do what he does and live a relatively steady and happy life. And he's really happy working with us too, which is great.

"We get on, in personalities as well. Obviously my personality can clash a lot, well it does clash with a lot of people. Especially non-engineers. But then as an engineer I can't even spell it. (Bit of an engineer joke from Uni)

"It's great when I get a chance to go to events because I get on with the people so great. My mental health issues just aren't there when I'm around the retro community people. We're all just accepted as we are so that keeps me really calm and never a problem. Also some of them have problems with their mental wellbeing too, but that's life isn't it?"

Appy makes everything we do better, more professional and more tough. We're so glad we met him and that we can enable him to do what makes Appy happy.

Chapter 14:

A thank you message to all involved in this project

When I set out on this project I did it alone, but I knew that I needed people with expertise in the many areas that I am lacking.

Over the time of this project development some are no longer involved, but the help they gave cemented the road map I had envisioned and made me realise I could complete this and far exceed the original scope in making it a far more user friendly and better quality design overall. This meant heavy custom design work rather than the original off the shelf nature that I felt was needed due to lack of engineering talent I had available in myself.

Firstly I want to thank Byron, whilst he thinks his contribution was small, the truth is that his input gave me access to utilising the original GBS 8200 and the GBS-Control Node system and having RGB Scart. Thank you Byron.

Throughout this project Kickstarter preparation I had graphics support from Paul Kitching with his usual amazing 3D renders of the design. Samuel Hurll created the Kickstarter video which wowed people and Phil South helped enormously by making my words make sense as he will do with this manual.

Peter Leigh (Nostalgia Nerd) was instrumental in getting the Kickstarter project over the line and without his video we may not have reached the goal. It is important to know we paid him nothing, he even bought the coffees, but his enthusiasm was the key factor to his support.

I have to thank all of the companies supporting me during this process mostly in China but one person I will highlight is Sara Tian who not only is my support at the tooling company for the chassis but also volunteered to be my translator in China when visiting lots of companies.

I also want to thank my wife who helped me sort out my accounts with this project and of course her support.

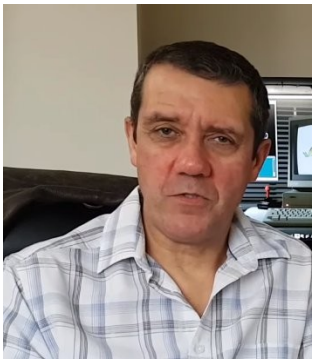
However, one person stands out and to who I am indebted too because his great engineering work transformed my project from a flexible and modular system but with off the shelf components type of project to a custom hardware and more flexible system including the XRI backplane instead of loads of cables internally.

He also allowed me to replace the original GBS8200 which was flawed and do a custom 4 layer board with the main TrueView chip with great VGA output to the back plane and multiple retro inputs plus an expansion to enable more

from third parties. I am of course referring to ‘Appy’ who is the engineer I'd always needed throughout my career back in the day to make my ideas real.

Finally, my Kickstarter backers to whom I owe the enabling of this project, thank you.

Steve Jones



Chapter 15:

My Kickstarter Backers

Without these people on the following pages you would not be reading these words because this product would not exist.

Please note I am using their Kickstarter names only, so apologies to those who did not put their full name but I assume you did this so as to remain private and I respect that.

Steve

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Adrian Hanington
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Ahmed Hassan Jassim Al-Thani
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Chapter 16:

My Patreon's

This is a list of ALL my Patreon's that have at least contributed once but also a lot of whom have supported me for years and once again without their support this monitor would not exist. Thank you.

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Chapter 17:

Main companies involved

Whilst this product was conceived and designed in the UK by myself and Appy, we could not have done it alone. As you can tell, to keep this product price as reasonable as I could I had no choice but to go to China, a country that I am really starting to like and the people have my respect for their work ethic and honest way of doing business.

HLH ProtoTypes

First company is HLH ProtoTypes in Shenzhen who are really a prototyping company as the name suggests but are so much more. They helped with the original case products that also make but this time they are handling all of the plastics, metalwork and even the assembly of the monitors.

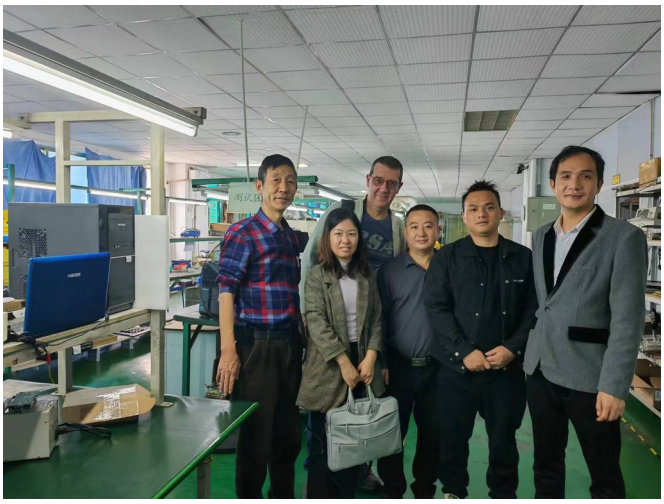
Biggest thanks go to Sara and Ronny, Sara who is my project manager in China and Ronny the cad designer and production man who has helped with my designs throughout. To be clear, these are not their Chinese names but most company staff who deal with foreign companies adopt a European name to make life easy.

Jingxin Quartz Technology

This company was picked as they have been making controllers for TV's and Monitors for a long time and they had the experience and the base technology we needed for the Slot-0 main controller board with the AV input.

But on top of this, they were prepared to work with this crazy British company with a mad idea and support us. Obviously monetary incentives helped, but they went beyond the call of duty integrating their technology in to Slot-0 and making our multitude of prototype stages.

Thank you to all especially Mr Lee and James for their support of this project throughout this long process.



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